1928.

QUEENSLAND.

TWENTY-EIGHTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

REPORT OF THE DIRECTOR

TO

THE HON. THE SECRETARY FOR AGRICULTURE AND STOCK

(*As required by "The Sugar Experiment Stations Act of 1900"*).

PRESENTED TO PARLIAMENT BY COMMAND.

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DIRECTOR'S REPORT.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

SIR,—I have the honour to submit the Twenty-eighth Annual Report of the Bureau of Sugar Experiment Stations up to the 15th November, 1928.

H. T. EASTERBY,

Brisbane, 3rd December, 1928. Director.

1.—Introduction.

According to the figures supplied to the Registrar-General, the production of raw sugar of 94 net titre for the year 1927 constituted a record, it being 485,745 tons, or 160 tons in excess of the previous record in 1925. Although this may be considered a record as far as tons of sugar manufactured are concerned, yet as the area from which cane was crushed in 1927 was 14,282 acres more than in 1925, the yield of cane per acre was not so good, being 19·36 tons in 1925 and 17·45 in 1927. The tonnage of cane from which the 1927 crop was produced amounted to 3,555,827 tons, as compared with 3,668,252 tons in 1925, so that the tons of cane required to make one ton of sugar were less last season. The amount of sugar exported in 1927 was 152,384 tons, as against 211,000 exported in 1925.

The proportion which the sugar required for consumption in the Commonwealth of Australia bore to the total production in Queensland and New South Wales, in 1927, was 68·8181 per cent. The net value per ton of the 94 net titre surplus sugar sold abroad was £12 2s. 6d., which was not so high as in 1926, when it was £14 18s. 10d. In respect of the raw sugar deemed to have been delivered and required for consumption and use within the Commonwealth of Australia, the Sugar Board were able to declare a payment of 10s. per ton on 94 net titre sugar in addition to the price of £26 prescribed for such sugar. The average payment that the Queensland and New South Wales sugar industry received for the whole crop was £22 0s. 4d. per ton of 94 net titre sugar. This, owing to the greater export, was not so high as in the previous year, when it reached £24 10s. 10d.

The agreement between the Commonwealth of Australia and the State of Queensland for continuation of sugar prices and the maintenance of the embargo on imported sugar expired on the 30th August, but was renewed for a further three years during the present year. The Federal Government has the right under the new arrangements to revise Australian prices if increased preference is granted to export sugar from Australia by Great Britain or any Dominion.

The exports of sugar since 1924, when the first large surplus was manufactured, are as under :—

	Tons.
1924	74,000
1925	211,000
1926	74,777
1927	152,384
1928 (estimated)	185,000

As there is still a certain amount of clamour raised by some Southern people as to the price of sugar, the following table, kindly supplied by Mr. Albert Townsend, the representative of the Commonwealth Government on the Export Sugar Committee, and an officer of the Federal Trade and Customs Department, should prove illuminating :—

Table showing that the increase in the Price of Sugar since 1914 has been less than that of any other constantly used commodity, also showing increase in wages.

Article.	July, 1914.	July, 1928.	Increased Percentage of 1928 over 1914.
			Per cent.
Sugar, per lb.	3·0d.	4·5d.	50·0
Butter, per lb.	13·1d.	22·25d.	69·8
Meat, per lb. (average)	5·66d.	8·56d.	51·2
Bread, 2-lb. loaf	3·5d.	5·98d.	70·8
Jam, per lb.	4·1d.	7·57d.	84·6
Milk, per quart	4·7d.	9·05d.	92·5
Coal, per ton (wholesale at wharf)	23s. 9d.	45s. 9d.	92·6
Basic wage, per week	£2 12s.	£4 15s.	82·7

(All these prices apply to Sydney).

1. Introduction—*continued.*

The average Commonwealth cost of all foods and groceries has increased by 74·5 per cent. since 1914, sugar being the lowest, viz., 50 per cent.

It may be pointed out that the production of sugar has been governed by the same laws as have influenced the rise in the other foodstuffs quoted above.

The export of sugar is also of great benefit to Australia, and millions of pounds come into this country as payment for same, thus increasing the Australian revenue. It is estimated that during the past four years some £7,000,000 have been received for sugar sent abroad.

The following have been the exports of sugar in manufactured articles since 1924:—

Exports of Sugar in Manufactured Articles.

	Tons.
1924-1925	5,500
1925-1926	4,800
1926-1927	4,170
1927-1928 (estimate)	4,500

2.—Approximate Estimate of the 1928 Crop.

The present season was wet in the earlier part of the year in all sugar districts, and excessively wet in the South. The rains were followed by a long period of dry weather, which induced an early arrowing of the crop, more particularly from Mackay north. While the cane crop is not so good as was anticipated earlier in the present year, the commercial cane sugar in the cane has been remarkably high, and most mills have manufactured sugar from a smaller number of tons of cane than at any time heretofore. Serious floods, cyclones, and frosts were not experienced, and labour in the mills and fields worked steadily throughout the season. Some difficulty in connection with storage capacity was experienced by one or two mills during the recent waterside trouble, and many farmers loaded and manned small vessels in North Queensland to get their sugar away to the Southern States.

From the following table it will be seen that the reduction, even from the estimate formed in June, is large:—

Estimated Crop of Cane, 1928 Season.

Mill.	Preliminary Estimate formed in June.	Approximate Estimate Furnished by Mills at end of October.	Remarks.
	Tons.	Tons.	
Mossman	82,000	78,542	Reduction due to dry weather
Hambledon	184,000	180,000	Reduction due to dry weather
Mulgrave	180,000	188,000	..
Babinda	190,000	190,000	..
Goondi	175,000	175,000	..
South Johnstone	180,000	178,000	..
Mourilyan	160,000	160,000	..
Tully	220,000	227,000	..
Victoria	252,000	259,000	..
Macknade	220,000	225,000	..
Invicta	90,000	83,000	Reduction due to dry weather
Pioneer	120,000	122,500	..
Kalamia	140,000	158,000	..
Inkerman	150,000	171,000	..
Proserpine	130,000	130,000	..
Cattle Creek	50,000	52,000	..
Racecourse	105,000	93,000	Reduction due to dry weather
Farleigh	112,000	94,000	Reduction due to dry weather
North Eton	60,000	67,500	..
Marian	105,000	90,000	Reduction due to dry weather
Pleystowe	130,000	110,000	Reduction due to dry weather and early arrowing
Plane Creek	130,000	124,000	Reduction due to dry weather and early arrowing
Qunaba	49,000	44,000	Reduction due to dry weather
Millaquin	108,000	94,600	Reduction due to dry weather
Bingera	100,000	98,000	Reduction due to dry weather
Fairymead	100,000	83,500	Reduction due to dry weather
Gin Gin	30,000	30,000	..
Childers	100,000	87,600	Reduction due to dry weather
Isis	90,000	87,000	Reduction due to dry weather
Maryborough	25,000	22,417	Reduction due to dry weather
Mount Bauple	30,000	24,000	Reduction due to dry weather
Moreton	45,000	37,000	Reduction due to dry weather following excessive rains
Rocky Point	3,500	3,000	..
Alberton	500	400	..
Eagleby	500	622	..
Total	3,856,500	3,767,681	

2. Approximate Estimate of the 1928 Crop—*continued.*

If this estimate is realised it should produce some 3,767,681 tons of cane. It is quite possible that only 7·15 tons of cane will be needed this year to produce one ton of sugar, and if this is so, then the production of raw sugar of 94 net titre may reach approximately 527,000 tons, which will be another record and by far the largest tonnage of sugar ever produced in Queensland.

It is anticipated that the yield of sugar in New South Wales this year will be 16,700 tons, which will bring the Australian production of raw sugar up to 543,700 tons.

In addition to this, the Victorian Sugar Factory at Maffra manufactured 2,349 tons of white granulated sugar from beet.

As the oversea price at present is not good, and the export will be larger than last year, a lower price to the growers and millers must result.

COMPARATIVE PROGRESS OF THE INDUSTRY DURING THE PAST TWENTY-NINE YEARS.

The average tonnage of cane per acre has shown no improvement during the past nine years, although the average tonnage of sugar per acre is better than in the previous decade. During the last nine years there have been a number of dry seasons, viz., 1919, 1920, 1922, 1923, and 1926, when the yields were small, but, even taking this into account, the yield of cane per acre should be better. The amount of green manure and fertilisers used is altogether too small, and cultivation methods could be improved.

Table showing Yield of Cane and Sugar per Acre and Tons of Cane required to make One Ton of Sugar during Twenty-nine 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
1921	18·60	2·30	8·11
1922	15·39	2·04	7·53
1923	14·75	1·94	7·60
1924	18·92	2·44	7·75
1925	19.36	2·56	7·55
1926	15·45	2·06	7·52
1927	17·45	2·38	7·32
Nine Years' Average	16 64	2·16	7·68

Due to the improvement in cane varieties and higher efficiency in sugar mills, the tonnage of cane required to manufacture one ton of sugar is now much less than in former years, and the figure for 1927 was the lowest on record.

2. Approximate Estimate of the 1928 Crop—*continued.*

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

Table showing Total Acres Cultivated and Crushed and Total Yields of Cane and Sugar per Acre for a Period of Twenty-nine Years.

Year.	Acres Cultivated.	Acres Crushed.	Yield.	
			Tons Cane.	Tons Sugar.
1899	110,657	79,435	1,176,466	123,289
1900	108,535	72,651	848,328	92,554
1901	112,031	78,160	1,180,091	120,858
1902	85,838	59,102	641,927	76,626
1903	111,536	60,375	823,875	91,828
1904	120,317	82,741	1,326,989	147,688
1905	134,107	96,093	1,415,745	152,722
1906	133,284	98,194	1,728,780	184,377
1907	126,810	94,384	1,665,028	188,307
1908	123,902	92,219	1,433,315	151,098
1909	128,178	80,095	1,163,569	134,584
1910	141,779	94,641	1,840,447	210,756
1911	130,376	95,766	1,534,451	173,296
1912	141,652	78,142	994,212	113,060
1913	147,743	102,803	2,085,588	242,837
1914	161,195	108,013	1,922,633	225,847
1915	153,027	94,459	1,152,516	140,496
1916	167,221	75,914	1,579,514	176,973
1917	175,762	108,707	2,704,211	307,714
1918	160,534	111,572	1,674,829	159,978
1919	148,469	84,877	1,258,760	162,136
1920	162,619	89,142	1,339,455	167,401
1921	184,513	122,956	2,287,416	282,198
1922	202,303	140,850	2,167,990	287,785
1923	219,965	138,742	2,045,808	269,175
1924	253,519	167,649	3,171,341	409,136
1925	269,509	189,466	3,668,252	485,585
1926	266,519	189,312	2,952,662	389,272
1927	274,838	203,748	3,555,827	*485,748

* This is raw sugar of 94 net titre.

PROGRESS MADE IN THE DEVELOPMENT OF THE SUGAR INDUSTRY IN THOSE DISTRICTS SITUATE NORTH OF TOWNSVILLE, SINCE 1910.

The above areas, with their high rainfalls and humid conditions, have made great progress in recent years, as the following table will show:—

Year.	Locality.	Number of Mills.	Tons of Sugar Produced.
1910	Above Townsville	7	57,135
	Below Townsville	42	153,621
1913	Above Townsville	7	62,414
	Below Townsville	41	180,423
1916	Above Townsville	9	98,396
	Below Townsville	38	78,577
1919	Above Townsville	9	101,351
	Below Townsville	33	60,785
1922	Above Townsville	9	120,617
	Below Townsville	31	167,618
1923	Above Townsville	9	161,227
	Below Townsville	29	107,948
1924	Above Townsville	9	189,947
	Below Townsville	29	219,189
1925	Above Townsville	10	216,755
	Below Townsville	27	268,830
1926	Above Townsville	10	221,104
	Below Townsville	26	168,168
1927	Above Townsville	10	228,839
	Below Townsville	25	256,906

Comparison of Tonnages of Cane and Sugar Produced in Different Areas of Queensland, comprising the Average Yields per Acre from 1902 to 1927.

——	Cane.	Sugar.
North of Townsville	17·47	2·20
Lower Burdekin	20·19	2·57
*Mackay and South	15·07	1·65

* The small districts of Moreton and Beenleigh are not included.

2. Approximate Estimate of the 1928 Crop—*continued.*

These figures show the increase in yield secured by the Lower Burdekin district, where irrigation is used.

From tables prepared by the Cane Prices Board, it is shown that the variation in crop yields from 1916 to 1925 was from 52 per cent. to 364 per cent. The crop varied from 13·8 tons to 23·8 tons between Ingham and Mossman, from 9·7 to 37·8 in the Lower Burdekin, from 8·9 to 21·4 in Mackay and Proserpine, from 7·2 to 26·3 in Bundaberg and Gin Gin, from 7·0 to 32·5 in Childers, Maryborough, and Mount Bauple, and from 19·2 to 29·1 in Nambour. The lowest yield of cane was in the Mackay-Proserpine area during that period.

3.—General Work of the Bureau.

Sugar Experiment Stations are established at South Johnstone, near Innisfail (Northern), Mackay (Central), and Bundaberg (Southern). These stations have chemical laboratories attached. Laboratories and offices for entomological research work are situated at Meringa, near Cairns (Northern), Mackay (Central), and Bundaberg (Southern). Laboratories for soils and sugar-mill chemistry and pathological work are to be erected shortly.

During the year the three research scholars sent abroad (Messrs. Bell, Bennett, and Kerr) have returned and joined the staff of the Sugar Experiment Stations.

Mr. A. F. Bell, while abroad studied pathology, Mr. Bennett, sugar-mill technology, and Dr. H. W. Kerr the physiology and chemistry of soils. All three gentlemen returned with high credentials, and their work will be of the greatest value to the sugar industry in Queensland.

Mr. A. F. Bell has assumed the supervision of the pathological work of this Bureau. Mr. Bennett has spent a considerable time this year at the various sugar mills, advising in sugar manufacture, while Dr. Kerr, who returned some months later—*i.e.*, in September—will take charge of the agricultural and soils section of the Sugar Bureau.

Every sugar district in Queensland has this year been visited by officers of the Bureau.

The Director's time has been largely occupied by the supervision and direction of the Experiment Stations and the general work of this Bureau, which involves a great deal of correspondence with farmers, farmers' associations, and others interested in the industry. Foreign correspondence has also to be handled, and the office work has materially increased. The official staff of the Bureau now numbers twenty-two.

The sending to the Press of reports of an informative nature on the work of the Bureau and the despatch of advices to farmers as to the treatment of their soils takes up considerable time.

Annual field days were held as usual at the Sugar Experiment Stations of Bundaberg, Mackay, and South Johnstone, and were largely attended. These field days are now looked forward to with considerable interest by large bodies of farmers, and are a means of conveying considerable information on agricultural, pathological, and entomological subjects.

Reports on the various sugar areas have been published every month in the papers circulating in sugar districts.

4.—Work of the Division of Soils and Agriculture.

The agricultural work of the Bureau includes the carrying out of experiments in cane cultivation at the various Sugar Experiment Stations, particulars of which will be found under their respective headings, and the giving of advice to canegrowers upon their problems in connection with land treatment, green manuring, fertilising, &c. Up to the present time the Director has been assisted in outside field work by three field assistants—viz., Messrs. J. C. Murray (Southern), E. H. Osborn (Central), and A. P. Gibson (Northern). The Southern district takes in from Beenleigh to Rockhampton, Central from Rockhampton to Rollingstone, and the Northern from the Herbert River to Mossman. The work of these three officers during the year has been most satisfactory, and they have been of considerable use to canegrowers, especially beginners in cane cultivation. In addition, the chemists in charge of the Sugar Experiment Stations at Bundaberg, Mackay, and South Johnstone afford help to growers who visit the station or write for same.

Reports are sent in by the Field Assistants to the Director on the following matters relating to cane farms, viz.:—Soils, crops, liming, green manuring, fertilising, drainage, irrigation, ploughing, planting, cultivation, harvesting, labour, trashing, ratooning, pests and diseases, varieties of cane in general use, climatic conditions, and arrowing of cane.

So far the Field Assistants have sent in reports upon 5,825 farms. Upon these 482 farmers have used lime, 1,036 have practised green manuring, and 1,406 have used fertilisers. This indicates that only 25 per cent. of our cane farmers are using fertilisers.

Year by year the Bureau emphasises the necessity for more intensive cultivation of cane farms. There can be no question that much better results could be obtained by concentrating on smaller areas and giving the best cultivation and treatment to the soil. At the present time the majority of farmers only look to increase of acreage to augment their cane crops. This is altogether wrong. The average yield per acre could undoubtedly be nearly doubled if proper methods were adopted, and these methods are constantly being brought before farmers by this Bureau. The excuse most frequently made is

4. Work of the Division of Soils and Agriculture—*continued.*

lack of funds, but this is not sound, as the extra cost of handling larger areas could be saved to a great extent. As previously pointed out, the time must come when the increased population of Australia will absorb all the sugar now over-produced, and the necessity of raising more cane and sugar per acre will become acute.

Some years ago a number of experiment plots on different farms were conducted by the Bureau, and it is proposed to again initiate a new series of farmers' and plantation plots.

Mr. H. W. Kerr, who left Australia in 1924 to study soils technology in other countries, attained a doctor's degree while at Wisconsin University in connection with soil investigations, where his work was so much appreciated that the Department of Agriculture received an application from the University authorities to grant an extension of time in order to allow of his finishing an important piece of research work. Dr. Kerr did not, therefore, return to Australia till September of this year—some six months later than his two fellow students. He has thus only had a limited time at his disposal to visit the cane districts, and is at present on a visit to the more Northern ones. In the meantime he has submitted the following report on the Bundaberg, Mackay, and Lower Burdekin areas:—

Report by Dr. H. W. Kerr, Sugar Soils Chemist.

"Since my return to Queensland in September, I have been able to spend a brief period in the Bundaberg, Mackay, and Lower Burdekin districts. These visits have enabled me to gain a better appreciation of the conditions which obtain, methods of cultivation employed, fertilisation practices, irrigation and harvesting operations; and I present herewith a short account of my observations and criticisms, with the outline of a policy which I consider should be pursued in an attempt at effecting increased efficiency and reduction of production costs. It is a system of scientific agriculture, which, after all, is the aim of all agricultural experimental work.

"Perhaps it would be as well to define what is meant by 'scientific agriculture.' Science has been aptly described as 'organised common sense,' and this is perhaps the best definition which could be given in this connection. It means that the value of *every* operation which is carried out must, first of all, be firmly established. Then it is necessary to carry out that operation in the most economical and expeditious manner. Nothing must be *accepted* on faith, or practised because long usage has given it a strong place in the agricultural scheme. Moreover, a careful study must be made of the factors which limit crop production, and an effort put forward to supplement naturally deficiencies to the ultimate economic limit.

"My studies abroad have taught me that wherever an agricultural industry has been threatened by pressure of economic factors, the method of recovery has been the adoption of the rigorous scientific method; and the pursuit of an intensive rather than an extensive policy has gone farthest towards the solution of the difficulties. That this is the logical procedure to adopt in the case of the Queensland sugar industry is very evident. The high cost of labour is the important economical factor, and it is necessary to employ methods which will yield the greatest returns for the labour expended. The use of labour-saving devices is absolutely essential in all practices, and the elimination of unnecessary operations imperative.

"The ultimate object will be, then, the production of the greatest economical yield of sugar per acre, and a reduction in the area of land cultivated, if necessary. It has been demonstrated, for example, that by cultivating intensively 40 acres of land a grower has been able to produce a profitable crop, whilst by treating 100 acres of the same land indifferently the returns barely paid wages. Further, the reduction in total tonnage effected by this policy leads to a diminution in total sugar production, with a consequent better price per ton of cane in times of over-production.

"It is a careful study of all factors which lead to more profitable farming, which constitutes the 'scientific method.' It is here also that the Bureau enters to place at the disposal of the farmer the experiences gained by agricultural research in this and other countries, and to co-operate in any experimental work for the solution of any problems which arise in the pursuit of increased efficiency.

"As examples of the problems which await careful investigation, a few instances will be given in connection with the following notes on the individual cane districts visited thus far. To a large extent each district has its own peculiar set of conditions; this applies to both climatic factors and soil types. In addition, pronounced variations are found within the individual areas, but for the present the major differences only will be considered.

"Bundaberg and Childers.

"In the Bundaberg and Childers districts the available water supply is obviously the serious limiting factor in crop production. This was very apparent at the time of my visit. Indeed, the irrigation possibilities of each district should receive very serious consideration. This aspect has been reviewed on many previous occasions, but it is felt that a definite attempt should be made to investigate fully the question of an economical supply of water, at least in certain local areas. Failing this, the whole agricultural system must aim at a more efficient use of the water which is received in the form of rain. This requires at times the adoption of dry-farming principles, to ensure that the crop may successfully carry over the rainless spells, and, above all, to maintain an adequate water supply to enable the young crop to get a start in the winter and early spring, when the rainfall is, in general, of a light and uncertain nature. The intelligent use of suitable fertilisers at the correct time and in appropriate proportions will undoubtedly do much to eke out the scanty moisture supply; for it is a well-established fact that plants make more economical use of water on fertile soils than they do on those less abundantly supplied with all the essential plant food materials.

"The time at which certain field operations are carried out is also a very important factor.

4. Work of the Division of Soils and Agriculture—*continued.*

The practice of ploughing the land, say, four times before planting in a dry season often results chiefly in the loss of water by the continuous stirring and exposing of the most fertile portion of the soil to the drying action of wind and sun. Under these conditions a less thorough preparation of the land might lead to much better results in these districts. The maintenance of a dry soil mulch is often resorted to, to reduce evaporation losses from the soil; but, unfortunately, the red volcanic loams are so porous that deep percolation losses are more important, and little can be done to mitigate these.

"The ploughing away from ratoons is a very effective cultural operation in times of abundant moisture supply; but this practice, in a dry period, can only result in the loss of valuable moisture, which the young stubble roots can ill afford.

"These and many other points are clearly evident as one studies conditions in these areas, and a scientific agricultural system demands that these factors be carefully investigated, and a better appreciation gained of what is the correct and what the detrimental practice.

"The ploughing-in of a leguminous crop (beans or peas) before planting has become an established practice with many farmers, and good results undoubtedly follow. However, it is erroneous to think that in this way the humus content of the soil is increased appreciably, and with it the water-holding capacity of the soil. The same arguments are held out in support of the practice of turning in the trash from volunteer ratoons. Trials conducted in other countries have shown that this increase cannot be effected to an important extent. Probably the desired results are achieved on certain farms in the Herbert River district, where the trash from 100 tons of cane may be incorporated with the soil during a period of four years. The quantity of organic matter returned in this way would probably exceed that added by ten leguminous crops each of 10 tons green weight. It is hoped that the net results of this practice will be definitely determined by experimental trial in the near future.

"The beneficial results which follow the ploughing-in of the leguminous crop are probably due in a large measure to the addition of considerable amounts of nitrogen and other nutrients, which become readily available to the succeeding crop. Perhaps still more important, in a dry year, is the effect of the covering afforded the soil by the green crop in lowering the soil temperature and conserving moisture. This may be of the utmost importance to the development of the young plant crop which follows.

"In parts of this district molasses has been found to produce excellent results on the red soils. It has been applied very successfully at the rate of 8 to 10 tons per acre. The application of molasses undoubtedly adds much readily available plant food material to the soil, and it is significant that the chief constituent of this nature is potash. The volcanic soils have shown good response to potash fertilisation, and a 10-ton application of molasses might yield 500 lb. or more of potash. The beneficial results observed might lie in this direction; but it has been shown also that the physical condition of the soil is materially improved, and the beneficial results have been found to persist for many years after the treatment. The results strongly suggest the value of this by-product as a soil ameliorant. A scientific study of the action will also receive close attention in an attempt to elucidate the nature of the benefits obtained.

"Mackay.

"The Mackay district, though receiving a higher mean rainfall than that just discussed, is nevertheless subjected to long spells of dry weather. The effects of a prolonged dry period are very evident at this time; and the employment of methods which will alleviate this problem should receive very earnest consideration.

"Many of the loamy soils of the area are quite shallow, being underlain by a peculiar yellow clay at a depth of only 9 inches. It would seem that the surface soil might be appreciably improved by bringing up, say, an inch of the subsoil from time to time, and incorporating this with the surface soil by subsequent cultivations. The water-holding capacity of the latter would be increased thereby, and its improved depth would provide a better medium for root development.

"The use of fertilisers in this district has much room for expansion; but it must be emphasised that no fertiliser is the correct one for any district, or farm, or field until the fertiliser requirements of the soil and crop have been tested by an adequate field trial. A group of farmers in this area have used consistently a mixture which they have definitely found to be more suitable than any of the well-known proprietary mixtures. The results obtained have been exceedingly profitable and satisfactory. It is in this field that the Bureau should be able to assist very materially in co-operating with growers in laying out fertility field plots.

"That irrigation in this district has at least limited possibilities has long been recognised; and it is encouraging to find that an attempt will be made in the near future to test its feasibility. If the water can be brought to the fields economically, it would doubtless enable the growing of the large crops which are harvested in a good season as a regular practice.

"Molasses and filter press mud have been used in certain localised areas with very beneficial results. Here, also, the use of these by-products has further room for exploitation.

"Lower Burdekin.

"The Lower Burdekin district is unique in that irrigation is carried on as a general practice. The district is favoured by a most providential combination—the soils are consistently fertile, and an adequate supply of very suitable water may be obtained by shallow pumping at some point on every farm. Some farms in this district possess what are probably the finest sugar soils in the world, and with an optimum supply of moisture throughout the growing season the crop yields might be maintained at a consistently high figure. On the other hand, the irrigation method as practised is both crude and wasteful, and would bear very careful investigation. In one irrigation more than twice as much water as the soil can hold is applied, and the distribution is

4. Work of the Division of Soils and Agriculture—*continued.*

very uneven. Moreover, the water is made to run along courses between the cane rows, and the supply of water to the young cane roots depends on the lateral movement of the soil moisture from its point of application. It is well known that this movement is very slow, and deep percolation of the water proceeds much more rapidly and completely. The continued flooding of the land results in the packing of the surface soil, which cracks badly on drying and bakes to a hard crust under the action of sun and wind. Thorough surface cultivation immediately after the water is taken off is imperative; and this costly operation results in the destruction of all the earth watercourses, which must be remade before the next irrigation. The period between water applications is also too great to permit of unchecked crop growth.

"The older lands of the district, and even many of the more fertile soils, do not produce profitable ratoons. This also seems to be the result of an inadequate water supply at the time when it is most required. A careful chemical study of the quality of the irrigation waters and of the condition of some of the soils is essential. Many of the latter have had their structure completely destroyed, probably as the result of overwatering.

"Growers in this district will require scientific assistance, and it is hoped that many pressing problems may be taken up in the near future.

"Considerable interest has been displayed towards the adoption of an automatic system of irrigation. The improved sprinkler head which I brought back from Honolulu was seen in operation here, and I feel sure that two or three growers will instal trial areas under the scheme. It offers very many advantages when labour costs are high, but it suffers the serious drawback of high installation cost. An exact figure for the latter cannot be given just at present, but it is hoped that this will be forthcoming very shortly.

"Failing the adoption of this system, there are several other irrigation methods which might well be tried; some of these will also be tested out on a small scale. The Hawaiian method of irrigating in the cane furrow, employing short lines, should have possibilities, or perhaps an adaptation of the method might be employed profitably. As the irrigation problem is by far the most important in this district, growers cannot be too strongly advised to take up this question with all earnestness.

"The use of suitable fertilisers should be made on certain lands, and again the correct mixture, or single constituent, required by the particular soil must be determined by small scale field trials.

"Now, in carrying out cultural, fertiliser, or irrigation trials, it is very evident that the grower's own farm is his best experimental station. Hewee, it has been my policy to try to interest farmers in laying out these tests with our co-operation, but on their own lands and under their direct care. They, then, will be the experimenters and the judges of the value of the practice under the conditions which obtain on the soils with which they are vitally concerned. The suggestion has been met with a very hearty reception by the keener type of farmer; and, of course, it is only those who would help themselves that the Bureau can attempt to help. In the matter of fertility and irrigation trials, also, these farmers have gladly agreed to provide the necessary materials at their own expense. That the farmer will display a keener interest in the work when he is financially concerned is quite obvious, and the experiment might then receive the attention which its importance demands.

"GENERAL.

"The response which has been met with is very encouraging, and in the districts visited arrangements have been made with a number of good and representative farmers, with whom this work will be taken up by next planting season. The laying out and supervising of these field trials will entail a considerable amount of work, but it is thought that for the time being the services of the station chemists and field assistants might be requisitioned for the purpose.

"There is a very important matter which has come to my notice very forcibly in some of the areas which I have visited. That is, the question of the individual weekly allotment method of harvesting. This is doubtless a most inefficient method of dealing with the crop, and one which involves serious losses to both grower and miller. Supposing that a farmer has a 10-acre field which will yield 40 tons per acre. Under the individual allotment scheme, eight to ten weeks may be required in which to harvest the block. This means that the first canes may be cut when immature, and probably before the field is cut out the cane has become overripe. In any case, much of the cane will be harvested when the crop is not at its best, and this applies to practically all fields throughout the entire season.

"Now, if the grouping system were installed, the entire block would be cut out in about ten days, and then provision could be made to ensure that the cane would be at its best when harvested so far as this is possible. This would involve the carrying out of a series of ripening tests along well-established lines, and it would seem that this work might well be undertaken by the cane testers at the various mills. If they were to devote their attention towards a determination of the state of maturity of the grower's cane, so that only mature canes should be cut, a great service would be afforded both grower and miller. It is not possible to carry out harvesting operations absolutely in conformation with this idea it is true, but very appreciable gains could certainly be effected.

"An individual commercial cane sugar test tells nothing regarding the state of maturity of the cane, for one crop may be at its best when the commercial cane sugar is only 12, while another will improve even after it has attained, say, 15 commercial cane sugar. Yet it is economically better to harvest the former rather than the latter if a series of tests show that the former cane is mature at 12 commercial cane sugar.

"This is not the only advantage offered by grouping, as is well known. The farmer would then be free to attend to his ratooning or watering on the entire block immediately after the cutters have finished. And experience has taught that the correct time at which to carry out ratooning operations is as soon as possible after the

4. Work of the Division of Soils and Agriculture—*continued.*

crop is harvested. It is not possible to get ratoons away to a good start if the field is harvested at the rate of two lines per day.

"Another question which arises is that of burning before harvesting. This has been the established practice on the majority of the Hawaiian plantations for many years, and it presents many distinct advantages.

"One step in the right direction to help bring about a more efficient method of harvesting will be the introduction of mechanical cutting. I had an opportunity to attend a demonstration of the Miller-Owen cane harvester when in Mackay. It may be said that it is free from many of the defects of the earlier machines. It is relatively simple in construction and free from unnecessary complications. The inventors have wisely aimed at keeping the machine light and easy to operate, while the cost of the machine is low. They have not been over-ambitious, but have confined themselves to the building of a harvester which will cut and top burnt cane and carry out the operation at a satisfactory rate (5 to 10 tons per hour).

"The saving in cutting costs, on a conservative estimate, would be appreciable if the machine is successful. We should be only too ready in this country to embrace any promising devices which make for greater economy in the industry when once they have proven that they are capable of doing the work, so that the results of an endurance test with the new machine will be watched with interest."

5.—Work of the Division of Sugar Mill Technology (March to October, 1928).

Some years ago the Bureau considered the formation of a special Technological Division for the purpose of giving direct assistance, where required, on problems associated with the methods and processes of sugar manufacture.

This division was formally instituted on the return of Mr. Norman Bennett, in March, after a period of four years spent abroad studying methods of manufacture in foreign countries. It was considered advisable for this officer to further study local conditions existing in Queensland in contrast with those abroad before formulating definite plans as to the future organisation of the division.

No attempt has been made for many years to assist the millers by the investigation of problems arising in sugar manufacture. Consequently most of the Queensland mills have been compelled to investigate their problems independently, with the result that little exchange of methods, crop statistics, &c., has been attempted by the individual mills.

In connection with the work done during the period, March to October of this year, Mr. Bennett has made the following report:—

REPORT OF SUGAR TECHNOLOGIST.

"In response to a request sent out by the Bureau to all the mills in Queensland, twenty-nine replies were received. Arrangements were made to visit all these mills during the crushing season, and these initial visits have now been completed between June and the end of October. An attempt will be made to revisit the Northern mills a second time before the close of the season.

"The response of some of the mills to the request of the Bureau for particular problems has been gratifying. Unfortunately, some of these problems must be held over pending an increase in staff and until such time as a closer control of factory methods has been introduced. It has been impossible to draw up comparative results of the work of our Queensland mills, as none of the mills has completed the season at the time of writing.

"Consideration is being given to the introduction of a scheme whereby it will be possible for the division to publish comparative figures on the basis of a uniform control in future years. A scheme of uniform methods of analysis and control will be submitted to the mills for comment and adoption before the commencement of the 1929 season. The introduction of these methods will facilitate the work of preparing mutual control sheets for circulation among the contributing mills during the crushing season.

"The present system of factory control is based upon an empirical 'commercial cane sugar' formula used by the Central Cane Prices Board in arriving at a price for cane supplied to the mill. Owing to differences in varieties grown, climatic and soil variations of the three main sugar districts of Queensland, the use of this payment formula as a basis of mill control gives no true relative comparison of the work of various mills. Until such time as the mills introduce measurements of the mixed juice entering manufacture, maceration water used, and molasses produced, the control has to be based on 'sucrose in cane' as derived from the 'c.c.s.' formula and not on a more accurate figure obtained by calculation from the weights of cane, mixed juice, and maceration water. In this respect Queensland control differs from that used in other sugar-producing countries. The essential for any serious organised attempt to improve efficiency in mill work is the introduction of—

(i.) Standardised methods of sampling and analysing all products of manufacture;

(ii.) Use of a uniform method of calculating reports for comparative purposes;

(iii.) Frequent interchange of working reports between all mills;

(iv.) An annual meeting of mill executives to discuss manufacturing problems and improvements based upon working operations of the preceding campaign.

"During the inspection visits carried out since the commencement of the present crushing

5. Work of the Division of Sugar Mill Technology (March to October, 1928)—*continued.*

season, the following errors of laboratory practice have been noticed:—

(i.) Indiscriminate use of flasks graduated at 15°C., 17½°C., and 20°C.

(ii.) Use of balances for 3 N W methods sensitive only to ·5 gm.

(iii.) Indiscriminate use of 26·048 gm. and 26 gm. normal weights under a false impression that the polariscope itself and not the flask graduation fixes the normal weight to be used.

(iv.) Use of tables given in Spencer's Handbook for Horne's Dry Lead Method based on 17½°C. when Brix spindles graduated at 27½°C. have been used.

(v.) Use of some polariscopes with scale graduations based on Bates-Jackson scale of the United States Bureau of Standards and not on the International Scale.

(vi.) Calculation of sucrose extraction figures for various mills of a tandem on the basis of an assumed constant purity for the residual juice in megass varying from 66⅔ to 80 per cent.

(vii.) Entire disregard of the sucrose in molasses held in stock when calculating the weekly sucrose balance.

"These errors individually and collectively have made it impossible to draw any comparison of the work of Queensland mills with that done abroad. Much remains to be done in regard to improvements in—

(i.) Use of macerating fluid with due regard to steam economy;

(ii.) General introduction of clarification control on basis of pH measurements;

(iii.) Modification of boiling systems and the relative benefit of steam and water in the fugals in order to produce an average sugar of 98·5 to 98·75 as required owing to modification of British tariff laws;

(iv.) Fuel economy in the boiler house as affected by steam conservation in the boiling end.

"Primarily, however, the chief work of the division for next season will be the introduction of a more rigid control of the manufacturing process. This can only be accomplished by separating the work required for the cane payment scheme and that necessary for mill control. It will require, in the majority of cases, additional assistance in the laboratory and close co-operation between the mills and the Experiment Stations in the use of the new methods."

6.—Work of the Division of Pathology.

This division is now under the supervision of Mr. A. F. Bell, one of the returned research scholars, who received special training in plant pathology whilst abroad in America, Great Britain, and other places, including the principal sugar countries of the world.

REPORT OF THE SUGAR PATHOLOGIST.

As the officer in charge of the Division of Pathology, I have the honour to submit the following report of the work of this Division during the past year:—

Staff.—

In December last Messrs. N. L. Kelly and G. Wilson, having completed their cadetship and qualified for the degree of B.Sc., joined the staff as assistants. Mr. E. J. Ferguson Wood returned to the University in March in order to undertake a year's graduate work in plant pathology; in addition to his University course he has also carried out a considerable amount of field work in the Southern district. Mr. W. Cottrell-Dormer, at present on extended leave, is now engaged upon his final year in the Faculty of Agriculture, and should return to duty at the end of the coming year. I assumed charge of the division in April, immediately following my return from abroad.

Field Inspections.—

Field inspections have been carried out in practically all sugar districts, with the exception of some of those supervised by the Colonial Sugar Refining Company. This company follows a policy of maintaining a field officer at each mill, and by this means is enabled to carry out an efficient programme of disease control. In addition to the ordinary district inspections, intensive disease surveys have been carried out in the Bundaberg, Maryborough, Nambour, and Beenleigh districts. The distribution of diseases remains practically the same as that outlined by Mr. Wood in last year's report.

Fiji Disease.—

An outbreak of Fiji disease was discovered in the Nambour district in March, and prompt steps were taken to control the disease, which now appears to have been eradicated. The manner of the introduction of the disease into this district could not be ascertained, but is probably due to an unreported importation of cane from Maryborough, Beenleigh, or New South Wales.

A small outbreak was reported from the Bundaberg district last year, but in this case also the disease appears to have been eradicated.

With the exception of the Eagleby district, good progress has been made towards the complete control of Fiji disease in the Beenleigh area, and the percentage of infected stools has decreased from 8 to 10 per cent. to less than 2 per cent., due to seed selection and the partial substitution of Q.813 and H.Q.285 for more susceptible varieties. Less progress has been made in the Maryborough area, but with adequate supervision complete control could be brought about in a very short time. To aid the farmers in these two districts, the Bureau issued lists containing the names and addresses of farmers from whom supplies of disease-free seed cane could be obtained. Through the courtesy of the Press, these lists were given publicity, and we look for a marked decrease in primary infection in this year's plant cane.

6. Work of the Division of Pathology—*continued.*

Mosaic Disease.—

Fortunately the majority of the farmers are acquainted with the symptoms, and appreciate the extent of the damage which may be caused by mosaic. North of Townsville this disease scarcely exists, and in the south, although generally distributed, is of major importance only in a very few mill areas, of which Mount Bauplé is the worst. At the request of the directors of the Farleigh Mill, an officer visited the district in June in order to select farms which would be suitable as sources of seed cane for this year's planting.

Gumming Disease.—

Gumming continues to be the major disease of Queensland, and that the position in the Bundaberg and Nambour districts is serious cannot be over-emphasised. In these two localities so widespread is the disease that it is impossible to practise seed selection; in the main areas it is impossible to find a single field which can be considered as a source of seed cane. Unfortunately the standard varieties are badly diseased, and no very satisfactory resistant varieties are available at present. Moreover, I am not inclined to place overmuch reliance on our limited field observations on varietal resistance and susceptibility.

Inasmuch as gumming has been in the Bundaberg district for at least thirty-five years, and the present standard varieties have been grown for a considerable period, it seems reasonable to assume that these two varieties must be very tolerant, if not resistant, to the disease, in order to have survived until the present time. Moreover, experience on the Tweed River has indicated that, if healthy seed cane is used, and due precautions taken to prevent knife infection, moderately resistant varieties can be safely grown in the vicinity of diseased cane. In view of these facts, efforts are now being made to find disease-free farms in more or less isolated positions on the outskirts of the Bundaberg area; such farms will be inspected periodically, and, if continually found to be free from gumming, will be advertised as sources of seed for next year's planting.

Preliminary steps have also been taken in the direction of establishing isolation nurseries for the propagation of disease-free cane. We have proposed that the mills or the farmers' organisations, or both, should undertake this work under the technical supervision of this division. In order to safeguard any farmers who may undertake such work on unassigned land, and if through no fault of their own the cane becomes diseased and useless for seed purposes, we have arranged with the Central Cane Prices Board to grant assignments within certain specified limits. The Bundaberg District Executive is circularising its members with a view to obtaining suitable farms for this purpose.

By the use of these methods it is considered possible to reduce losses to a minimum and relieve the situation until such time as we have introduced or bred suitable resistant varieties.

A field trial to test comparative resistance is being carried out at the Bundaberg Experiment Station, the following varieties being under observation:—

P.O.J. 2714, Oramboo, Korpi, Nanemo, Badila, H. 227, M. 28/10, M. 55, Black Innis, Uba, M. 1900 Seedling, D. 1135, Q. 812A, Q. 813, Q. 1098, Co. 210, Co. 213, Co. 227, B.H. 10/12, and S.C. 12/4. (The latter two varieties were observed to be resistant to gumming in Porto Rico and St. Kitts, British West Indies, during my visit to the West Indies in 1926.) The three Coimbatore seedlings appear quite free from gumming, although they have been exposed to infection for a period of five years, and they have accordingly been included in a yield trial, with Q. 813 as the standard variety.

At the request of the Nambour Growers' Association we supplied a short list of apparently disease-free farms in the Pialba district, in order that Nambour farmers might have available some healthy seed cane for this year's planting.

Gumming also exists in isolated farms in the Mackay, Mount Bauple, Mulgrave, and Beenleigh districts. With the extension of the area under Q. 813 it is hoped to obtain complete control in Beenleigh, whilst at Mulgrave the disease appears to be confined to one farm. It is in the large Mackay district that the greatest potential danger may exist, and the need for a detailed farm-to-farm survey is urgent. With the knowledge of distribution so obtained it would be possible to guard against the further spread of the disease, and, perhaps, bring about its eradication.

The position at the Victoria and Macknade Mills, in the Ingham district, continues to improve under the direction of the field officers of the Colonial Sugar Refining Company, and it is not considered that gumming is now causing any direct losses.

Leaf Scald.—

South of Cardwell this disease occurs only on scattered farms, and its further spread could doubtless be checked with adequate supervision. North of Cardwell the disease is epidemic, and our surveys indicate that it is present on approximately 100 per cent. of the farms. Unlike mosaic and Fiji diseases, leaf scald and gumming cannot be controlled by the selection of individual stools within a field, in or near which definite symptoms have been observed. Consequently it follows that seed selection is impossible throughout this large area. The narrowness of the coastal belt in this part of Queensland, and the consequently limited area of land available for sugar-cane culture, make it very difficult to establish isolated nurseries for the propagation of disease-free seed cane. Fortunately the main variety, Badila, has so far proved quite tolerant to the disease, and the losses do not appear to be significant in the vast majority of cases. Under these circumstances it would appear that our best plan is to concentrate on raising resistant seedlings which will resist this disease. It will be interesting to observe whether P.O.J. 2878 will prove as resistant to leaf scald in Queensland as it has to the probably identical gomziekte in Java.

Diseases of Secondary Importance.—

Under this heading are included downy mildew (leaf stripe), top rot (red stripe ?), spindle top, red rot, various ill-defined rots of the stem, and

6. Work of the Division of Pathology—*continued.*

root rots caused by weak parasites. Field observations concerning the inter-relation of these diseases to the environmental conditions are deplorably meagre, but we are of the opinion that they are intimately connected with the class of soil, agricultural practice, stage of maturity of the cane, &c. It is hoped that field observations carried out in conjunction with the fertiliser, irrigation, and cultural experiments, to be inaugurated by Dr. Kerr, will yield valuable information as to the remedial measures to be adopted.

Red rot and other stem rots have been particularly common in certain localities this year, when the continued dry weather stopped all growth and caused the cane in many fields to become "over-ripe." Under these conditions the present system of harvesting is responsible for great losses in sugar; the percentage of sucrose rapidly diminishes in diseased canes, and fields in which the disease is beginning to have a measurable effect should be harvested in a day or two and not at the rate of 30 or 40 tons per week. The following analyses made at Sarina and Kalamia indicate the losses caused by this disease:—

	Sarina (1900 Seedling).		Kalamia (E. K. 28).	
	Healthy.	Diseased.	Healthy.	Diseased.
Brix	24·0	21·0	23·2	20·8
Sucrose	22·4	18·1	21·3	16·0
C.C.S.	17·7	13·7	16·1	10·8
Glucose	0·3	0·7	0·5	2·5
Purity	93·2	86·3	91·6	77·0

Damage to Cane by Foxes.—

The fox must now be added to the already long list of sugar-cane pests, and is causing some damage in the southern part of the State. These animals chew the cane stalks a short distance above the ground, apparently attracted by the sweet juice, and the damaged cane falls to the ground. The chewed portion of the cane has an appearance similar to that caused by an iron-tyred wheel passing over a cane stalk. The variety commonly attacked is H.Q. 285, a soft and brittle cane.

Introduction of New Varieties.—

During the year thirteen varieties were imported from Java and sixty-five from Hawaii. The former included the famous P.O.J. 2878, and the following new canes were brought in for breeding purposes:—Glagah (*Saccharum spontaneum*), P.O.J. 2364, P.O.J. 2722, P.O.J. 2785, P.O.J. 2940, S.W. 3, and S.W. 499. D.I. 52, E.K. 28, and Black Cheribon were also included in the collection.

The sixty-five Hawaiian varieties were imported under arrangement with the Hawaiian Sugar Planters' Association, and their resistance and susceptibility to diseases not present in Hawaii will be determined during the next few years. Most of these canes have one parent which is highly resistant to gumming, and it is hoped to obtain one or more varieties with which to combat this disease.

Collection for a Variety Garden.—

An urgent necessity is an isolated variety garden in which will be maintained a disease-free collection of all the varieties grown in Queensland. In order to obtain the necessary nucleus of disease-free seed, selected canes are being grown under observation in private gardens in Brisbane. If found to be perfectly healthy, these canes will ultimately be transferred to the variety garden; at present about twenty varieties have been planted out in this manner.

Laboratory and Equipment.—

A list of the necessary laboratory equipment has been placed on order, and tentative plans for a laboratory have been prepared. It is desirable that the erection of a laboratory be expedited, as investigational work is very seriously hampered under the existing conditions.

The Problems of the Future.—

Owing to the presence of practically all the serious diseases of cane, and the fact that the half million tons of sugar are produced by some 7,000 farmers, the control of sugar-cane diseases in Queensland presents a problem which, in magnitude and complexity, is unequalled in the sugar world. For the most part, the methods of control must be devised entirely from our own experience, as there is little in the experience of other countries which is likely to prove of much benefit. Such countries as have an efficient staff of pathologists have managed to exclude most of the serious diseases, and, consequently, there has been no investigation of these diseases. On the other hand, in countries where major diseases are numerous, the pathological service has usually been inefficient or totally lacking. The chief lesson to be learned from foreign sugar-cane pathology is the necessity for a field staff to act as intermediaries between the laboratory and the farmer. Much of the failure to achieve reasonably good control of disease is due to the non-establishment of such a link.

From the nature of sugar-cane culture, and the low economic value of each individual plant, it is evident that in the present state of knowledge all efforts towards disease control must lie in prevention, and not in cure, except in so far as the control of certain diseases by modified field practice might be regarded as a cure. It is also evident that in the last analysis the most economically sound measures of prevention is an extensive and well planned programme of seedling raising.

6. Work of the Division of Pathology—*continued.*

The absence of trained pathologists and agriculturists in Queensland is responsible for the fact that few reliable field observations have been recorded. For a long time to come the members of the staff of this division must play the part of observers and recorders, rather than that of disseminators of information. The work of the assistants during the past two or three years has furnished sufficient data on the general distribution of all the major and some of the minor diseases; it is now necessary to study the detailed distribution and its relation to environmental factors. Frequent detailed surveys are an absolute necessity for the purposes of seed selection, but these can only be carried out by placing an officer in each subdistrict. Such an officer would not by any means be required to devote his whole time to disease control work, but could combine this with other advisory duties. For instance, during the greater part of the milling season, i.e., when the cane is either very tall or very young, conditions are distinctly unfavourable for disease survey work. These men would certainly not require to be plant pathologists, but preferably agriculturists who had had a short training in disease diagnosis and control. Unless some such system can be devised, the possibilities of practical disease control are strictly limited.

One of the most important factors in disease control is seed selection, and in most cases this must be supervised by a trained man. On the other hand, in many districts where diseases such as leaf scald and gumming are widespread, the only reasonable method of ensuring supplies of healthy seed cane is to grow the cane under supervision in isolated nursery farms, and this a scheme which we must endeavour to promote wherever feasible.

Local quarantines must aim at preventing the interchange of varieties and diseases between districts. As soon as we have a controlled breeding programme operating, the introduction of foreign canes must be reduced to a minimum. Modern seedlings which are outstanding in the country of origin are outstanding simply because they conform to the peculiar needs of that country, and hence it is not to be expected, in general, that they will be of any great value in any other country. The only rational method of seeking the best canes, from the standpoints of yield and disease resistance, is to raise our own seedlings. With the limited labour at our command, the first step must be to establish the most desirable types of cross and then proceed to raise as many seedlings as possible from these canes.

The determination of varietal resistance and susceptibility must be made by controlled experiments as far as possible. Unless the complete history of the cane is known for each locality, field observations are liable to be misleading, especially in the case of diseases transmitted by contact, and much which has been written in recent years may have to be modified profoundly.

Thanks are due to Mr. D. S. North, Pathologist to the Colonial Sugar Refining Company, for his continued interest and assistance; each member of the staff has now completed a period of training under his capable supervision. My personal thanks are also due to the directors and staffs of the Hawaiian Sugar Planters' Association, Philippine Sugar Association, Philippine Bureau of Science, and the Proefstation voor de Java Suiker-Industrie, for their courteous assistance during my recent visits.

ARTHUR F. BELL.

7. Work of the Division of Entomology.

NORTHERN AREA.

The Entomological Laboratory in connection with insect pests of sugar-cane is situated at Meringa, near Cairns, and is under the charge of Mr. Edmund Jarvis, whose work has continued to be of high scientific interest, and at the same time of practical use to the industry.

Mr. Jarvis, in speaking of his staff, makes the following remarks:—

"Mr. J. H. Buzacott has continued to hold the position of Assistant to Entomologist, additional services having been rendered also during the last eight months by Mr. W. A. McDougall, who took up duties at this Laboratory on the fifth of January, 1928.

"The services of Mr. Buzacott have been greatly appreciated. Apart from his varied knowledge of machinery, and other work of a mechanical nature—which has often proved valuable here—his marked artistic abilities, combined with entomological attainments, have recently enabled this Laboratory to prepare several exhibition show-cases containing insect pests of sugar-cane, and also coloured diagrammatic illustrations of the life-cycle stages of principal enemies of cane. Two of these show-cases have been sent to the Experiment Station at South Johnstone, while others have found a place in the biological laboratory of Brisbane University. Not the least of Mr. Buzacott's qualifications is his invariable willingness to recognise that the 'need is the call,' regardless whether work of the moment happens to be agreeable or otherwise.

"Mr. W. A. McDougall (Assistant to Entomologist) is gradually becoming familiarised with various official duties. During his few months at Meringa he has been given charge of the work of propagating specimens of the Tachinid fly parasite, *Ceromasia sphenophori* Vill., for liberating in canefields infested with the weevil borer (*Rhabdocnemis obscurus* Boisd.), in which duty he has shown considerable interest. The success attending our breeding of this useful parasite is detailed in my report under the heading of 'Notes on Biological Control.'"

7. Work of the Division of Entomology—*continued.*

ANNUAL REPORT OF ENTOMOLOGIST, 1927-1928.

To the Director of
Bureau of Sugar Experiment Stations.

SIR,—I have the honour to furnish the following Annual Report, dealing with the various forms of research and experimental work carried out at the Meringa Sugar Experiment Station, during the past twelve months ended August, 1928:—

Our Principal Cane Beetle Effectively Controlled.

As a result of experimentation extending over a period of about three years the value of paradichlorobenzene as a fumigant for destroying cane grubs has been fully demonstrated, while at the same time we have proved over and over again that when properly applied it does not injure growth of the cane. There are reasons, indeed, for believing that in some cases such fumigation of the soil tends rather to stimulate growth of the stools.

In 1924, for example, a grower at Highleigh advised me that although no decided evidence of grub injury could be noticed either on our treated or check plots of D. 1135, the standing cane on the former appeared to him to be slightly higher than that growing on the untreated plot. A couple of weeks later, however, when comparing the length of the sticks from these plots while they lay in the field after cutting, this difference in tonnage was quite appreciable.

An interesting illustration in this connection occurred also at a farm at which some plots of cane (B. 147) had been fumigated with paradichlorobenzene by the owner, independently of any collaboration with the Bureau of Sugar Experiment Stations. The following details of this experiment, however, were kindly communicated to the writer at the end of the season, after the cane of these plots had been harvested separately and crushed at the Mulgrave Mill:—

Plot 1 (consisting approximately of two acres) was treated with crude paradichlorobenzene alone, at the rate of 150 lb. per acre. This was applied with a simple form of fertilising machine, the crystalline nodules having first been passed through a coarse sieve (quarter-inch meshes)..

Plot 2 (of exactly similar size) was treated with 80 lb. of paradichlor., thoroughly mixed with the same weight of manure, and applied in manner described above.

Results.—The cane obtained from Plot 1 (paradichlor. used alone) was 64·990 tons, the average c.c.s. of which was 15·67; while that harvested from Plot 2 was 52·573 tons, having an average c.c.s. of 15·23.

Review of Field Work in connection with Paradichlorobenzine as a Grub Destroyer.

Between the dates 17th January, 1923, and 11th February, 1924, sixty-one experiment plots of size varying from $\frac{1}{16}$ to $\frac{1}{4}$ of an acre were laid down in various canefields in the district of Cairns. Fumigation of the treated plots was effected in all cases by means of hand-injection, the doses of paradichlor. used in these experiments varying in quantity from $\frac{1}{16}$ to $\frac{1}{4}$ oz. (Apothec.), and being buried in most cases $4\frac{1}{2}$ inches deep, 12 to 18 inches apart, and 4 to 6 inches from the cane stools. The quantity used per acre varied from about 60 to 200 lb., which comprised, however, several brands differing in price and quality.

Most of the plots were fumigated during the month of December, many in January and February, and a few in November.

Cane varieties treated were mostly D. 1135 and Badila, which had been planted during July, August, and January.

Sixteen plots fumigated with paradichlorobenzene, but which were not grub-infested, served to illustrate the fact that this chemical has no injurious effect whatsoever on ultimate growth and development of the cane; seeing that the stools on all of these test plots were found to be equally as fine and healthy as those growing on a similar number of check plots alongside each of the treated areas.

On the other hand, its effectiveness against cane grubs was amply demonstrated on grub-infested plots, notably on those at Woree, Meringa, and Highleigh (see Bulletin No. 19, pp. 39 to 47, Div. of Entomology).

It may be advisable to mention here that in all the foregoing experiments the paradichlorobenzene before being used was passed through a coarse seive with quarter-inch meshes, in which form it is suitable for applying either by machine or hand injection. Despite definite recommendations, however, made by our Sugar Bureau from time to time, many growers are still under the impression that paradichlor. to be of any use must first be dissolved in carbon bisulphide in order that it may be injected in liquid form.

On account of the fact, however, that when dissolved in this way the most desirable property of paradichlor. as a soil fumigant—viz., its long sustained toxic action—is practically destroyed, while at the same time additional cost is incurred for labour and material by the employment of two insecticides, when either of them if used alone and at the right time would do the work required, such method of fumigation has never been advocated by the present writer. It is this undoubted advantage of sustained action possessed by paradichlor. in dry form over other soil fumigants of rapid volatility which has led to its extensive use in America and other countries as a controlling agent against some of the most formidable insect pests known to economic entomologists. One is forced to admit that when the fumes from injections of dry nodules of paradichlor. continue active day after day for a fortnight or longer in grub-infested cane land, the toxic vapour can hardly fail to ultimately reach grubs chancing to be ensconced in compacted lumps of soil not easily entered by such vapours; or those grubs which so often lie directly under the stools, in earth more or less consolidated by increasing pressure due to expansion during growth of the basal portion of the cane sticks and main roots, where

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the soil being a little moister as a rule than that disturbed by cultivation is proportionately difficult to permeate.

Further, with regard to the matter of dissolving paradichlorobenzene in liquid mediums, it was shown by experiments conducted in America during 1923 that "When paradichlorobenzene is dissolved in carbon tetrachloride, the mixture fractionates upon evaporation. About 1 per cent. of the paradichlorobenzene goes off with the carbon tetrachloride regardless of the original concentration. This means that the toxicity of the latter cannot be very greatly changed."*

Appliances for Fumigating Grub-infested Cane Land.

During the last twelve months the question of burying soil fumigants in such manner as to reduce cost of application to a minimum has been looked into, with the result that we are now able to administer dry fumigants like calcium cyanide and paradichlorobenzene expeditiously and economically by means of using horse power.

Fumigating Machine.—With this appliance a man and one horse can fumigate about 3 acres of cane per day. This machine, which operates in much the same way as a corn planter, buries the dry crystals, nodules, or flakes, as the case may be, at regular depths and distances apart, while the soil above the doses is at the same time slightly consolidated by a special roller attached at the back.

Fertilising Machine.—As already alluded to above, cane land has been successfully fumigated with paradichlor by using a simple form of manuring machine. The advantages of this method of application present great future possibilities, seeing that such fumigation can be carried out by the grower during the course of ordinary routine work, when he gives his final dressing of manure to the young stools, at which time the grubs of our grey-back cockchafer are still in the second instar and have not commenced to seriously damage the cane.

Hand Injectors.—These are used for various liquid fumigants, like carbon bisulphide, benzine, &c. The original "Pal Excelsior" injector, which was invented more than thirty years ago by Vermorel for combating *Phylloxera vastatrix* in the vineyards of France, still holds its own as being the cheapest and best appliance for treating subterranean insects. The "Danks Injector," of somewhat similar construction, but heavier and more expensive, has been used in Australia for many years.

Hand injectors, although very useful at times in orchards or small holdings, are not recommended for fumigating large areas such as canefields, since by this method a man cannot treat much more than one-third of an acre per day.

Notes on Biological Control.

In my last annual report it was stated that during the year 1926-27 applications from growers for specimens of *Ceromasia sphenophori*, the well-known Tachinid parasite of the weevil borer (*Rhabdocnemis obscurus* Boisd.), had been fewer than usual, but that 378 living specimens and about 500 puparia of this Tachinid contained in cane sticks taken from our breeding cages had been distributed at South Johnstone, Innisfail, and other districts.

No further liberations of this parasite were effected for about eleven months (between April, 1927, to March, 1928).

The increase of this pest having, however, been favoured, as was expected, by conditions brought about by the recent cyclonic disturbance, special attention was given to the breeding of *Ceromasia sphenophori*, with the result that during the last five months (April to August, 1928) 1,127 living specimens of this Tachinid were reared at Meringa Experiment Station and released on thirty-one different selections among borer-infested cane. In addition to these consignments, field boxes were established at Mourilyan and Mount Sophia, holding cane sticks containing in all about 150 puparia of *C. sphenophori*, from which the parasites were due to emerge in a day or so. The liberations of live Tachinids were made on the mill areas of the following districts:—South Johnstone, 463 specimens; Goondi, 295; Babinda, 232; Mulgrave, 107; Mourilyan, 30 specimens. The work of breeding and liberating consignments of this useful parasite has been given to Mr. W. A. McDougall (assistant to Entomologist), who has shown considerable interest in this branch of biological control.

Study of Hymenopterous Parasites and Entomogenous Fungi.—

Investigation of this fascinating branch of research work has been carried out from time to time during the past twelve months by Mr. J. H. Buzacott (assistant to Entomologist), from whose notes the following data have been taken:—

Notes on Breeding Discolia soror Sm.—"Difficulty was at first experienced in getting these wasps to lay, but when suitable conditions were reached they laid fairly well. Owing to shortage of grubs the breeding was not carried out in quantity. *Discolia soror* lays best in tins of fairly moist sandy soil with a little humus mixed among it. It parasitises both *D. australis* and *A. boisduvali*, but of the two seems to prefer the former. . . . The egg resembles that of *Campsomeris* and is equally large, but is attached by the large end, contrary to the custom of *Campsomeris*. . . . During May it hatches in six days, the larva much resembles that of *Campsomeris*, but is smaller than that of *tasmaniensis*, and it spins in approximately eleven days after hatching. . . . Pupal period in only specimen bred through was thirty-five days."

It may be mentioned here, for comparison with the above notes, that during the month of June the eggs of *Campsomeris*—which in summer weather take three days to hatch—require from seven to ten days, while the period occupied by its combined egg and larval stages varies from eighteen to twenty-four days, under an average shade temperature of about 68 degrees Fah. In January (summer brood), however, these two life-cycle stages are completed in twelve days, the temperature at that time being about 82 degrees Fah.

* 30th Annual Report, Minnesota Agricultural Experiment Station, 1921-22, pp. 68-73.

7. Work of the Division of Entomology—*continued.*

Breeding Emenadia cucullata Macl.—Additional data to that published by the writer in 1922 ("Queensland Agricultural Journal," vol. xviii., p. 39) was obtained by Mr. J. H. Buzacott during October, 1927, and May, 1928, who found that the triungulin of this species is able to live for twenty-nine days in confinement without taking nourishment of any kind except a little moisture. As many as four triungulins of *cucullata* were observed inside a single larva of *Campsomeris tasmaniensis* Sauss., but unfortunately the host died before attaining full development. In other cases triungulins of this beetle which had entered larvæ of *Discolia soror* Sm. reached a length of 5 mm., although none were reared through to the imago condition.

Fungus Parasite of Beetle Borer.—On 19th June some test tubes containing cultures of a vegetable parasite known to attack a beetle borer (*Rhabdocnemis* sp.) affecting sugar-cane in the Philippines were brought to this Experiment Station, instructions having been previously received from the Director regarding the advisability of our studying its possibilities as a controlling factor against the weevil borer, *R. obscurus*, under Queensland climatic conditions.

These cultures, which were prepared by Mr. A. F. Bell, Pathologist to the Sugar Bureau, were grown on corn meal agar.

The fungus was successfully propagated by us on sterile potato slices, and by the fifth day (during June, 1928) Mr. J. H. Buzacott (assistant to Entomologist), who had been given charge of this work, noticed a growth of hyphæ, on which fructification appeared on the ninth day after inoculation. Out of the different methods of infection tried, that of spreading the spores on a piece of cane sectioned longitudinally was the only one that gave positive results.

Acetylene Light Attractive to Grey-back Cockchafer.

In view of the report published by Mr. R. W. Mungomery (Assistant Entomologist) in the February number of the "Australian Sugar Journal," vol. xix., pp. 656-657, in which he stresses the very unimportant phototropic reaction manifested by females of our southern cockchafer *Pseudoholophylla furfuracea* Burm., it became advisable to briefly enumerate the various experiments carried out in North Queensland in connection with the phototropism of our grey-back cockchafer, *Lepidoderma albohirtum* Waterh. Details of this work were accordingly published in vol. xx. of the abovementioned journal, pp. 167-168, in which it was shown that, unlike the Southern cane beetle, *P. furfuracea*, both sexes of our notorious Northern species are strongly attracted to artificial light.

Protection of Insectivorous Birds.

Commenting on a letter received from the Director, having reference to the wilful destruction by cane farmers and others of our chief insect-eating birds in the district of Cairns, the following notes were published in the April number of the "Australian Sugar Journal":—

Although undoubtedly a few of our native birds play an important part in the biological control of insects as a whole (including both harmless and injurious species), it should be remembered that the percentage of cane beetles destroyed by them in canefields during a couple of months of the year is exceedingly small in comparison with that effected by the numerous parasitic and predaceous insect enemies which exercise at all times a natural controlling influence, not only upon the imago or adult form, but also upon the egg, larval, and pupal conditions of each injurious species affecting sugar-cane. It should not be forgotten that the few predatory birds in question, including *Carphibis spinicollis* (Straw-necked Ibis) *Grallina picata* (Mud Lark, or Pee-wee), &c., &c., chancing to frequent cane land, probably represent less than a quater of the total number of birds which habitually devour myriads of these cockchafers under natural conditions during their flighting period throughout the vast uncultivated tracts of scrub, mountain, and forest country.

We may, I think, assume that, although in violation of the Birds Act of 1921, many useful birds are still wantonly shot by itinerant sportsmen, and even by thoughtless farmers who have not yet learned to value the services of such feathered friends, the quantity annually destroyed in this way would necessarily be a small fraction of the whole of the insectivorous birds occurring throughout the district of Cairns.

Such foolish slaughter, however, is to be deplored, seeing that if continued it must eventually lead to several of the most useful of our grub-eating birds avoiding the neighbourhood of cane land and breeding elsewhere.

Importance of Drainage in Cane Culture.

Disregarding our volcanic and high land cane areas, there is much low-lying country possessing a good natural drainage, even in those situations where the soil happens to contain a large proportion of clay. On some of the flats, however, such as occur near Aloomba and elsewhere, some practical system of artificial drainage becomes one of the essentials to successful cane growing. Some of the areas between the North Coast Line and the Bellenden-Ker ranges, for instance, cannot be expected to produce good crops of cane until they have been properly drained and well cultivated. The depth of such drains is a matter of no little importance, since it has a direct bearing on the aeration of soil so treated. In addition to increasing the fertility of the land, improved aeration provides ideal conditions for the treatment of grub-infested areas with soil fumigants. Most of the failures, indeed, experienced by our growers in the past to obtain the best results from the use of carbon bisulphide have been due to its having been applied to fields not sufficiently aerated to allow the toxic fumes to permeate uniformly throughout the depth of soil in which cane grubs were working.

Some Dangers Induced by "High-cutting."

Growers were warned that high-cutting of cane chancing to be infested by the weevil borer (*Rhabdocnemis obscurus* Boisd.) should always be carefully avoided. The larvæ and pupæ of

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this serious cane pest generally occur in the last few inches of the stick at about ground level; such being almost invariably the case in light infestations. One of the methods of checking the increase of this beetle is to cut the crop low, by which means practically all the larvæ and pupæ likely to be present on a plantation are thus removed from the land and destroyed during the process of milling. Should the crop be cut too high, however, a large percentage are sure to be left behind, and these larvæ, after transforming into pupæ and stopping in their tunnels for a time, will ultimately produce beetles which at once turn their attention to next season's ratoons. Evidence of the above-mentioned fact of this insect usually injuring cane close to ground level may often be seen on trucks of borer-affected cane standing in a mill yard, where it will be noticed that about 60 per cent. or more of such damage is betrayed by holes in the bottom ends of the sticks, indicating where tunnels of this insect have been cut through transversely.

In addition to favouring the increase of the weevil borer, high-cutting has a tendency also to encourage the spread of the smallest of our three species of moth borers of cane, viz., *Ephysterus chersæa*, Meyr., the caterpillars of which show a preference for shoots originating from buds above the ground.

Dates of Emergence of the "Grey-back" Cockchafer (Lepidoderma albohirtum Waterh.).

During the 1927-1928 season cane beetles commenced to emerge from cultivated areas around Meringa about the middle of December, 1927, after a fall of 2·16 inches of rain experienced between the 15th to 20th of that month.

It was remarked that many of these grey-backs were badly rubbed, in some instances the elytra being of a uniform brown colour, owing to nearly all the whitish scales having been rubbed off. Such condition is probably brought about during repeated attempts of the beetle to force a passage to the surface before the ground has become sufficiently moistened to permit of an easy exit from the pupal chamber. This often happens in seasons of drought, when these beetles are forced to remain longer than usual in the ground on account of continued dryness of the soil.

This species usually appears on the wing about the middle of December, as will be seen from the following table giving data for the last fourteen years:—

1914	5th December.
1915	11th December.
1916	7th November.
1917	29th October.
1918	15th October.
1919-20	15th January.
1920	5th November.
1921	2nd December.
1922	22nd December.
1923	7th December.
1924	13th December.
1925	18th November.
1926	18th December.
1927	18th December.

C

The most favourable seasons for grub control by means of soil fumigation are those in which emergence of the beetles takes place in October or the beginning of November, while most of the cane requiring treatment is still young, and the ground free from excessive moisture. Emergencies occurring early in December are also favourable, since fumigation can generally be practised towards the end of this month or during most of January before commencement of the wet season.

Field Experiment Plots.

Recent results obtained by the establishment of various test plots laid down during January last on volcanic soil in the Hambledon Mill area indicated that the cane on plots treated by us with different amounts of carbon bisulphide mixed with other insecticides, made on the whole better growth than that growing on the check plots.

The fumigants, &c., experimented with were as follows:—

1. Carbon bisulphide and kerosene (half and half mixture). Doses of $\frac{1}{8}$ to $\frac{1}{4}$ oz. injected 4 inches deep, 3 inches from plants, 12 inches apart, on both sides of the rows.
2. Carbon bisulphide and Mustard oil (1 gallon CS_2 to 10 to 15 cc. M. oil). Doses, $\frac{1}{8}$ to $\frac{1}{4}$ oz. 3 inches from plants, 12 inches apart, 4 inches deep, and on both sides of cane rows.
3. Naphthalene impregnated with Mustard oil (20 cc. M. oil to 2 lb. naphthalene). Dose, $\frac{1}{4}$-oz. injections, 12 inches apart, 4 inches deep, 3 inches from plants, and on both sides.
4. Benzine and naphthalene (1 lb. naph. dissolved in 1 gall. benzine). Dose, $\frac{1}{4}$ oz. 4 inches deep, 3 inches from plants, 12 inches apart, and on both sides of rows.
5. Benzine and Mustard oil (1 gall. benzine to 10-15 cc. M. oil). Dose, $\frac{1}{4}$ oz., 4 inches deep, 3 inches from plants, 12 inches apart, and on both sides of cane rows.
6. Chlorocide A; $\frac{1}{8}$-oz. doses, 12 inches apart, 3 inches from stools, 4 inches deep, and on both sides of rows.
7. Calcium cyanide (flake form). Doses, $\frac{1}{8}$ oz., 12 inches apart, 4 inches deep, 3 inches from plants, and on both sides.

The best results were obtained on Plot 2, but no difference was noticeable in cane where the larger amount of mustard oil had been used; the $\frac{1}{8}$-oz. doses appearing to have been just as effective as the $\frac{1}{4}$-oz. doses of the mixture of bisulphide and kerosene applied to Plot 1. The cane treated with naphthalene and mustard oil, and that fumigated with benzine and naphthalene gave negative results.

Relation of Feeding Trees to the Numerical Increase of Cane Beetles.

Perhaps the most important factor in connection with the control of our notorious grey-back cockchafer, and one which appears to present a possible solution to the cane grub problem, is the influence exercised on this insect by its food-

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plants, which, when chancing to occur in the vicinity of cane land, often serve to attract great numbers of these cockchafers during their aerial existence or flighting period.

Some of the growers at Mosman, which are seldom troubled with cane grubs, attribute their good fortune to the destruction of all feeding trees of the beetle to within a considerable distance from their canefields. We may reasonably assume that in certain sugar-growing districts such action might prove exceedingly advantageous, but, at the same time, one should bear in mind that results obtained in this connection on one class of country might not be secured in other widely separated districts. The following recommendations, however, made by the writer last September ("Australian Sugar Journal," vol. xix., p. 335) would apply to local conditions in a district such as Cairns, where, amongst other influencing factors, that of migration of this pest has received some attention.

In the event of a belt or clump of timber containing food plants of the beetle chancing to occur in the midst of, or to separate two adjacent plantations, or to lie in a south-easterly situation about a mile from the southern headland of a canefield, such trees should be cut down.

Similarly, when either one or opposite sides of an area of cane land happen to run in a south-easterly direction and be closely bounded by forest country, it is often advisable to cut out all feeding trees, &c., growing near such headlands to a distance of about half a mile from the nearest rows of cane.

On the other hand, when the southern edge of a canefield is bounded closely by forest land extending far to the southward it is not advisable to clear a belt of timber back from such headlands or to cut down the feeding trees.

Should grubs occur over an area of cane land chancing to be more or less surrounded on all quarters except the south by timbered mountain ranges, destruction of the food plants of this cockchafer would, if practicable, not only entail considerable labour and expense, but be likely in many cases to prove ineffectual as a controlling measure. Such cul-de-sacs or small pockets usually become grub-affected in the first place as a result of the arrival of beetles migrating from a south-easterly direction, which, owing to the disposition of the mountains, are forced to come to rest upon trees fringing the base of these ranges. Finding the situation for breeding purposes, and that further progression towards the north-east and west to be more or less obstructed by mountainous country, they generally establish themselves in such localities and regularly damage the cane each season. In permanent infestations of this kind the best plan is to prevent excessive multiplication of the beetles by collecting them during the flighting period, either from native food plants or from trap-trees grown for this purpose; and by picking up the grubs during the course of cultural operations. By exercising common-sense methods of this sort it should be possible on such cane areas to ultimately reduce the grub pest to harmless proportions; seeing that the land in question is practically closed from further invasion from all quarters but the south, while the chance of reinfestation by migrating beetles probably only takes place during seasons which happen to be exceptionally favourable to the breeding of this insect over vast tracts of uncultivated country.

Museum of Sugar-cane Entomology.

Four large exhibition showcases, containing specimens of the principal insects attacking sugar-cane, were prepared during the last twelve months, two of these cases having been sent to the Northern Sugar Experiment Station at South Johnstone, and two to the Queensland University. A large diagrammatic coloured chart of the weevil borer of cane (*Rhabdocnemis obscurus* Boisd.), the work of Mr. J. H. Buzacott (assistant to Entomologist), has recently been added to our office museum, illustrating the various life-cycle stages of this beetle, together with the nature of injury to the cane sticks due to tunnelling of the larvæ.

Allusion was made in my last Annual Report to the want of additional space for the exhibition of organisms destructive to sugar-cane and their parasitic and predaceous natural enemies, &c.

This extension to our museum could be provided at very little expense. Our insect collection about three years ago (August, 1925) numbered over 4,000 specimens, comprising nearly 2,000 species, while at the present time (October, 1928) it contains 6,743 specimens, which include 2,091 species.

Of these species, 941 belong to the group Coleoptera (beetles), 287 to the Diptera, 365 to the Hymenoptera, 147 to the Orthoptera, 196 to the Lepidoptera, 123 to the Hemiptera, 29 to the Neuroptera, and 3 to the Isoptera.

Significance of the Recent Grub-infestation, 1927-28.

In the year 1917, when this pest appeared in alarming numbers, the rainfall for November and December of 1916, together with that of January to April, was 69·37 inches, as against 81·51 inches for the same period of last year (1927).

During the period of June to October, immediately preceding the outbreak of 1917, a fall of 6·17 inches was registered here; whereas for the same period of last year, which preceded our present grub-infestation, the precipitation happened to be 8·09 inches. Had it not been for the meteorological check experienced during the seasons 1925-27, the recent rainfalls mentioned above—which exceed those leading up to the 1917 outbreak by 14·06 inches—would have brought about a far more serious grub-infestation than that being felt at present in the district of Cairns.

Publications.

The following Monthly Reports—dealing with research work and other activities carried out in connection with the control and study of cane insects—together with other miscellaneous publications were supplied by the writer during the last twelve months.

Monthly Progress Reports.—Published in "Queensland Agricultural Journal":—For September, 1927, vol. xxviii., pp. 339-41, one full plate; October, 1927, vol. xxviii., pp. 556-58, one full plate; November, 1927, vol. xxviii., pp. 565-68, one full plate; December, 1927, vol. xxix., pp.

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122-23; January, 1928, vol. xxix., pp. 198-99; February, 1928, vol. xxix., pp. 259-60; April, 1928, vol. xxix., pp. 338-39; May, 1928, vol. xxix., pp. 389-90; August, 1928, vol. xxx., pp. 95-96, one full plate. Published in the "Australian Sugar Journal":—For September, 1927, vol. xix., pp. 335-37; October, 1927, vol. xix., pp. 395-98, one inset illustration; November, 1927, vol. xix., pp. 481-82; December, 1927, vol. xix., pp. 542-44, four inset illustrations; January, 1928, vol. xix., pp. 611-15; February, 1928, vol. xix., pp. 655-56; March, 1928, vol. xix., pp. 727-28, one full plate; April, 1928, vol. xx., p. 27; May, 1928, vol. xx., pp. 107-08; June, 1928, vol. xx., pp. 164-65; July, 1928, vol. xx., p. 263; August, 1928, vol. xx., p. 287.

Entomological Hints to Canegrowers.—Published in "Queensland Agricultural Journal":—September, 1927, vol. xxviii., p. 206, one plate; October, 1927, vol. xxviii., pp. 341-42, one inset illustration; November, 1927, vol. xxviii., pp. 442-43; December, 1927, vol. xxviii., pp. 554-55; January, 1928, vol. xxix., pp. 7-8; February, 1928, vol. xxix., p. 180; March, 1928, vol. xxix., pp. 180-81; April, 1928, vol. xxix., pp. 337-38; June, 1928, vol. xxix., pp. 388-89, two inset illustrations; August, 1928, vol. xxx., p. 90. Published in "Australian Sugar Journal":—September, 1927, vol. xix., pp. 333-34, one inset illustration; October, 1927, vol. xix., pp. 393-95; November, 1927, vol. xix., p. 457; December, 1927, pp. 526-27; January, 1928, vol. xix., p. 611; February, 1928, vol. xix., p. 655; March, 1928, vol. xix., p. 726; April, 1928, vol. xx., p. 19; May, 1928, vol. xx., p. 133; June, 1928, vol. xx., p. 161, two inset illustrations; July, 1928, vol. xx., pp. 233-39; August, 1928, vol. xx. pp. 285-86.

Pamphlet on Paradichlorobenzene for Controlling Cane Grubs.—This was published in the February number of the "Queensland Agricultural Journal" (vol. xxix., pp. 97-113) and illustrated by three full-page plates and five inset photos.

Notes on Queensland Cane Insects and Their Control (Fourth Series), including various Entomological Science Papers.—This will be published, I understand, as Bulletin No. 20 of Division of Entomology.

Miscellaneous Articles.

"Fighting Insect Pests of Sugar-cane in North Queensland," with thirteen illustrations. Published in "The Reference Book of the Sugar Industry of the World," for 1928, vol. vi., No. 8, pp. 58-61, 1928.

"How to Breed the Tachinid Parasite of the Weevil-Borer of Sugar-cane." Published in "Tropical Agriculture," vol. iv., pp. 203-205, with seven illustrations.

"The Control of Root-Eating Scarabæid Grubs in Queensland Canefields." Paper contributed to the Fourth International Congress, held at Ithaca, New York, during August, 1928, with several illustrations.

Reports by Mr. J. H. Buzacott, Assistant to Entomologist, being an account of visits paid to various districts.

"Report on Insects of the Hambledon Cane Area." "Queensland Agricultural Journal," vol. xxviii., pp. 563-64, December, 1927.

"Cane-Boring Insects Noticed in the Babinda District." "Queensland Agricultural Journal," vol. xxviii., p. 555, December, 1927.

"Cane Pests and Diseases at Innisfail." "Queensland Agricultural Journal," vol. xxix., p. 114, February, 1928.

"Report on the Lower Burdekin District." "Queensland Agricultural Journal," vol. xxix., pp. 275-76, April, 1928.

"Report on Visit to the Atherton Tableland." "Queensland Agricultural Journal," vol. xxx., pp. 6-7, July, 1928.

"Report on Inspection of Grub Damage at Yuruga." "Queensland Agricultural Journal," vol. xxx., pp. 88-89, August, 1928.

I have, &c.,

EDMUND JARVIS, Entomologist.

CENTRAL AREA (MACKAY).

A branch of the Division of Entomology was opened at Mackay in the month of January last, under the charge of Mr. A. N. Burns, Assistant Entomologist, formerly at Meringa. Mr. Burns has opened up new work at Mackay and has proved an earnest and energetic officer. His report for the period he has been in charge at Mackay follows.

Report of the Assistant Entomologist at Mackay.

Director,

Bureau of Sugar Experiment Stations,
Brisbane.

SIR,—I have the honour to submit the following report of the work performed at this laboratory since my taking up duties in January last.

Since the commencement of my work at the Central Sugar Experiment Station, much of my time has been centred on the carrying out and continuing of a series of grub fumigation tests, commenced by Mr. R. W. Mungomery, at West Plane Creek, Sarina. A similar experiment and practical demonstration into the fumigation of cane grubs was also carried out at Mount Jukes, near Mackay. Farmers in both these localities have been judiciously collecting by hand large numbers of cane beetles from the feeding trees, and have also in many instances destroyed the feeding trees in the immediate vicinities of their farms, which no doubt, in combination with the extremely wet season of February and March last, has been responsible for reducing very considerably the amount of grub infestation in these areas.

Both the abovenamed districts suffered very severe grub attack in the 1926-1927 summer, but from farmers' own observations, and surveys made by the writer prior to the laying down of the experiments, grub damage was not severe in comparison with the previous season. This condition has been most desirable to growers, but

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has, unfortunately, not been as favourable as it could have been for determining the results of the different fumigation plots.

A small experiment plot was also laid down at the Experiment Station against grubs of the Frenchi cane beetle (*Lepidiota frenchi* Blkb.), but the cane being second ratoon and of poor growth, and the number of grubs per stool small, results to date have been disappointing.

Many laboratory experiments embodying the use of many different fumigants, several of which have not previously been tried against cane grubs, have been carried out, and much valuable data has been secured therefrom. Results from some of the latest experiments are not yet available, the experiments being still in progress.

Many farms in the Mackay area and district have been visited; also at Sarina and other portions of the Plane Creek Mill area. Ayr and Jarvisfield district were also visited in connection with serious grub injury that was occurring there. In these instances numbers of different cane pests have been identified for growers, and help and advice has been given regarding the control and prevention of further damage to their cane.

Much time and attention has been directed to the breeding through of as many as possible of the cane insects occurring in the Central cane areas, and, in consequence, much information regarding times of appearance, life history stages, injury caused, &c., has been gathered. A number of natural parasites of many of the different cane pests have also been bred through in the above phase of the work.

A good representative office collection of cane insects has been accumulated, together with many spirit specimens of most of the cane grubs, pupæ, &c., as well as other leaf-eating larvæ, and cane-boring insects.

Taking into comparison the investigations into cane-destroying insects carried out in North Queensland, all observations clearly show that in the Central cane areas also, root-eating cockchafer grubs are undoubtedly the worst enemies of sugar-cane, and are, with several exceptions, the same species as those occurring in far Northern canefields. Infestation here happily does not appear to attain such magnitude and degree of severity as it does farther north. This may be due to several causes, the chief of which, in the writer's opinion, is the nature of the soil, as compared with that in the far North, where heavy grub infestation is always most marked in the very friable red volcanic soils; whereas most of the soil in the Mackay district is either black or greyish and of a very heavy nature. In what would be termed very heavy grub attack in this district the number of grubs per stool of cane would range from about six up to a dozen or more; the latter number, however, would be only in exceptional cases. In the far North that figure is frequently much exceeded, and ranges fairly constantly throughout severly infested areas.

The principal cane grubs occurring in the Central districts are (in descending order of destructiveness)—*Lepidoderma albohirtum* Waterhouse —the greyback; *Lepidiota frenchi* Blackburn—the Frenchi beetle grub; *Anoplognathus boisduvali* Boisduval—Christmas beetle grub; *Dasygnathus australis* Boisduval—dusky cane beetle grub; *Anomala australasiæ* Blackburn—Anomala beetle grub; and *Pentodon australis* Blackburn—black stem gauger grub. In addition to these, one large species of grub, probably some species of *Anoplognathus*, and several small ones belonging to such genera as *Neso*, *Haplonycha*, &c., have been collected from canefields, and are being bred at the laboratory with a view to identification, and the correct classification of each grub to its particular beetle.

Other insects that have come under notice and have been studied are the Beetle Borer (*Rhabdocnemis obscurus* Boisd.); Large Moth Borer (*Phragmatiphila truncata* Walker); Army Worms of several species (*Cirphis* spp., &c.); Wireworms of several species (*Elateridæ* spp.); as well as other leaf-eating and sap-sucking insects.

Field Experiments.—

A fumigation demonstration was given, and four plots of grub-infested cane fumigated in the presence of a number of farmers at West Plane Creek early in February last. The method of locating the grubs at the cane roots was demonstrated, and explanations of ascertaining the correct conditions of soils for fumigation, depths, &c., at which to apply the doses of poison were clearly detailed. A complete description of the life history of the greyback cane beetle (*Lepidoderma albohirtum* Waterh.) was given, special attention being given to the different stages of the grub. It was pointed out that most of the cane is destroyed by grubs when they reach the third or final grub stage; but that the main object of successful fumigation was to destroy them by the injection into the soil around the cane roots of poisonous compounds, the principal ones used being paradichlorobenzene and carbon bisulphide. This should be done before the grubs reached the third stage. If the cane were left till such time as the leaves and tops were wilting and withering, the injury might have gone so far and the cane be so weakened that it might not recover to a profitable extent as a result of "too late fumigation." Stress was also laid on the fact that to fumigate immediately—*i.e.*, one or two days, after heavy rains was also useless, as the soil would be so saturated that thorough permeation of the fumes of the poisons injected would be impossible, and thus much waste of time and material would ensue. The two different soil injectors for injecting liquids and solids, respectively, were examined and their working thoroughly explained; and during the fumigation of the plots farmers themselves were permitted to use the injectors, and so thus become familiar with their use. The final data in connection with these field experiments is not yet available, but results will be submitted in future monthly reports.

During February also a similar demonstration and the fumigation of two plots was carried out at Mount Jukes in the presence of a number of growers of that district. As at West Plane Creek, full explanations were given regarding the life cycle of the cane beetles, the correct time and conditions for fumigation, &c. Farmers here

7. Work of the Division of Entomology—*continued.*

were also afforded the opportunity of using the injectors themselves. In this area again comparatively few grubs were found at the cane roots, where during the previous season a heavy infestation occurred.

Another small field experiment plot was laid down at the Experiment Station against grubs of the "Frenchi" (*Lepidiota frenchi* Blkb.) cane beetle. The cane fumigated was second ratoon Q. 813 and rather poor, and only from two to three grubs were found at each stool. The cane in both the control and fumigated plot is still poor, and little difference is so far discernible.

Laboratory Experiments.—

These have been carried out extensively, and altogether thirteen different fumigants have been experimented with. Each experiment was carried out against either third-stage grubs of the greyback beetle (*Lepidoderma albohirtum* Waterhouse) or Frenchi beetle (*Lepidiota frenchi* Blkb.) in cages containing approximately 62 cubic inches of soil. Details of each completed experiment and the fumigants used, together with results obtained, are itemised hereunder:—

No. 1.

Paradichlor and Carbon Disulphide in saturated solution, ⅛-oz. doses.—Six cages each containing one third-stage frenchi grub in moist soil, and about ½ inch from bottom of cage. Three of the cages with doses 1 inch above grubs (A) and three cages with doses 2 inches above grubs (B).

No. 1 A gave 100 per cent. kill within forty-eight hours.

No. 1 B gave 66⅔ per cent. kill within forty-eight hours and 100 per cent. kill within five days.

No odour of paradichlor was perceptible after eight days.

No. 2.

Paradichlor and Shell Benzine in saturated solution, ⅛-oz. doses—Six cages each containing one third-stage frenchi grub in moist soil, and about ½ inch from bottom of cage. Three cages with doses 2 inches above grubs (A) and three cages with doses 3 inches above grubs (B).

No. 2 A gave 100 per cent. kill within three days.

No. 2 B gave 100 per cent. kill within three days.

No. 3.

Paradichlor, ⅛-oz. doses.—Four cages each containing one third-stage frenchi grub in moist soil, and about ½ inch from bottom of cage. Two cages fumigated with crude paradichlor (A) and two cages fumigated with refined paradichlor (B).

No. 3 A gave 100 per cent. kill within three days.

No. 3 B gave 100 per cent. kill within ten days.

The odour of paradichlor could be noticed very faintly three months after placing in the soil.

No. 4.

Nicotine Sulphate, ¼-oz. and ½-oz. doses, of 10 per cent., and 25 per cent. and 50 per cent. solution.—Nine cages each with one third-stage frenchi grub in moist soil, and about ½ inch from bottom of cage. Poured into three cages to within about 1½ inches of grubs, ¼-oz. doses of the 10 per cent. solution (A), and in three more cages to same depth, ½-oz. doses of a 25 per cent. solution (B), and in the last three cages to same depth, ½-oz. doses of a 50 per cent. solution (C).

No. 4 A—Result negative.

No. 4 B—Result negative.

No. 4 C—Result negative.

No. 5.

Repetition of Experiment No. 4, but against third-stage greyback grubs, and using 1-oz. doses of a 10 per cent. solution (four cages).

No. 5—The only result was a 25 per cent. kill in two days.

No. 6.

Benzine and Sinapsis Oil, ⅛-oz. doses of a 5 per cent. solution.—Three cages each containing one third-stage greyback grub in moist soil, and about ½ inch from bottom of cage. Doses poured into soil 2½ inches above grubs. No. 6 gave 66⅔ per cent. kill within three days, and 100 per cent. kill in two weeks.

No. 7.

Shell Benzine, ¼-oz. doses.—Three cages of moist soil, each with one third-stage greyback grub about ½ inch from bottom of cage. Doses poured into soil 2½ inches above grubs. No. 7 gave 100 per cent. kill within four and a-half days.

The remaining experiments are not yet finalised, being still in progress; so far, results promise to be favourable. When completed, all data gathered will be submitted in future monthly reports.

Notes on Cane Pests.—

Outbreak of Large Moth Borers (*Phragmatiphila truncata* Walker).—During the months of July and August this insect was unusually plentiful in several canefields near the laboratory. Attention was first drawn to the presence of the larvæ in the mature cane sticks (variety H.Q. 426), where, in some cases, every stick in a stool was attacked. The severest injury was confined to the outer rows and edges of the cane, but examples were to be found throughout the entire field. This cane was cut shortly afterwards, so careful examinations were made from time to time in the ratoons. These, as expected, became heavily infested, and damage in three outer rows adjoining a roadway was estimated, from counts made over a number of stools, to be as high as 70 per cent. Taking the infestation over the whole field, it was estimated to be about 20 per cent. It was demonstrated that, by cutting out as far below ground level as possible all attacked shoots, control could be exercised over these borers. Shoots, however, must be cut out immediately any signs of "wilting" appear, otherwise the caterpillars will have probably entered a fresh shoot. It was also found that often a larva would only remain in one shoot for two or three days, feeding at first in the main portion above ground level, then eating its way downwards to the point of attachment with the stool.

7. Work of the Division of Entomology—*continued.*

Prevalence of Army Worms (*Cirphis* spp. and other species).—Considerable numbers of larvæ of these insects have been observed in canefields, principally in low-lying areas. From observations made, young ratoon cane seemed more subject to attack than plant cane. In the earlier period of attack, the lesser army worm (*Cirphis loreyi* Dup.) predominated, but latterly the true army worm (*Cirphis unipuncta* Haw.) has been in the majority. In addition to these two well-known species, three other species of Noctuids of the army worm type have been recently bred from cane leaves, their larvæ having been taken with the two above species. As yet these new species are unidentified.

Breeding Experiments.—

These have been, and are at present being undertaken on a large scale, not only to determine the life history of each cane pest, but in order to note any differences occurring that may be due to climatic, soil, or other conditions, as compared with the same insects in far Northern canefields. Following is a summary of the insects that have been bred, or that are at present being bred:—

1. *Lepidoderma albohirtum* Waterhouse (Greyback Beetle).—Breeding from eggs collected under cane stools at West Plane Creek; also from grubs in various stages collected from canefields in Mackay district and Ayr.
2. *Lepidiota frenchi* Blkb.—Breeding from grubs collected in canefields and grass lands.
3. *Dasygnathus australis-dejeani* Blkb.—Breeding from grubs collected in canefields and from compost heaps.
4. *Anomala australasiæ* Blkb. (Anomala Beetle).—Breeding from grubs collected in canefields and from heaps of rotting vegetation.
5. *Anoplognathus* sp?.—Breeding from grubs collected in canefields.
6. *Pentodon australis* Blkb.—Breeding from grubs collected in canefields.
7. *Xylotrupes australicus* Thomson (Elephant Beetle).—Breeding from grubs collected in humus beds.
8. *Neso* sp?., *Haplonycha* sp?., and others.—Small grubs being bred. These have been collected from canefields and grass lands.
9. *Pseudoholophylla furfuracea* Burm. (Small Southern Cane Beetle).—Breeding from grubs sent from Bundaberg and Isis districts.
10. *Lepidiota trichosterna* Lea (Large Southern Cane Beetle).—Breeding from grubs sent from the Bundaberg district.
11. *Rhabdocnemis obscurus* Boisd. (Beetle Borer or New Guinea Borer).—Bred from grubs and pupæ taken from cane sticks.
12. *Phragmaliphila truncata* Walker (Large Moth Borer).—Bred from caterpillars taken from mature cane sticks and from young shoots.
13. *Opogona glycyphaga* Meyr. (Bud Moth).—Bred from larvæ collected from under leaf sheaths, cane buds, &c.
14. *Cirphis unipuncta* Haw. (Army Worm).—Bred from larvæ collected from cane leaves, and from underneath soil, &c., in canefields. Also from pupæ taken in canefields.
15. *Cirphis loreyi* Dup. (Lesser Army Worm).—Bred from larvæ collected from cane leaves, and from underneath soil, &c., in canefields.
16. *Other Species of Army Worms.*—Three species, at present unidentified, bred from caterpillars collected from cane leaves.
17. *Ophiusa mellicerte* Drury.—A sugar-cane pest of minor importance; bred from a larva found eating rose leaves.
18. *Remigia frugalis* Fab.—Bred from caterpillars collected from cane leaves.
19. *Melanitis leda bankia* Linn.—Bred through from eggs deposited by caged female butterfly, also from larvæ collected from cane leaves.

    Melanitis leda barbardi Fab.—Bred from eggs deposited by caged female butterfly, also from larvæ collected from cane leaves. This form is only taken during the dry season, the form *bankia* occurring in the wet season.
20. *Padraona marnas* Felder (Cane Skipper).—Bred from larvæ collected from cane leaves.
21. *Parnara mathias* Fabr. (Large Cane Skipper).—Bred from larvæ collected from cane leaves.
22. *Wireworm* spp. (larvæ of Elaterid or "Click" Beetles).—One species bred through larvæ attacking cane sets. Two other species being bred, their larvæ also injuring cane sets and shoots.
23. *Phænacantha australicus* Kirk. (Linear Bug).—Bred to adult stage from small nymphs collected from cane leaves.

Parasites Bred from Cane Insects.—

1. *Tachinidæ* spp. (Order Diptera) (Parasitic Flies).—Two species bred from larvæ of *Cirphis unipuncta* Haw. (Army Worm); one species bred from larvæ of *Remigia frugalis* Fab. (Grass Caterpillar).
2. *Braconidæ* spp. (Order Hymenoptera) (small parasitic Wasps).—One species bred from larvæ of *Melanitis leda* (Cane Butterfly); one species bred from larvæ of *Parnara mathias* Fabr. (Large Cane Skipper).
3. *Ichneumonidæ* spp. (Order Hymenoptera) (Ichneumon Wasp Parasites).—One species bred from larvæ of *Padraona marnas* Felder (Cane Skipper); one species bred from larvæ of *Cirphis unipuncta* Haw. (Army Worm).

7. **Work of the Division of Entomology**—*continued.*

4. *Campsomeris radula* Fabr. (Order Hymenoptera, Fam. Scoliidæ) (Digger Wasp Parasite).—Bred from grubs (third stage) of *Lepidoderma albohirtum* Waterh. (Greyback) and of *Lepidiota frenchi* Blkb. (Frenchi Beetle).

Predatory Enemies of Cane Insects Bred at Laboratory.—

1. *Asilid* sp. (*Promachus doddi* Bezzi ?) (Robber Fly).—One species bred from larvæ taken in grub-infested canefields.

Entomological Exhibit at Mackay District Annual Show.—

An interesting exhibit was arranged for the Show, consisting of a showcase containing examples of the principal cane beetles and other important cane insects and their parasites, together with the life stages of the principal cane pests in jars of spirits. Several of the major cane diseases were also represented by examples preserved in formalin in exhibition jars. The writer was in charge of the exhibit, and many farmers availed themselves of the opportunity of examining the exhibits and discussing the various methods of controlling the different cane pests.

A similar exhibit was specially arranged at the Station for the visit of the Reso Party, who much appreciated discussing the different cane insects.

Reference Collection of Insects.—

This has gradually been added to, and now comprises some 325 specimens, which are represented in the following Orders:—

Coleoptera	37 species
Hymenoptera	46 species
Lepidoptera	42 species
Diptera	13 species
Orthoptera	3 species
Homoptera	4 species
Hemiptera	5 species
Neuroptera	3 species
Total	153 species

Altogether thirty-five different species of cane pests are included, and most of these in series. In addition to the above, the life stages of many of the cane insects are represented in spirits in exhibition jars, the total number of jars being ninety-two.

Acknowledgment.—

The writer wishes to acknowledge with much appreciation the kindly assistance rendered at different times by the various mills and farmers' associations, also farmers who have brought under notice occurrences of cane pests in the district, and those who have allotted portions of their farms for the carrying out of fumigation experiments, &c.

Growers are invited to inspect the collection of cane insects at the Laboratory, and are especially requested to bring under notice any occurrence of insects attacking cane on their farms.

The writer has been assisted (part time only) by Mr. W. Allan, Cadet Student at this Station, who has worked diligently.

A. N. BURNS, Assistant Entomologist.

SOUTHERN AREA (BUNDABERG).

Mr. R. W. Mungomery, Assistant Entomologist, is in charge of the entomological work at Bundaberg. Mr. Mungomery made an important discovery at Isis in connection with the collection of beetles which has been the means of saving large sums of money to the canegrowers of that district. His work is performed with zeal and ability, while his assistant, Mr. G. Bates, has also given satisfactory service.

Report of the Assistant Entomologist at Bundaberg.

Southern Sugar Experiment Station,
Bundaberg, 30th October, 1928.

The Director,
Bureau of Sugar Experiment Stations,
Brisbane.

SIR,—I have the honour to submit the following report in connection with the activities and investigation work carried on by the Division of Entomology, Southern Sugar Experiment Station, Bundaberg, for the year ending October, 1928:—

Rearrangement of Entomological Boundaries.—

Since the inception of investigation work on the various entomological problems which confront the Southern sugar-growers, the Mackay district has always been included amongst those districts served by this station. Visits have been made to this district periodically or coincident with the predetermined activities of the pest or pests under observation. This arrangement was arrived at from the point of view of the relative proximity of this station, and not on account of any closer relationship with the Southern than with the Northern cane insects, for the Mackay fauna is essentially a tropical one.

With the establishment of an Entomological Laboratory at Mackay towards the end of January, 1928, the writer relinquished control of entomological work in that district and handed over all investigation work to Mr. A. N. Burns, Assistant Entomologist, who is now attached to that station. Accordingly, all subsequent references to entomological investigations contained in this report apply, unless otherwise specifically stated, to those districts between and including Bundaberg on the north and Beenleigh on the south.

Review of Weather and its bearing on Damage by Pests.—

The rainfall during the year under review has been well above the average, the total precipitation between the months November, 1927, and October, 1928, being 66·89 inches. Such copious rains, whilst promoting a vigorous growth, have naturally been of great benefit in minimising insect damage. The spring months were almost ideal, rain and sunshine alternating in a manner most favourable for all plant growth, and in no case was the interval between the larger downfalls more than a fortnight. Spring plant cane, which in drier years in some of the more "grubby" districts is so prone to be killed by grubs, made a good "strike," produced a large rooting system, and was little troubled by grubs. The summer months, although very wet, were

7. Work of the Division of Entomology—*continued.*

characterised by cooler temperatures which were not quite seasonal and certainly not typical of this district. On account of this, therefore, the cane was not able to make the most of an advantage which such a wonderful spring had given it. Continued rain fell right into April, and only on the higher lands of the Isis district was grub damage at all noticeable. There some of the autumn plant cane succumbed to the attack of the smaller first and second stage grubs, this being a less usual occurrence than damage by the larger third stage grubs.

The wet season, by promoting a greater growth of grasses, &c., seems to have increased damage by rats and mice. This matter is discussed elsewhere in this report.

Weather Promoting Spread of Fungus Disease.—

A fungus disease, particularly severe in its intensity, was found to have broken out amongst "frenchi" grubs on several of the cane farms in the Oakwood area, and no doubt its spread has been accentuated by the seasonal conditions which have been particularly favourable for the spread of most fungi. This fungus was found to be identical with one which had been responsible for the deaths of "furfuracea" grubs in the Isis district, and in many respects it resembles the green Muscardine Fungus (*Metarrhizium anisopliæ* Metch.), though it does not give rise to the same green fruiting bodies which are so characteristic of the latter fungus. Up to the present it has not been identified, but its usefulness can be judged from the fact that at certain periods it has caused a mortality as high as 20 per cent. of those grubs present in a field. Where the grubs are more concentrated, mortality results are correspondingly higher.

Investigations into the Possibility of Furthering Biological Control of our Common Cane Grubs.—

Investigations carried out during the past few years have shown the importance of our parasitic and predaceous insects in controlling cane grubs. This is especially noticeable in the Woongarra district in connection with the occurrence there of the cane grub *P. furfuracea* Burm. In a comparison of the Isis and Woongarra districts, although soil and climatic conditions do not appear to differ to any great extent, these two districts differ greatly in the degree of infestation of this pest, for, whereas the Woongarra farms are almost free or, at most, suffer very lightly from grub attack, the Isis district suffers severe damage on individual farms.

The position of these parasitic and predaceous insects was looked into, and it was found to be such that it might in a large measure account for this discrepancy in the two districts. On the one hand, friendly insects were found to be very scarce in the Isis, whilst in the Woongarra district, on the other hand, they frequently outnumber the grub population of a given soil. Accordingly measures were adopted to attempt to discourage or modify any practice in which our parasitic or predaceous agencies were being destroyed.

In some districts such as the Isis it has for many years been the custom to collect grubs which are exposed by the plough during cultivating operations. The quantities of such grubs, on being taken to certain receivers, are recorded for the purpose of payment, and the grubs are then destroyed. In the past, when such collecting was carried on, it was often found that many of our beneficial insects were included amongst the harmful ones which were to be destroyed. This in nearly all cases was not done designedly, but was the outcome of ignorance in entomological matters generally.

A system of entomological training was then projected, and it was decided to carry out a certain line of instruction, whereby those concerned would be taught to recognise our more important parasites and predators. As it was impossible to approach all parties concerned, the receivers alone were given this instruction, with the understanding that they should pass on the information to the various collectors. This could most readily be done when examining the specimens which were brought to the receivers for payment, and if parasites, &c., were discovered they should be pointed out and the collector warned not to include these insects again with the harmful species. If this warning remained unheeded, and the receiver found subsequent collections to be interspersed with parasites, he had the power to refuse their acceptance. It was thought that this would go far towards overcoming the weakness that had heretofore existed in the system, and it is hoped that with the hearty co-operation of farmers and collectors, &c., greater efficiency in biological control will soon eventuate.

Following on this line of inquiry, it was observed that many of our insectivorous birds were frequently found following ploughs in large flocks, and an examination of the stomach contents of some of them showed that they frequently exhibit a marked liking for the small parasitic and predaceous insects in preference to the larger Scarabæid grubs. If such a state of affairs holds throughout the year, the position becomes such that their presence behind ploughs is no longer desirable. However, their true position in the economics of sugar-cane entomology has not yet been sufficiently investigated to either condemn or commend them, and the determining of their true status will form part of the investigation work to be carried out in the ensuing year.

Dexiid Fly Parasites.—

The large metallic coloured flies belonging to the family *Dexiidæ* have hitherto been regarded as of minor importance, and in the Cairns district the experience goes to show that the percentage of grubs destroyed by them is decimal. Here in the south of Queensland we have found that they contribute towards grub control to as high as 50 per cent. in limited areas, and can no longer be looked on as being of scientific interest only. The species responsible for this high parasitism is an undescribed species of the genus *Rutilia*, and so far the recorded hosts are the larvæ of *Lepidiota frenchii* Blkb. and *Dasygnathus* sp., both of which are fairly common around Bundaberg.

7. Work of the Division of Entomology—*continued.*

Soil Moisture and its Influence on Cane Grub Behaviour.—

When investigating the cane-grub problem during the past few years it was our lot to experience very dry years in the commencement of our work. Under comparatively dry conditions we found that young grubs on hatching out of the eggs soon migrated towards the cane plant for the purpose of obtaining food and an adequate supply of moisture which was readily obtained from the cane roots. If at that time fumigation were carried out, a fairly high proportion of the young grubs would be killed. This last year, being very wet, has completely reversed such a state of affairs, and we found that grubs may live equally well within the interspace as within the cane rows, obtaining their required degree of moisture from the soil, whilst the organic matter which is incorporated with the soil acts as a source of food, hence the necessity for their migrating towards the cane stool does not arise. Grubs often live in the interspace in this manner for four to six months or longer. Fumigation of the cane stool fails to kill them, and, moreover, the stool is at all times subject to their invasion, this usually happening when a period of dry weather sets in and the soil becomes dry. When a field of cane has been fumigated, most frequently the inroads of these "interspace" grubs synchronise with the time when all the toxic vapours of the fumigant have long since been dispelled, and such habits have impressed on us the need for a second fumigation or for securing another fumigant which, though slower acting, is none the less toxic, or, on the other hand, for the obtaining of a poison which, when incorporated with the soil surrounding the plant, would kill the grub after it had eaten the contaminated soil. Experiments with this object in view are now being undertaken.

Further Investigations in the Light-trapping of "Furfuracea" Beetles.—

Attention was drawn in last year's Annual Report to the preponderance of male beetles over female beetles amongst those which were caught at artificial light traps and to the previous waste of money which had been expended for such beetle trapping. Although our recommendations to discontinue this system of trapping, which were made to the Isis Shire Council, were forthwith adopted, this met with some opposition from those who maintained that such a state of affairs was the result of an abnormal season in which droughty conditions had largely prevailed. Accordingly, the ensuing year being an extraordinarily wet one, similar investigations, though on a much larger scale, were carried out, and these pointed conclusively to this state of affairs existing at all times, irrespective of the weather conditions experienced in any given year. Investigations in 1926 showed the percentage of female beetles trapped was slightly less than 1 per cent., whilst in 1927 the average of trappings over all classes of grub-infested land was 1·1 per cent., thus showing a very close agreement for the two seasons.

Rats.—

Rats have been more troublesome than usual this year and damage has been reported from several farms along the Burnett and Maroochy Rivers. Rat damage to mature cane has been augmented by reason of the prolific growth of weeds and grasses, which has provided the rodents with suitable shelter and breeding grounds. Usually it is the custom in the winter months, when most of the grasses are dry, to burn the paddocks adjacent to the canefields, but the winter of 1927 was so rainy that grasses remained green and it was almost impossible to fire these paddocks. Almost invariably the gullies and banks of the rivers remained overgrown with tall grasses, and these were the spots from which they launched their attacks on the neighbouring canefields. For the most part cane was eaten out in patches, the affected part occurring sometimes in the middle of a block, the varieties chiefly damaged being Q. 813 and H.Q. 285. Some of the more intelligent farmers have been using the barium carbonate biscuit as a poison bait, and its success has been evident from the cessation of damage soon after the distribution of the biscuits in the damaged fields.

The periodical burning of grasses, &c., has a big effect in keeping down their numbers, for often scores of these animals are forced to retreat into a narrow pocket or gully, which on being burnt completely wipes them out.

Foxes.—

Reports have recently come to hand from widespread sources such as Beenleigh, Childers, and the Bundaberg districts of damage done to mature cane by foxes. As with most other animals that have acquired a liking for cane, they prefer the sweet varieties with a fairly soft rind, and H.Q. 285 seems to be the one most singled out by them. Fox injury can readily be distinguished by the stalk exhibiting teeth punctures along the lower internodes, where the animal has been chewing the stalk to extract the juice. This in itself is not the worst feature, but, following on this, high winds soon break or bend the upper portion at this point of weakness, with the result that half of the stick soon withers and dies, so that the injury can amount to a considerable loss of cane.

It has been known for some time that foxes have sometimes eaten cane beetles during their flighting season, and some farmers have been loath to shoot them on this account, but it is generally recognised that the small amount of good that they do in this respect is more than counterbalanced by their destructive tendencies when they turn their attentions to sugar-cane.

Breeding Work.—

This work has been carried on interruptedly during the past year, and in addition to several of the well-known sugar-cane insects which have been bred through their various stages to determine the intensity of the parasitism which they have suffered, other insects new to sugar-cane entomology have been bred and forwarded to the various specialists in those particular groups for identification. These for the most part are of

7. Work of the Division of Entomology—*continued.*

secondary importance and comprise the following insects:—

Family *Scarabæidæ*.—

Anoplognathus pallidicollis Blch.—Taken at Nambour and Pialba.

Cericesthis pruinosa Dalm.—Bundaberg and Nambour.

Haplonyx castaneus Macl.—Bundaberg.

Family *Psychida*.—

Plutorectis melanodes M. & L.—Bundaberg.

Detailed descriptions of these insects appeared in various monthly reports issued from this office.

I have, &c.,
R. W. MUNGOMERY,
Assistant Entomologist.

8.—Work of the Northern Sugar Experiment Station at South Johnstone.

The Chemist in Charge of this Station is Mr. E. J. Barke, whose work during the time he has occupied the position has been of a sterling character. The beautiful appearance of the station, and the clean and attractive office and laboratory with its pictures and collections of pests and diseases of sugar-cane for the benefit of farmers, is worthy of high commendation. Moreover, Mr. Barke has reduced the cost of running the station considerably without sacrificing efficiency. The raising of new seedling canes is one of the important duties of this station. Last year 15,000 new varieties were propagated, and these were grown this year. The Chemist in Charge is assisted by Mr. S. J. Kelly, Assistant Chemist, who has rendered satisfactory help in the laboratory, seedling work, care of Tachinid flies, and the keeping of the meteorological data. Mr. Barke reports that Messrs. F. Lindsay, laboratory attendant, and the field staff, comprising Messrs. W. Hamilton (foreman), R. Nicholls, and E. Fitzpatrick, have rendered able assistance.

The tables of crop and analytical results in the following section have been prepared by the Chemist in Charge, who has also furnished notes on crops for the Director's use.

METEOROLOGICAL.

The weather during the early planting period of 1927, May to July, was favourable for the growth of cane. The rainfall was above the average, and excellent germinations were obtained. The opposite conditions were experienced during the spring planting months, August and September, and in many cases poor germinations resulted. The rainfall for the month of August amounted to only 20 points, this being the lowest on record. The growing conditions improved during the month of October, when a fall of 3·35 inches was recorded, and the cane made good progress. The next month gave light showers, and the cane continued to make fair growth. Good soaking rains fell during December, 1927, and with high humid conditions the cane made vigorous growth and was well advanced in January, 1928. Good growing conditions continued right through the remainder of the season, and the rainfall was evenly distributed over this period.

The following are the rainfall records taken at this station since the year 1919:—

Year.	Rainfall in inches.
1919	97·61
1920	123·92
1921	202·52
1922	107·14
1923	84·78
1924	146·71
1925	118·94
1926	77·50
1927	138·11
1928 (9 months) ..	95·43

Abstract of Meteorological Observations made at the Northern Sugar Experiment Station, South Johnstone, from 1st September, 1927, to 31st August, 1928—Covering Period of Growth of Experiment Canes.

Month.	Rainfall in Inches.	Number of Wet Days.	Average Rainfall, 8 Years, 1920–1927.	Highest Shade Maximum.	Lowest Shade Maximum.	Mean Shade Maximum.	Highest Shade Minimum.	Lowest Shade Minimum.	Mean Shade Minimum.	Lowest Terrestrial Minimum.	Mean Terrestrial Minimum.	Mean Diurnal Range.	Mean Temperature, 9 a.m.	Mean Relative Humidity of the Air, 9 a.m.
September, 1927 ..	2·38	9	4·44	89	77·8	83	72	47·8	59·5	44	55·2	23·5	72·7	72
October, 1927 ..	3·35	18	2·86	92·5	81	85·1	72	58·9	66·8	55	61·9	18·3	78·8	70
November, 1927 ..	1·57	9	3·00	94·8	83	89·1	73·5	62·5	68	58	63	21·1	83·1	64
December, 1927 ..	16·95	15	10·59	101·2	81	90·7	73·5	62·5	70·4	54·2	65·3	20·3	83·9	68
January, 1928 ..	11·12	12	13·98	94	84·2	89·8	75·5	65	77·5	58	64	12·3	83·4	75
February, 1928 ..	26·82	22	21·38	97	80·3	91·2	78·7	72	74·9	70	73·4	16·3	84	82
March, 1928 ..	30·72	28	28·46	90	81·5	85·8	75·5	66	70·6	65	69·3	15·2	78·1	84
April, 1928 ..	7·9	17	16·46	91·2	80·2	86·8	74	54·1	68·3	50·3	66	18·5	78·5	82
May, 1928 ..	8·68	20	9·68	88·9	71·5	79·1	70	48·8	60·2	47	58·2	18·9	70·9	81
June, 1928 ..	1·26	8	6·97	83·1	71·1	77·5	66·2	41·5	55·7	35·1	50·3	21·8	65·5	84
July, 1928 ..	5·11	12	4·26	83·6	70·9	76·6	67·5	45	56·7	43·7	54·8	19·9	66·1	86
August, 1928 ..	3·66	17	2·89	83·2	72·5	77·9	69·5	51·5	60·6	52	57·5	17·3	69·6	84
	119·52	187	124·97	..	..	..	..	..	..	..	..	..	..	*77·7

* Average.

8. Work of the Northern Sugar Experiment Station—*continued.*

EXPERIMENTS DEALT WITH IN THIS SECTION OF THE REPORT.

(1) Continuation of experiments with fertilisers —Badila, second ratoons.

Plot 1—500 lb. basic superphosphate per acre.

Plot 2—500 lb. meatwoks per acre.

Plot 3—500 lb. mixed manure, containing 200 lb. nitrate of soda, 100 lb. sulphate of potash, and 200 lb. superphosphate per acre.

Plot 4—No manure.

Plot 5—500 lb. sulphate of potash per acre.

Plot 6—500 lb. mixed manure, containing 250 lb. sulphate of ammonia and 250 lb. nitrate of soda per acre.

(2) Continuation of experiments with Badila cane, of which top plants, middle plants, and bottom plants were separately planted—first ratoons.

(3) Continuation of experiments with fertilisers and methods of applying. Two series. Cane used, Badila first ratoons.

First Series.—

Plot 1—No manure.

Plot 2—1,000 lb. superphosphate per acre, applied in one dressing.

Plot 3—No manure.

Plot 4—1,000 lb. superphosphate per acre, applied in three dressings, with intervals of seven weeks between dressings.

Second Series—

Plot 1—1,000 lb. basic superphosphate per acre, applied in one dressing.

Plot 2—No manure.

Plot 3—1,000 lb. basic superphosphate per acre, applied in three dressings, with intervals of seven weeks between dressings.

(4) Subsoiling and fertilising experiments—Badila, plant cane.

Plot 1—Ordinary cultivation.

Plot 2—Subsoiled to depth of 18 inches.

Plot 3—Ordinary cultivation and mixed fertiliser applied.

Plot 4—Subsoiled to depth of 18 inches and mixed fertiliser applied.

(5) Experiment to test the value of different quantities of lime.

Plot 1—Lime at the rate of 1 ton per acre.

Plot 2—Lime at the rate of 2 tons per acre.

Plot 3—No lime.

Plot 4—Lime at the rate of 1 ton per acre.

Plot 5—Lime at the rate of 2 tons per acre.

Plot 6—No lime.

(6) Conclusion of competitive trials of South Johnstone Queensland seedling canes—First ratoon cane.

(7) Competitive trials of twenty selected South Johnstone Queensland seedling canes—Plant cane.

(8) Analytical examination of South Johnstone Queensland seedling canes—Plant cane.

(9) Analytical examination of arrowed and non-arrowed cane.

(10) Experiment in soaking plants before planting—Badila, plant cane.

Plot 1—Plants soaked in limewater containing lime to saturation for forty-eight hours.

Plot 2—Plants soaked in limewater containing lime to saturation and 1 lb. of magnesium sulphate to 50 gallons, for forty-eight hours.

Plot 3—Plants soaked in water for forty-eight hours.

Plot 4—Ordinary planting.

(1) Continuation of Fertilising Experiment—Badila, Second Ratoons.

The object of this experiment was to test the action of mixed manures as against single fertilisers such as nitrogen, potash, and phosphoric acid.

The first ratoon crop was harvested on the 5th October, 1927, each plot ratooned uniformly, and the cane came away with plenty of vigour.

The cane fertilised with nitrogen, potash, and phosphate (Plot 3) this year showed the healthiest colour in foliage and the most advanced growth. A noticeable feature in this experiment was the low percentage of arrowing in the cane fertilised with nitrogenous manures. This experiment will be carried on into a third ratoon crop.

The analytical and crop results are set out below—

Analytical Examination of Plots in Fertiliser Experiments, N.G. 15 (Badila)—2nd Ratoon Crop—September, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Fibre.	% Glucose in Juice.	% Sucrose in Cane	% C.C.S. in Cane.
B4	1	N.G. 15 ..	Fertiliser applied as follows :—500 lb. basic superphosphate per acre.	11 months	14 Sep.	21·4	19·88	92·9	9·5	0·38	17·0	16·26
B4	2	N.G. 15 ..	Fertiliser applied as follows :—500 lb. meatworks per acre	11 months	14 Sep.	21·4	20·00	93·4	9·5	0·35	17·1	16·29
B4	3	N.G. 15 ..	Fertiliser applied as follows :—200 lb. nitrate of soda, 100 lb. sulphate of potash, and 200 lb. basic superphosphate per acre	11 months	14 Sep.	21·5	20·12	93·6	9·5	0·32	17·2	16·40

8. Work of the Northern Sugar Experiment Station—*continued.*

Analytical Examination of Plots in Fertiliser Experiments, N.G. 15 (Badila)—2nd Ratoon Crop—September, 1928—*continued.*

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Fibre.	% Glucose in Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
B4	4	N.G. 15 ..	No manure	11 months	14 Sep.	22·4	20·95	93·5	9·5	0·31	17·9	17·07
B4	5	N.G. 15 ..	Fertiliser applied as follows :—500 lb. sulphate of potash per acre	11 months	14 Sep.	21·9	20·73	94·6	9·5	0·30	17·7	17·01
B4	6	N.G. 15 ..	Fertiliser applied as follows :—250 lb. sulphate of ammonia and 250 lb. nitrate of soda per acre	11 months	14 Sep.	22·0	20·30	92·3	9·5	0·34	17·4	16·41

Crop Results of Plots in Fertiliser Experiments. N.G. 15 (Badila)—2nd Ratoon Crop—September, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
B4	1	N.G. 15 ..	Fertiliser applied as follows :—500 lb. basic superphosphate per acre	11 months	32·12	5·46	5·22
B4	2	N.G. 15 ..	Fertiliser applied as follows :—500 lb. meatworks per acre	11 months	31·06	5·31	5·06
B4	3	N.G. 15 ..	Fertiliser applied as follows :—200 lb. nitrate of soda, 100 lb. sulphate of potash, and 200 lb. basic superphosphate per acre	11 months	38·64	6·65	6·34
B4	4	N.G. 15 ..	No manure	11 months	24·34	4·36	4·15
B4	5	N.G. 15 ..	Fertiliser applied as follows :—500 lb. sulphate of potash per acre	11 months	33·46	5·92	5·69
B4	6	N.G. 15 ..	Fertiliser applied as follows :—250 lb. sulphate of ammonia and 250 lb. nitrate of soda per acre	11 months	34·24	5.96	5·62

Crop Results to Date of Plots in Fertiliser Experiments, N.G. 15 (Badila)—September, 1928.

Division.	Plot Number.	Variety of cane.	Treatment.	Plant Crop, 1926—Age 12 Months.		First Ratoon Crop, 1927—Age 12 Months.		Second Ratoon Crop, 1928—Age 11 Months.		Average for Three Crops.	
				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.	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.
B4	1	N.G. 15	Fertiliser applied as follows :—500 lb. basic superphosphate per acre	41·59	7·52	42·42	7·27	32·12	5·22	38·71	6·79
B4	2	N.G. 15	Fertiliser applied as follows :—500 lb. meatworks per acre	42·94	7·05	43·77	7·33	31·06	5·06	39·26	6·63
B4	3	N.G. 15	Fertiliser applied as follows :—200 lb. nitrate of soda, 100 lb. sulphate of potash, and 200 lb. basic superphosphate per acre	39·54	6·59	46·34	7·74	38·64	6·34	41·51	6·94
B4	4	N.G. 15	No manure	42·72	7·02	35·71	5·08	24·34	4·15	34·26	5·67
B4	5	N.G. 15	Fertiliser applied as follows :—500 lb. sulphate of potash per acre	43·51	7·42	44·95	7·72	33·46	5·69	40·64	7·05
B4	6	N.G. 15	Fertiliser applied as follows :—250 lb. sulphate of ammonia and 250 lb. nitrate of soda per acre	41·24	7·06	45·30	6·69	34·24	5·62	40·26	6·51

8. Work of the Northern Sugar Experiment Station—*continued.*

This year, in the second ratoon crop the mixed fertilisers have given superior results. The average results of all the plots to which single and mixed fertilisers were applied is fairly close, and the general result is good, but the experiment cannot be regarded as a conclusive victory for mixed manure on this soil. It will be carried over into a third ratoon crop.

(2) Experiments with Badila Cane of which the Top Plants, Middle Plants, and Bottom Plants were separately Planted—First Ratoons.

The plant cane was harvested in October, 1927, and all the plots were ratooned to a depth of 12 inches with plough and subsoiler, and harrowed to level off. In November, 1927, mixed fertiliser was applied to all the plots at the following rate per acre:—150 lb. sulphate of ammonia, 50 lb. nitrate of soda, 100 lb. sulphate of potash, and 300 lb. meatworks.

The cane ratooned well in all the plots and made even, unchecked growth throughout the season.

Very little difference is shown in the average results to date.

The analytical and crop results appear hereunder:—

Analytical Examination of Experiments with Badila Cane, of which Top Plants, Middle Plants, and Bottom Plants were separately Planted—1st Ratoon Crop—September, 1928.

Division.	Plot Number.	Seed Used.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	Commercial Cane Sugar in Cane.
A1	1	Plants from bottom of sticks ..	12 months	29-9-28	22·1	20·73	0·45	93·8	17·74	16·94
A1	2	Plants from middle of sticks ..	12 months	29-9-28	23·5	21·95	0·55	91·7	18·79	17·89
A1	3	Plants from top of sticks	12 months	29-9-28	22·9	21·22	0·67	92·7	18·16	17·22

Crop Results of Experiments with Badila Cane, of which Top Plants, Middle Plants, and Bottom Plants were separately Planted—1st Ratoon Crop—September, 1928.

Division.	Plot Number.	Seed Used.	Age of Cane.	Yield of Cane per Acre in English Tons.	Total Yield of Sugar per Acre in English Tons.	Total Yield of Commercial Cane Sugar per Acre in English Tons.
A1 ..	1	Plants from bottom of sticks	12 months	38·35	6·80	6·50
A1 ..	2	Plants from middle of sticks	12 months	37·88	7·12	6·78
A1 ..	3	Plants from top of sticks	12 months	38·00	6·90	6·54

Crop Results to Date of Experiments with Badila Cane, of which Top Plants, Middle Plants, and Bottom Plants were separately Planted—September, 1928.

Division.	Plot Number.	Seed Used.	Plant Crop, 1927—Age 13 Months.		First Ratoon Crop, 1928—Age 12 Months.		Average for Two Crops.	
			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.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
A1 ..	1	Plants from bottom of sticks	43·56	7·06	38·35	6·50	40·95	6·80
A1 ..	2	Plants from middle of sticks	38·65	6·38	37·88	6·78	38·26	6·58
A1 ..	3	Plants from top of sticks	39·21	6·43	38·00	6·54	38·60	6·48

(3) Experiments with Fertilisers using heavy dressings of Superphosphate and Basic Superphosphate in One and Three Dressings—Badila, First Ratoons.

The plant crop was harvested on the 7th October, 1927, and ratooned to a depth of 12 inches with plough and subsoiler, and harrowed to level off.

This experiment was divided into two series, and the different treatment of the various plots was as follows:—

First Series—

Plot 1—No manure.

Plot 2—1,000 lb. superphosphate per acre, applied in one dressing.

Plot 3—No manure.

Plot 4—1,000 lb. superphosphate per acre, applied in three dressings with intervals of seven weeks between dressings.

8. Work of the Northern Sugar Experiment Station—*continued.*

Second Series—

Plot 1—1,000 lb. basic superphosphate per acre, applied in one dressing.

Plot 2—No manure.

Plot 3—1,000 lb. basic superphosphate per acre, applied in three dressings with intervals of seven weeks between dressings.

The cane ratooned well in all the plots and made even growth until December, 1927, when, after a good fall of rain, the manured plots showed marked advanced growth. The four manured plots continued with even growth until February, 1928, when Plot 4 in the first series and Plot 3 in the second series showed an advantage in growth, and this order continued up to the time of harvesting.

The analytical and crop results are set out below—

Analytical Examination of Experiments with Different Fertilisers and Methods of Applying—N.G. 15 (Badila)—1st Ratoon Crop—September, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice	% Fibre.	% Glucose in Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
			First Series.									
A1	1	N.G. 15 ..	No manure	12 months	27-9-28	22·6	21·07	93·2	9·4	0·63	18·03	17·15
A1	2	N.G. 15 ..	1,000 lb. of superphosphate per acre, applied in one dressing	12 months	27-9-28	22·2	20·47	92·2	9·4	0·76	17·52	16·56
A1	3	N.G. 15 ..	No manure	12 months	27-9-28	22·5	21·07	93·6	9·4	0·60	18·03	17·20
A1	4	N.G. 15 ..	1,000 lb. of superphosphate per acre, applied in three dressings with intervals of seven weeks between dressings	12 months	27-9-28	21·7	20·12	92·7	9·4	0·72	17·22	16·33
			Second Series.									
A1	1	N.G. 15 ..	1,000 lb. of basic superphosphate per acre, applied in one dressing	12 months	27-9-28	21·9	20·15	92·0	9·4	0·68	17·25	16·28
A1	2	N.G. 15 ..	No manure	12 months	27-9-28	22·5	20·64	91·7	9·4	0·68	17·67	16·65
A1	3	N.G. 15 ..	1,000 lb. of basic superphosphate per acre, applied in three dressings, with intervals of seven weeks between dressings.	12 months	27-9-28	21·7	20·22	93·2	9·4	0·60	17·31	16·46

Crop Results of Experiments with Different Fertilisers and Methods of Applying—N.G. 15 (Badila)—First Ratoon Crop—September, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
			First Series.				
A1	1	N.G. 15 ..	No manure	12 months	24·12	4·35	4·14
A1	2	N.G. 15 ..	1,000 lb. of superphosphate per acre, applied in one dressing	12 months	32·04	5·61	5·31
A1	3	N.G. 15 ..	No manure	12 months	24·37	4·39	4·19
A1	4	N.G. 15 ..	1,000 lb. of superphosphate per acre, applied in three dressings, with intervals of seven weeks between dressings	12 months	34·22	5·89	5·59

8. Work of the Northern Sugar Experiment Station—*continued.*

Crop Results of Experiments with Different Fertilisers and Methods of Applying—N.G. 15 (Badila)—First Ratoon Crop—September, 1928—*continued.*

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
			Second Series.				
A1	1	N.G. 15 ..	1,000 lb. of basic superphosphate per acre, applied in one dressing	12 months	33·82	5·83	5·51
A1	2	N.G. 15 ..	No manure	12 months	23·92	4·23	3·98
A1	3	N.G. 15 ..	1,000 lb. basic superphosphate per acre, applied in three dressings, with intervals of seven weeks between dressings	12 months	35·08	6·07	5·77

The reason for undertaking the above experiment was due to the fact that it was known that certain poor patches of soil existed in this division, and it was thought by Mr. von Stieglitz that the application of large dressings of phosphates might assist in overcoming this inferiority. The results in the plant crop were not wholly consistent, but the effect on the ratoon crop is much more regular, the best results being obtained where the phosphoric acid was applied in three dressings. The average result for the application of phosphoric acid in the first ratoon crop over the plots where no manure was applied was as under—

Phosphate applied—33·79 tons cane per acre.

No phosphate—24·13 tons cane per acre.

These result are satisfactory. The crop results to date of this experiment are now given—

Crop Results to Date of Experiments with Different Fertilisers and Methods of Applying—N.G. 15 (Badila)—September, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Plant Crop, 1927—Age, 13 Months.		First Ratoon Crop, 1928—Age, 12 Months.		Average for Two Crops.	
				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.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
			First Series.						
A1	1	N.G. 15 ..	No manure	28·31	4·85	24·12	4·14	26·21	4·52
A1	2	N.G. 15 ..	1,000 lb. of superphosphate per acre, applied in one dressing	28·12	4·91	32·04	5·31	30·08	5·12
A1	3	N.G. 15 ..	No manure	26·58	4·61	24·37	4·19	25·47	4·41
A1	4	N.G. 15 ..	1,000 lb. of superphosphate per acre, applied in three dressings, with intervals of seven weeks between dressings	30·41	5·18	34·22	5·59	32·31	5·39
			Second Series.						
A1	1	N.G. 15 ..	1,000 lb. of basic superphosphate per acre, applied in one dressing	32·53	5·60	33·82	5·51	33·17	5·55
A1	2	N.G. 15 ..	No manure	28·12	4·48	23·92	3·98	26·02	4·23
A1	3	N.G. 15 ..	1,000 lb. basic superphosphate per acre, applied in three dressings, with intervals of seven weeks between dressings	28·37	4·68	35·08	5·77	31·72	5·28

(4) Subsoiling and Fertilising Experiments—Kadka, Plant Cane.

Plot 1—Ordinary cultivation, no manure.

Plot 2—Subsoiled to depth of 18 inches, no manure.

Plot 3—Ordinary cultivation, and mixed fertilisers applied at the following rate per acre:—150 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. sulphate of potash, and 300 lb. superphosphate.

Plot 4—Subsoiled to depth of 18 inches, and mixed fertiliser applied at the following rate per acre:—150 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. sulphate of potash, and 300 lb. superphosphate.

Uniform land was divided into four plots, the whole being cross ploughed four times to a depth of 12 inches, while two plots, 2 and 4, were subsoiled by means of a subsoiler to a further depth of 6 inches, making 18 inches in all. The crop

8. Work of the Northern Sugar Experiment Station—*continued.*

was planted in August, 1927, and the difference between the subsoiled and ordinary cultivated plots was most marked during the whole period of growth. In November, 1927, plots 3 and 4 received an application of mixed fertiliser at the following rate per acre:—150 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. sulphate of potash, and 300 lb. superphosphate.

The analytical and crop results are tabulated hereunder—

Analytical Examination of Subsoiling and Fertilising Experiments, N.G. 15 (Badila)—Plant Crop—September, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Fibre.	% Glucose in Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
B1	1	N.G. 15	Ordinary cultivation; no manure	13 months	29-9-28	22·3	21·07	94·5	9·0	0·30	18·12	17·37
B1	2	N.G. 15	Subsoiled to depth of 18 in.; no manure	13 months	29-9-28	22·0	20·68	94·0	9·0	0·34	17·78	17·00
B1	3	N.G. 15	Ordinary cultivation, and mixed fertiliser applied at the following rates per acre:—150 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. sulphate of potash, and 300 lb. superphosphate	13 months	29-9-28	21·5	20·17	93·8	9·0	0·40	17·35	16·56
B1	4	N.G. 15	Subsoiled to depth of 18 in., and mixed fertiliser applied at the following rates per acre:—150 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. sulphate of potash, and 300 lb. superphosphate	13 months	29-9-28	21·8	20·17	92·5	9·0	0·54	17·35	16·43

Crop Results of Subsoiling and Fertilising Experiments—N.G. 15 (Badila)—Plant Crop—September, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
B1	1	N.G. 15 ..	Ordinary cultivation; no manure	13 months	35·46	6·42	6·16
B1	2	N.G. 15 ..	Subsoiled to depth of 18 in.; no manure ..	13 months	39·22	6·97	6·67
B1	3	N.G. 15 ..	Ordinary cultivation, and mixed fertiliser applied at the following rates per acre:—150 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. sulphate of potash, and 300 lb. superphosphate	13 months	41·02	7·12	6·79
B1	4	N.G. 15 ..	Subsoiled to depth of 18 in. and mixed fertiliser applied at the following rates per acre:—150 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. sulphate of potash, and 300 lb. superphosphate	13 months	46·26	8·03	7·60

This confirms previous experiments on alluvial land, viz.—that subsoiling pays well. Still better results are hoped for in the ratoon crops.

(5). Experiment to Test the Value of Different Quantities of Lime—Plant Crop.

Plot 1—Burnt lime applied at the rate of 1 ton per acre.

Plot 2—Burnt lime applied at the rate of 2 tons per acre.

Plot 3—No lime.

Plot 4—Burnt lime applied at the rate of 1 ton per acre.

Plot 5—Burnt lime applied at the rate of 2 tons per acre.

Plot 6—No lime.

The land for this experiment was prepared by sowing with cowpea at the rate of one bushel per acre in December, 1926, ploughing under in March, 1927, and allowing the green crop to decay. The field received four ploughings. Burnt lime at the above rates per acre was applied after the final ploughing, and harrowed in. The crop was planted in August, 1927, and an excellent

8. Work of the Northern Sugar Experiment Station—*continued.*

germination was obtained. The limed plots showed marked advanced growth throughout the season, as will be seen by the results given below—

Analytical Examination of Plots in Liming Experiments, N.G. 15 (Badila)—Plant Crop—September, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Fibre.	% Glucose in Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
A3	1	N.G. 15	Burnt lime applied at the rate of 1 ton per acre	13 months	24-9-28	21·2	19·52	92·1	9·0	0·61	16·79	15·85
A3	2	N.G. 15	Burnt lime applied at the rate of 2 tons per acre	13 months	24-9-28	20·4	18·52	90·8	9·0	0·77	15·93	14·91
A3	3	N.G. 15	No lime	13 months	24-9-28	22·2	20·42	92·0	9·0	0·72	17·56	16·57
A3	4	N.G. 15	Burnt lime applied at the rate of 1 ton per acre	13 months	24-9-28	20·4	18·95	92·9	9·0	0·54	16·30	15·47
A3	5	N.G. 15	Burnt lime applied at the rate of 2 tons per acre	13 months	24-9-28	20·3	18·62	91·7	9·0	0·57	16·01	15·09
A3	6	N.G. 15	No lime	13 months	24-9-28	22·4	21·19	94·6	9·0	0·31	18·22	17·48

Crop Results of Plots in Liming Experiments, N.G. 15 (Badila)—Plant Crop—September, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
A3	1	N.G. 15 ..	Burnt lime applied at the rate of 1 ton per acre	13 months	38·54	6·47	6·11
A3	2	N.G. 15 ..	Burnt lime applied at the rate of 2 tons per acre	13 months	40·24	6·41	6·00
A3	3	N.G. 15 ..	No lime	13 months	32·31	5·67	5·35
A3	4	N.G. 15 ..	Burnt lime applied at the rate of 1 ton per acre	13 months	39·62	6·46	6·13
A3	5	N.G. 15 ..	Burnt lime applied at the rate of 2 tons per acre	13 months	41·36	6·62	6·24
A3	6	N.G. 15 ..	No lime	13 months	33·51	6·10	5·86

It has been generally considered that liming would benefit the Innisfail soils, and an experiment in this direction was considered necessary. Accordingly plots were laid down in duplicate and the results are decidedly in favour of the application of lime.

The following are the average yields from the plant crop:—

1 ton of burnt lime per acre ..	39.08 tons
2 tons of burnt lime per acre ..	40.30 tons
No lime applied	32·91 tons

The dressing one 1 ton of lime per acre, however, appears almost as beneficial as the 2 tons, the difference being 6·17 and 7·39 tons of cane respectively for the addition of lime.

(6) Conclusion of Competitive Trials of South Johnstone Queensland Seedling Canes—First Ratoons.

After harvesting the plant crop in October, 1927, each plot was uniformly ratooned to a depth of 12 inches. In November, 1927, mixed fertilisers were applied at the following rate per acre:—100 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. sulphate of potash, and 200 lb. meatworks.

Below are presented the analytical and crop results, from which it will be seen that S.J.Q. 3, S.J.Q. 4, S.J.Q. 16, and S.J.Q. 28 show promise of becoming good commercial canes. S.J.Q. 7, the cane which gave the best result in the plant crop, is susceptible to leaf-scald disease, and it is due to this fact that the ratoon result is so far below that of the plant crop.

8. Work of the Northern Sugar Experiment Station—*continued.*

First Analytical Examination of Competitive Trials with South Johnstone Seedling Canes—First Ratoon Crop—July, 1928.

Seedling Number.	Month of Analysis.	Age of Cane.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane	% C.C.S. in Cane.	Variety from which Seed was taken.
S.J.Q. 2 ..	July	9 months ..	19·3	17·52	90·8	14·89	13·9	N.G. 15 (Badila)
S.J.Q. 3 ..	July	9 months ..	18·4	16·42	89·2	13·96	12·9	N.G. 15 (Badila)
S.J.Q. 4 ..	July	9 months ..	17·9	15·84	88·5	13·46	12·4	N.G. 15 (Badila)
S.J.Q. 5 ..	July	9 months ..	16·8	14·20	84·5	12·07	10·8	N.G. 15 (Badila)
S.J.Q. 7 ..	July	9 months ..	19·3	17·93	92·9	15·24	14·5	N.G. 15 (Badila)
S.J.Q. 9 ..	July	9 months ..	16·6	13·15	79·2	11·18	9·5	N.G. 15 (Badila)
S.J.Q. 12 ..	July	9 months ..	16·9	13·80	81·6	11·73	10·2	N.G. 15 (Badila)
S.J.Q. 15 ..	July	9 months ..	19·8	18·51	93·5	15·73	15·0	N.G. 15 (Bedila)
S.J.Q. 16 ..	July	9 months ..	18·0	16·69	92·7	14·19	13·45	N.G. 15 (Badila)
S.J.Q. 17 ..	July	9 months ..	20·3	18·81	92·7	15·99	15·15	N.G. 15 (Badila)
S.J.Q. 19 ..	July	9 months ..	17·3	14·12	81·6	12·00	10·5	N.G. 15 (Badila)
S.J.Q. 20 ..	July	9 months ..	16·7	14·00	83·8	11·90	10·6	N.G. 15 (Badila)
S.J.Q. 21 ..	July	9 months ..	17·5	14·97	85·5	12·72	11·5	N.G. 15 (Badila)
S.J.Q. 25 ..	July	9 months ..	17·4	14·33	82·3	12·18	10·7	N.G. 15 (Badila)
S.J.Q. 26 ..	July	9 months ..	16·5	13·43	81·4	11·41	9·9	N.G. 24 (Goru)
S.J.Q. 28 ..	July	9 months ..	17·0	14·55	85·6	12·37	11·15	N.G. 24 (Goru)
S.J.Q. 31 ..	July	9 months ..	16·9	15·06	89·1	12·80	11·85	Q. 903
S.J.Q. 41 ..	July	9 months ..	17·0	14·79	87·0	12·57	11·5	N.G. 16
S.J.Q. 44 ..	July	9 months ..	18·4	14·95	81·2	12·71	11·05	N.G. 16
S.J.Q. 45 ..	July	9 months ..	17·3	14·48	83·7	12·31	10·9	H.Q. 77
S.J.Q. 46 ..	July	9 months ..	20·1	16·74	83·3	14·23	12·6	H.Q. 77
S.J.Q. 48 ..	July	9 months ..	17·8	14·32	80·4	12·17	10·5	H.Q. 77
S.J.Q. 49 ..	July	9 months ..	19·0	17·41	91·6	14·80	13·9	H.Q. 77
S.J.Q. 51 ..	July	9 months ..	15·7	13·18	83·9	11·20	10.0	H.Q. 77
S.J.Q. 53 ..	July	9 months ..	18·8	16·26	86·5	13·82	12·55	H.Q. 77
S.J.Q. 54 ..	July	9 months ..	16·6	15·10	90·9	12·83	12·0	E.K. 28
S.J.Q. 55 ..	July	9 months ..	17·1	14·92	87·2	12.68	11·6	E.K. 28
S.J.Q. 58 ..	July	9 months ..	14·1	12·13	86·0	10·31	9·3	H. 109
S.J.Q. 60 ..	July	9 months ..	20·3	18·48	91·0	15·71	14·7	H· 109
S.J.Q. 64 ..	July	9 months ..	18·8	16·65	88·6	14·15	13·05	N.G. 15 (Badila)
S.J.Q. 70 ..	July	9 months ..	18·3	17·03	93·0	14.47	13·75	N.G. 15 (Badila)
S.J.Q. 77 ..	July	9 months ..	16·8	13·85	82·4	11·77	10·35	N.G. 15 (Badila)
S.J.Q. 91 ..	July	9 months ..	18·0	16·30	90·5	13·85	12·95	Q. 903
S.J.Q. 112 ..	July	9 months ..	19·0	17·99	94·7	15·29	14·7	N.G. 16
S.J.Q. 137 ..	July	9 months ..	19·0	17·73	93·3	15·07	14·3	H.Q. 77
S.J.Q. 174 ..	July	9 months ..	18·3	16·32	89·2	13·87	12·8	E.K. 28
S.J.Q. 301 ..	July	9 months ..	17·9	15·61	87·2	13·27	12·1	Q. 903
S.J.Q. 312 ..	July	9 months ..	16·0	14·08	88·0	11·97	11·0	N.G. 102
S.J.Q. 318 ..	July	9 months ..	17·2	14·90	86·6	12·66	11·5	N.G. 102
S.J.Q. 319 ..	July	9 months ..	16·9	12·92	76·4	10·98	9·1	N.G. 102
S.J.Q. 329 ..	July	9 months ..	17·8	15·47	86·9	13·15	12·0	N.G. 102
S.J.Q. 344 ..	July	9 months ..	18·5	17·04	92·1	14·48	13·7	7R. 428
S.J.Q. 468 ..	July	9 months ..	16·9	14·47	85·6	12·30	11·1	N.G. 24 (Goru)

Second Analytical Examination of Competitive Trials with South Johnstone Seedling Canes—First Ratoon Crop—August, 1928.

Seedling Number.	Month of Analysis.	Age of Cane.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice	% Sucrose in Cane.	% C.C.S. in Cane.	Variety from which Seed was taken.
S.J.Q. 2 ..	August ..	10 months	20·1	18·56	92·3	15·78	..	N.G. 15 (Badila)
S.J.Q. 3 ..	August ..	10 months	20·3	18·81	92·7	15·99	..	N.G. 15 (Badila)
S.J.Q. 4 ..	August ..	10 months	19·8	18·01	90·9	15·31	..	N.G. 15 (Badila)
S.J.Q. 5 ..	August ..	10 months	19·8	17·54	88·6	14·91	..	N.G. 15 (Badila)
S.J.Q. 7 ..	August ..	10 months	19·4	17·94	92·5	15·25	..	N.G. 15 (Badila)
S.J.Q. 9 ..	August ..	10 months	17·7	15·09	85·2	12.83	..	N.G. 15 (Badila)
S.J.Q. 12 ..	August ..	10 months	17·8	14·81	83·2	12·59	..	N.G. 15 (Badila)
S.J.Q. 15 ..	August ..	10 months	20·6	19·24	93·4	16·35	..	N.G. 15 (Badila)
S.J.Q. 16 ..	August ..	10 months	20·2	19·24	95·2	16·35	..	N.G. 15 (Badila)
S.J.Q. 17 ..	August ..	10 months	20·8	19·59	94·2	16·65	..	N.G. 15 (Badila)
S.J.Q. 19 ..	August ..	10 months	19·2	16·98	88·4	14·43	..	N.G. 15 (Badila)
S.J.Q. 20 ..	August ..	10 months	17·5	14·84	84·8	12·61	..	N.G. 15 (Badila)
S.J.Q. 21 ..	August ..	10 months	19·3	17·73	91·9	15·07	..	N.G. 15 (Badila)
S.J.Q. 25 ..	August ..	10 months	18·9	16·54	87·5	14·06	..	S.G. 15 (Badila)
S.J.Q. 26 ..	August ..	10 months	18·2	15·81	86·9	13·44	..	N.G. 24 (Goru)
S.J.Q. 28 ..	August ..	10 months	19·5	17·82	91·4	15·15	..	N.G. 24 (Goru)
S.J.Q. 31 ..	August ..	10 months	18·6	16·34	90·8	13·89	..	Q. 903
S.J.Q. 41 ..	August ..	10 months	18·9	17·33	91·7	14·73	..	N.G. 16
S.J.Q. 44 ..	August ..	10 months	19·2	16·20	84·4	13·77	..	N.G. 16
S.J.Q. 45 ..	August ..	10 months	18·6	15·97	85·9	13·57	..	H.Q. 77
S.J.Q. 46 ..	August ..	10 months	16·9	13·86	82·0	11·78	..	H.Q. 77

8. Work of the Northern Sugar Experiment Station—*continued.*

Second Analytical Examination of Competitive Trials with South Johnstone Seedling Canes—First Ratoon Crop—August, 1928—*continued.*

Seedling Number.	Month of Analysis.	Age of Cane.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.T.S. in Cane.	Variety from which Seed was taken.
S.J.Q. 48 ..	August ..	10 months	16·6	12·60	75·9	10·71	..	H.Q. 77
S.J.Q. 49 ..	August ..	10 months	19·5	18·10	92·8	15·38	..	H.Q. 77
S.J.Q. 51 ..	August ..	10 months	16·9	13.90	82·2	11·81	..	H.Q. 77
S.J.Q. 53 ..	August ..	10 months	20·7	18·86	91·1	16·03	..	H.Q. 77
S.J.Q. 54 ..	August ..	10 months	17·3	15·72	90·9	13·36	..	E.K. 28
S.J.Q. 55 ..	August ..	10 months	18·7	17·43	93·2	14·81	..	E.K. 28
S.J.Q. 58 ..	August ..	10 months	20·6	19·50	94·7	16·57	..	H. 109
S.J.Q. 60 ..	August ..	10 months	19·9	19·01	95·5	16·16	..	H. 109
S.J.Q. 64 ..	August ..	10 months	18·0	15·32	85·1	13·02	..	N.G. 15 (Badila)
S.J.Q. 70 ..	August ..	10 months	19·5	18.13	93·0	15·41	..	N.G. 15 (Badila)
S.J.Q. 77 ..	August ..	10 months	17·4	14·81	85·1	12·59	..	N.G. 15 (Badila)
S.J.Q. 91 ..	August ..	10 months	18·8	17·33	92·2	14·73	..	Q. 903
S.J.Q. 112 ..	August ..	10 months	19·4	18·50	95·4	15·72	..	N.G. 16
S.J.Q. 137 ..	August ..	10 months	19·3	17·46	90·5	14·84	..	H.Q. 77
S.J.Q. 174 ..	August ..	10 months	19·1	17·67	92·5	15·02	..	E.K. 28
S.J.Q. 301 ..	August ..	10 months	19·5	17·92	91·9	15·23	..	Q. 903
S.J.Q. 312 ..	August ..	10 months	18·3	16·54	90·4	14·06	..	N.G. 102
S.J.Q. 318 ..	August ..	10 months	19·3	17·54	90·9	14·91	..	N.G. 102
S.J.Q. 319 ..	August ..	10 months	18·8	16·60	88·3	14·11	13.0	N.G. 102
S.J.Q. 329 ..	August ..	10 months	19·1	16·83	88·1	14·30	13·15	N.G. 102
S.J.Q. 344 ..	August ..	10 months	19·8	18·32	92·5	15·57	14·7	7R. 428
S.J.Q. 468 ..	August ..	10 months	18·3	16·08	87·9	13·67	12·5	N.G. 24 (Goru)

Final Analytical Examination of Competitive Trials with South Johnstone Seedling Canes—First Ratoon Crop—September, 1928.

Seedling Number.	Month of Analysis.	Age of Cane.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% Commercial Cane Sugar in Cane.	Variety from which Seed was taken.
S.J.Q. 2 ..	September ..	11 months	21·3	19·83	93·1	16·85	16·0	N.G. 15 (Badila)
S.J.Q. 3 ..	September ..	11 months	20·4	18·64	91·3	15·56	14·6	N.G. 15 (Badila)
S.J.Q. 4 ..	September ..	11 months	20·2	18·83	93·2	15·91	15·1	N.G. 15 (Badila)
S.J.Q. 5 ..	September ..	11 months	19·9	17·57	88·3	14·93	13·7	N.G. 15 (Badila)
S.J.Q. 7 ..	September ..	11 months	19·2	17·43	90·8	14·64	13·7	N.G. 15 (Badila)
S.J.Q. 9 ..	September ..	11 months	17·6	14·71	83·6	12·50	11·1	N.G. 15 (Badila)
S.J.Q. 12 ..	September ..	11 months	19·3	17·08	88·5	14·52	13·4	N.G. 15 (Badila)
S.J.Q. 15 ..	September ..	11 months	21·5	19·62	91·2	16·28	15·3	N.G. 15 (Badila)
S.J.Q. 16 ..	September ..	11 months	20·9	19·97	95·5	16·57	16·0	N.G. 15 (Badila)
S.J.Q. 17 ..	September ..	11 months	20·7	19·34	93·4	16·34	15·6	N.G. 15 (Badila)
S.J.Q. 19 ..	September ..	11 months	17·8	14·97	84·1	12·72	11·3	N.G. 15 (Badila)
S.J.Q. 20 ..	September ..	11 months	19·5	17·10	87·7	14·53	13·3	N.G. 15 (Badila)
S.J.Q. 21 ..	September ..	11 months	19·2	17·41	90·7	14·71	13·8	N.G. 15 (Badila)
S.J.Q. 25 ..	September ..	11 months	19·0	14·69	77·3	12·49	10·5	N.G. 15 (Badila)
S.J.Q. 26 ..	September ..	11 months	16·5	13·98	84·7	11·88	10·6	N.G. 24 (Goru)
S.J.Q. 28 ..	September ..	11 months	20·2	18·13	89·7	15·32	14·2	N.G. 24 (Goru)
S.J.Q. 31 ..	September ..	11 months	19·4	17·82	91·8	15·06	14·2	Q. 903
S.J.Q. 41 ..	September ..	11 months	18·8	16·38	87·1	13.84	12·6	N.G. 16
S.J.Q. 44 ..	September ..	11 months	19·0	15·07	79·3	12·81	10·9	N.G. 16
S.J.Q. 45 ..	September ..	11 months	19·0	16·50	86·8	14·02	12·8	H.Q. 77
S.J.Q. 46 ..	September ..	11 months	18·6	15·41	82·8	13·10	11·55	H.Q. 77
S.J.Q. 48 ..	September ..	11 months	18·5	14·84	80·2	12·69	10·9	H.Q. 77
S.J.Q. 49 ..	September ..	11 months	20·4	17·97	88·1	15·27	14·0	H.Q. 77
S.J.Q. 51 ..	September ..	11 months	19·3	16·60	86·5	14·35	13·0	H.Q. 77
S.J.Q. 53 ..	September ..	11 months	20·8	19·44	93·5	16·62	15·3	H.Q. 77
S.J.Q. 54 ..	September ..	11 months	19·0	16·99	89·4	14·45	13·3	E.K. 28
S.J.Q. 55 ..	September ..	11 months	19·7	18·34	93·1	15·90	14·8	E.K. 28
S.J.Q. 58 ..	September ..	11 months	19·7	18·24	92·6	15·70	14·7	H. 109
S.J.Q. 60 ..	September ..	11 months	20·5	19·53	95·3	16·21	15·6	H. 109
S.J.Q. 64 ..	September ..	11 months	19·8	17·85	90·0	15·15	14·1	N.G. 15 (Badila)
S.J.Q. 70 ..	September ..	11 months	19·9	18·37	92·3	15·43	14·6	N.G. 15 (Badila)
S.J.Q. 77 ..	September ..	11 months	18·6	15·75	84·7	13·47	12·1	N.G. 15 (Badila)
S.J.Q. 91 ..	September ..	11 months	20·9	19·54	93·5	16·41	15·6	Q. 903
S.J.Q. 112 ..	September ..	11 months	21·2	19·52	92·1	16·69	15·75	N.G. 16
S.J.Q. 137 ..	September ..	11 months	24·1	18·96	89·8	15·55	14·45	H.Q. 77
S.J.Q. 174 ..	September ..	11 months	20·8	18·96	91·1	16·02	15·00	E.K. 28
S.J.Q. 301 ..	September ..	11 months	20·2	18·54	91·8	15·87	14·8	Q. 903
S.J.Q. 312 ..	September ..	11 months	19·5	17·49	89·7	14·87	13·8	N.G. 102
S.J.Q. 318 ..	September ..	11 months	19·4	17·20	88·6	14·28	13·2	N.G. 102
S.J.Q. 319 ..	September ..	11 months	19·0	15·89	84·0	13·08	11·35	N.G. 102
S.J.Q. 329 ..	September ..	11 months	20·7	18·07	87·3	15·18	13·9	N.G. 102
S.J.Q. 344 ..	September ..	11 months	21·9	20·20	92·2	17·07	16·1	7R. 428
S.J.Q. 468 ..	September ..	11 months	19·2	17·04	88·7	14·48	13·4	N.G. 24 (Goru)

8. Work of the Northern Sugar Experiment Station—*continued.*

Crop Results of Competitive Trials with South Johnstone Seedling Canes—First Ratoon Crop—September, 1928.

Seedling Number.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Variety from which Seed was taken.
S.J.Q. 2	11 months	30·1	4·82	N.G. 15 (Badila)
S.J.Q. 3	11 months	54·0	7·88	N.G. 15 (Badila)
S.J.Q. 4	11 months	56·8	8·58	N.G. 15 (Badila)
S.J.Q. 5	11 months	50·2	6·88	N.G. 15 (Badila)
S.J.Q. 7	11 months	51·1	7·00	N.G. 15 (Badila)
S.J.Q. 9	11 months	67·2	7·46	N.G. 15 (Badila)
S.J.Q. 12	11 months	52·0	6·97	N.G. 15 (Badila)
S.J.Q. 15	11 months	50·5	7·73	N.G. 15 (Badila)
S.J.Q. 16	11 months	50·3	8·05	N.G. 15 (Badila)
S.J.Q. 17	11 months	49·2	7·67	N.G. 15 (Badila)
S.J.Q. 19	11 months	41·0	4·63	N.G. 15 (Badila)
S.J.Q. 20	11 months	30·1	4·00	N.G. 15 (Badila)
S.J.Q. 21	11 months	36·8	5·08	N.G. 15 (Badila)
S.J.Q. 25	11 months	38·5	4·04	N.G. 15 (Badila)
S.J.Q. 26	11 months	42·2	4·47	N.G. 24 (Goru)
S.J.Q. 28	11 months	55·6	7·89	N.G. 24 (Goru)
S.J.Q. 31	11 months	42·4	6·02	Q. 903
S.J.Q. 41	11 months	38·0	4·79	N.G. 16
S.J.Q. 44	11 months	40·5	4·41	N.G. 16
S.J.Q. 45	11 months	38·2	4·89	H.Q. 77
S.J.Q. 46	11 months	29·1	3·36	H.Q. 77
S.J.Q. 48	11 months	30·6	3·33	H.Q. 77
S.J.Q. 49	11 months	30·6	4·28	H.Q. 77
S.J.Q. 51	11 months	41·4	5·38	H.Q. 77
S.J.Q. 53	11 months	42·3	6·68	H·Q. 77
S.J.Q. 54	11 months	42·8	5·69	E.K. 28
S.J.Q. 55	11 months	38·1	5·64	E.K. 28
S.J.Q. 58	11 months	47·3	6·95	H. 109
S.J.Q. 60	11 months	37·4	5·83	H. 109
S.J.Q. 64	11 months	40·2	5·67	N.G. 15 (Badila)
S.J.Q. 70	11 months	25·0	3·65	N.G. 15 (Badila)
S.J.Q. 77	11 months	44·4	5·37	N.G. 15 (Badila)
S.J.Q. 91	11 months	30·0	4·68	Q. 903
S.J.Q. 112	11 months	28·5	4·49	N.G. 16
S.J.Q. 137	11 months	30·8	4·45	H·Q· 77
S.J.Q. 174	11 months	49·4	7·41	E.K. 28
S.J.Q. 301	11 months	50·2	7·43	Q. 903
S.J.Q. 312	11 months	46·0	6·35	N.G. 102
S.J.Q. 318	11 months	36·6	4·83	N.G. 102
S.J.Q. 319	11 months	25·2	2·87	N.G. 102
S.J.Q. 329	11 months	39·1	5·43	N.G. 102
S.J.Q. 344	11 months	32·4	5·22	7R. 428
S.J.Q. 468	11 months	34·6	4·64	N.G. 24 (Goru)

It will be gathered from the final analytical results and table of crop yields that many of these seedlings are of promise. Two of these which were free from disease—viz., S.J.Q. 4 and S.J.Q. 28—were distributed to farmers this year.

The crop results to date appear hereunder—

Crop Results to Date of Competitive Trials with South Johnstone Seedling Canes.

Seedling Number.	Plant Crop, 1927—Age 12 months.		First Ratoon Crop, 1928—Age 11 months.		Average for Two Crops.	
	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 Englise Tons.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
S.J.Q. 2	35·0	5·49	30·1	4·82	32·55	5·18
S.J.Q. 3	56·0	7·84	54·0	7·88	55·0	7·86
S.J.Q. 4	59·1	7·71	56·8	8·58	57·95	8·14
S.J.Q. 5	55·6	6·95	50·2	6·88	52·9	6·92
S.J.Q. 7	73·1	11·11	51·1	7·00	62·1	9·45
S.J.Q. 9	76·2	7·73	67·2	7·46	71·7	7·60
S.J.Q. 12	64·6	6·88	52·0	6·97	58·3	6·92
S.J.Q. 15	63·8	9·12	50·5	7·73	57·15	8·50
S.J.Q. 16	49·8	7·12	50·3	8·05	50·05	7·59
S.J.Q. 17	49·8	7·22	49·2	7·67	49·5	7·43
S.J.Q. 19	45·1	3·52	41·0	4·63	43·05	4·05
S.J.Q. 20	39·2	4·43	30·1	4·00	34·65	4·24
S.J.Q. 21	44·8	5·96	36·8	5·08	40·8	5·56
S.J.Q. 25	49·8	5·60	38·5	4·04	44·15	4·92
S.J.Q. 26	52·1	4·84	42·2	4·47	47·15	4·67
S.J.Q. 28	58·3	8·10	55·6	7·89	56·95	7·99

8. Work of the Northern Sugar Experiment Station—*continued.*

Crop Results to Date of Competitive Trials with South Johnstone Seedling Canes—*continued.*

Seedling Number.	Plant Crop, 1927—Age 12 Months.		First Ratoon Crop, 1928—Age 11 Months.		Average for Two Crops.	
	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.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
S.J.Q. 31	46·3	5·83	42·4	6·02	44·35	5·92
S.J.Q. 41	43·6	5·95	38·0	4·79	40·8	5·41
S.J.Q. 44	47·1	5·13	40·5	4·41	43·8	4·80
S.J.Q. 45	43·6	4·88	38·2	4·89	40·9	4·88
S.J.Q. 46	33·8	3·34	29·1	3·36	31·45	3·35
a.J.Q. 48	38·1	3·77	30·6	3·33	34·35	3·57
S.J.Q. 49	36·5	5·00	30·6	4·28	33·55	4·67
S.J.Q. 51	45·5	4·59	41·4	5·38	43·45	4·97
S.J.Q. 53	46·7	6·30	42·3	6·68	44·5	6·48
S.J.Q. 54	45·5	6·41	42·8	5·69	44·15	6·06
S.J.Q. 55	43·9	5·71	38·1	5·64	41·0	5·68
S.J.Q. 58	50·1	6·66	47·3	6·95	48·7	6·80
S.J.Q. 60	38·9	5·06	37·4	5·83	38·15	5·44
S.J.Q. 64	46·3	5·76	40·2	5·67	43·25	5·72
S.J.Q. 70	29·9	4·07	25·0	3·65	27·45	3·88
S.J.Q. 77	46·3	5·00	44·4	5·37	45·35	5·18
S.J.Q. 91	31·1	4·26	30·0	4·68	30·55	4·47
S.J.Q. 112	29·9	4·27	28·5	4·49	29·2	4·38
S.J.Q. 137	31·9	3·83	30·8	4·45	31·35	4·13
S.J.Q. 174	53·7	7·73	49·4	7·41	51·55	7·57
S.J.Q. 301	57·9	7·58	50·2	7·43	54·05	7·51
S.J.Q. 312	46·3	4·93	46·0	6·35	46·15	5·64
S.J.Q. 318	38·9	4·47	36·6	4·83	37·75	4·64
S.J.Q. 319	29·2	2·83	25·2	2·87	27·2	2·85
S.J.Q. 329	43·6	4·84	39·1	5·43	41·35	5·12
S.J.Q. 344	33·4	4·71	32·4	5·22	32·9	4·96
S.J.Q. 468	45·1	4·91	34·6	4·64	39·85	4·79

(7) Competitive Trials of Twenty Selected South Johnstone Queensland Seedling Canes—Plant Cane.

The land was prepared for these trials by planting with cowpea at the rate of one bushel per acre in November, 1926, and ploughing under in January, 1927. The cowpea was allowed to rot, and after four ploughings and harrowings twenty plots were laid out and planted with selected South Johnstone Queensland seedling canes in August, 1927.

In October, 1927, mixed fertiliser was applied at the following rate per acre:—100 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. sulphate of potash, and 200 lb. meatworks.

The analytical and crop results are presented below—

First Analytical Examination of Competitive Trials with South Johnstone Seedling Canes—Plant Crop—July, 1928.

Division.	Seedling Number.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.	Variety from which Seed was taken.
B3	S.J.Q. 2 ..	11 months	12–7–28	19·5	18·02	92·4	15·32	14·5	N.G. 15 (Badila)
B3	S.J.Q. 3 ..	11 months	12–7–28	20·4	19·13	93·8	16·26	15·5	N.G. 15 (Badila)
B3	S.J.Q. 4 ..	11 months	12–7–28	17·7	15·46	87·3	13·14	12·0	N.G. 15 (Badila)
B3	S.J.Q. 7 ..	11 months	12–7–28	18·8	17·09	90·9	14·53	13·6	N.G. 15 (Badila)
B3	S.J.Q. 15 ..	11 months	12–7–28	19·1	17·17	89·9	14·59	13·6	N.G. 15 (Badila)
B3	S.J.Q. 16 ..	11 months	12–7–28	17·6	15·82	89·9	13·45	12·5	N.G. 15 (Badila)
B3	S.J.Q. 17 ..	11 months	12–7–28	17·7	14·84	83·8	12·51	11·2	N.G. 15 (Badila)
B3	S.J.Q. 21 ..	11 months	12–7–28	17·6	15·17	86·2	12·89	11·7	N.G. 15 (Badila)
B3	S.J.Q. 25 ..	11 months	12–7–28	16·1	12·38	76·9	10·52	8·8	N.G. 15 (Badila)
B3	S.J.Q. 26 ..	11 months	12–7–28	15·8	12·74	80·6	10·83	9·3	N.G. 24 (Goru)
B3	S.J.Q. 28 ..	11 months	12–7–28	17·5	15·27	87·2	12·98	11·85	N.G. 24 (Goru)
B3	S.J.Q. 49 ..	11 months	12–7–28	19·2	16·55	86·2	14·07	12·7	H.Q. 77
B3	S.J.Q. 53 ..	11 months	12–7–28	17·2	13·61	79·1	11·57	9·9	H.Q. 77
B3	S.Q.J. 55 ..	11 months	12–7–28	18·7	17·20	92·0	14·62	13·8	E.K. 28
B3	S.J.Q. 60 ..	11 months	12–7–28	18·5	17·06	92·2	14·50	13·7	H. 109
B3	S.J.Q. 77 ..	11 months	12–7–28	17·0	13·75	80·9	11·69	10·1	N.G. 15 (Badila)
B3	S.J.Q. 112 ..	11 months	12–7–28	18·5	16·25	87·8	13·81	12·7	N.G. 16
B3	S.J.Q. 137 ..	11 months	12–7–28	17·5	15·57	89·0	13·23	12·2	H.Q. 77
B3	S.J.Q. 301 ..	11 months	12–7–28	17·6	15·41	87·5	13·10	12·0	Q. 903
B3	S.J.Q. 344 ..	11 months	12–7–28	19·4	17·47	90·0	14·85	13·8	7R. 428

8. Work of the Northern Sugar Experiment Station—*continued.*

Second Analytical Examination of Competitive Trials with South Johnstone Seedling Canes—Plant Crop—August, 1928.

Division.	Seedling Number.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.	Variety from which Seed was taken.
B3	S.J.Q. 2 ..	12 months	15–8–28	19·2	17·85	93·0	15·17	14·41	N.G. 15 (Badila)
B3	S.J.Q. 3 ..	12 months	15–8–28	21·2	20·35	95·9	17·30	16·72	N.G. 15 (Badila)
B3	S.J.Q. 4 ..	12 months	15–8–28	19·8	18·25	92·2	15·51	14·65	N.G. 15 (Badila)
B3	S.J.Q. 7 ..	12 months	15–8–28	19·8	18·52	93·5	15·74	15·00	N.G. 15 (Badila)
B3	S.J.Q. 15 ..	12 months	15–8–28	19·8	18·25	92·2	15·51	14·65	N.G. 15 (Badila)
B3	S.J.Q. 16 ..	12 months	15–8–28	18·1	16·73	92·4	14·22	13·46	N.G. 15 (Badila)
B3	S.J.Q. 17 ..	12 months	15–8–28	19·3	16·86	87·3	14·33	13·10	N.G. 15 (Badila)
B3	S.J.Q. 21 ..	12 months	15–8–28	19·2	17·28	90·0	14·69	13·68	N.G. 15 (Badila)
B3	S.J.Q. 25 ..	12 months	15–8–28	19·3	16·65	86·3	14·15	12·83	N.G. 15 (Badila)
B3	S.J.Q. 26 ..	12 months	15–8–28	16·1	13·56	84·2	11·53	10·28	N.G. 24 (Goru)
B3	S.J.Q. 28 ..	12 months	15–8–28	20·0	18·40	92·0	15·64	14·59	N.G. 24 (Goru)
B3	S.J.Q. 49 ..	12 months	15–8–28	19·2	17·06	88·8	14·50	13·40	H.Q. 77
B3	S.J.Q. 53 ..	12 months	15–8–28	18·0	15·01	83·4	12·76	11·31	H.Q. 77
B3	S.J.Q. 55 ..	12 months	15–8–28	18·9	17·60	93·1	14·96	14·22	E.K. 28
B3	S.J.Q. 60 ..	12 months	15–8–28	18·6	17·65	94·9	15·00	14·41	H. 108
B3	S.J.Q. 77 ..	12 months	15–8–28	16·7	13·25	79·3	11·26	9·63	N.G. 15 (Badila)
B3	S.J.Q. 112 ..	12 months	15–8–28	19·5	17·69	90·7	15·04	14·07	N.G. 16
B3	S.J.Q. 137 ..	12 months	15–8–28	19·4	17·44	89·9	14·82	13·80	H.Q. 77
B3	S.J.Q. 301 ..	12 months	15–8–28	18·1	16·30	90·0	13·85	12·47	Q. 903
B3	S.J.Q. 344 ..	12 months	15–8–28	19·9	18·09	90·9	15·38	14·41	7R. 428

Final Analytical Examination of Competitive Trials with South Johnstone Seedling Canes—Plant Crop—September, 1928.

Division	Seedling Number.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Fibre.	% Glucose in Juice.	% Sucrose in Cane.	% C.C.S. in Cane.	Variety from which Seed was taken.
B3	S.J.Q. 2 ..	13 months	21–9–28	22·0	20·80	94·5	10·0	0·28	17·68	16·95	N.G. 15 (Badila)
B3	S.J.Q. 3 ..	13 months	21–9–28	20·8	19·61	94·3	11·5	0·36	16·37	15·7	N.G. 15 (Badila)
B3	S.J.Q. 4 ..	13 months	21–9–28	20·2	18·66	92·4	10·5	0·48	15·77	14·9	N.G. 15 (Badila)
B3	S.J.Q. 7 ..	13 months	21–9–28	21·3	20·09	94·3	11·0	0·41	16·87	16·15	N.G. 15 (Badila)
B3	S.J.Q. 15 ..	13 months	21–9–28	21·1	19·51	92·5	12·0	0·36	16·19	15·3	N.G. 15 (Badila)
B3	S.J.Q. 16 ..	13 months	21–9–28	20·6	19·48	94·6	12·0	0·35	16·17	15·5	N.G. 15 (Badila)
B3	S.J.Q. 17 ..	13 months	21–9–28	19·9	17·50	87·9	10·5	0·71	14·79	13·6	N.G. 15 (Badila)
B3	S.J.Q. 21 ..	13 months	21–9–28	19·8	17·83	90·0	10·5	0·93	15·07	14·0	N.G. 15 (Badila)
B3	S.J.Q. 25 ..	13 months	21–9–28	20·7	18·38	88·8	10·0	0·82	15·62	14·4	N.G. 15 (Badila)
B3	S.J.Q. 26 ..	13 months	21–9–28	17·8	15·56	87·4	10·0	1·04	13·23	12·1	N.G. 24 (Goru)
B3	S.J.Q. 28 ..	13 months	21–9–28	20·2	18·26	90·4	9·5	0·42	15·61	14·6	N.G. 24 (Goru)
B3	S.J.Q. 49 ..	13 months	21–9–28	18·9	16·80	88·9	10·0	0·63	14·28	13·2	H.Q. 77
B3	S.J.Q. 53 ..	13 months	21–9–28	19·6	17·49	89·2	9·5	0·48	14·95	13·85	H.Q. 77
B3	S.J.Q. 55 ..	13 months	21–9–28	19·2	17·99	93·7	10·0	0·44	15·29	14·6	E.K. 28
B3	S.J.Q. 60 ..	13 months	21–9–28	19·2	17·69	92·1	12·0	0·52	14·68	13·9	H. 109
B3	S.J.Q. 77 ..	13 months	21–9–28	20·9	18·98	90·8	9·5	0·50	16·23	15·2	N.G. 15 (Badila)
B3	S.J.Q. 112 ..	13 months	21–9–28	21·9	20·61	94·1	9·5	0·31	17·62	16·85	N.G. 16
B3	S.J.Q. 137 ..	13 months	21–9–28	21·1	18·00	85·3	13·0	0·63	14·76	13·3	H.Q. 77
B3	S.J.Q. 301 ..	13 months	21–9–28	19·3	17·49	90·6	10·5	0·83	14·78	13·8	Q. 903
B3	S.J.Q. 344 ..	13 months	21–9–28	21·1	18·61	88·2	10·5	0·41	15·72	14·5	7R. 428

Crop Results of Competitive Trials with South Johnstone Seedling Canes—Plant Crop—September, 1928.

Seedling Number.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English tons.	Variety from which Seed was taken.
S.J.Q. 2	13 months ..	32·6	4·70	N.G. 15 (Badila)
S.J.Q. 3	13 months ..	54·2	9·06	N.G. 15 (Badila)
S.J.Q. 4	13 months ..	59·6	8·73	N.G. 15 (Badila)
S.J.Q. 7	13 months ..	52·5	7·87	N.G. 15 (Badila)
S.J.Q. 15	13 months ..	50·2	7·35	N.G. 15 (Badila)
S.J.Q. 16	13 months ..	52·2	7·03	N.G. 15 (Badila)
S.J.Q. 17	13 months ..	50·2	6·58	N.G. 15 (Badila)
S.J.Q. 21	13 months ..	44·1	6·03	N.G. 15 (Badila)
S.J.Q. 25	13 months ..	47·4	6·08	N.G. 15 (Badila)
S.J.Q. 26	13 months ..	45·2	4·65	N.G. 24 (Goru)
S.J.Q. 28	13 months ..	58·6	8·55	N.G. 24 (Goru)
S.J.Q. 49	13 months ..	33·4	4·47	H.Q. 77
S.J.Q. 53	13 months ..	47·8	5·41	H.Q. 77
S.J.Q. 55	13 months ..	40·7	5·79	E.K. 28
S.J.Q. 60	13 months ..	45·1	6·50	H. 109
S.J.Q. 77	13 months ..	40·2	3·87	N.G. 15 (Badila)
S.J.Q. 112	13 months ..	30·6	4·30	N.G. 16
S.J.Q. 137	13 months ..	38·8	5·35	H.Q. 77
S.J.Q. 301	13 months ..	55·3	6·89	Q. 903
S.J.Q. 344	13 months ..	36·4	5·24	7R. 428

8. Work of the Northern Sugar Experiment Station—*continued.*

(8) Analytical Examination of South Johnstone Queensland Seedling Canes—Plant Cane.

The South Johnstone Queensland seedling canes, of which the analytical results are set out below, are canes of erect habit and healthy appearance.

First Analytical Examination of South Johnstone Seedling Canes—Plant Crop—July, 1928.

Division.	Seedling Number.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.	Variety from which Seed was taken.
B5	S.J.Q. 356 ..	10 months	20–7–28	17·8	14·69	82·5	12·49	11·0	Q. 903
B5	S.J.Q. 361 ..	10 months	20–7–28	17·4	13·90	79·9	11·81	10·15	Q. 903
B5	S.J.Q. 471 ..	10 months	20–7–28	19·7	17·57	89·2	14·93	13·8	H.Q. 77
B5	S.J.Q. 487 ..	10 months	20–7–28	18·9	17·20	91·0	14·62	13·7	Badila
B5	S.J.Q. 491 ..	10 months	20–7–28	16·2	13·27	81·9	11·28	9·9	Badila
B5	S.J.Q. 492 ..	10 months	20–7–28	15·2	11·44	75·3	9·72	8·0	Badila
B5	S.J.Q. 524 ..	10 months	20–7–28	14·7	11·10	75·5	9·43	7·75	Badila
B5	S.J.Q. 537 ..	10 months	20–7–28	17·5	15·58	89·0	13·24	12·25	Badila
B5	S.J.Q. 567 ..	10 months	20–7–28	16·8	13·46	80·1	11·44	9·85	N.G. 24
B5	S.J.Q. 621 ..	10 months	20–7–28	17·9	16·02	89·5	13·62	12·6	Q. 903
B5	S.J.Q. 638 ..	10 months	20–7–28	18·0	15·53	86·3	13·20	12·0½	Q. 903
B5	S.J.Q. 653 ..	10 months	20–7–28	14·9	10·94	73·4	9·30	7·5½	Q. 903
B5	S.J.Q. 696 ..	10 months	20–7–28	18·1	16·56	91·4	14·08	13·2	Q. 903
B5	S.J.Q. 725 ..	10 months	20–7–28	16·9	13·99	82·8	11·89	10·5	Q. 903
B5	S.J.Q. 761 ..	10 months	20–7–28	15·9	12·45	78·3	10·58	8·95	Q. 903
B5	S.J.Q. 770 ..	10 months	20–7–28	18·2	15·87	87·2	13·49	12·3	Q. 903
B5	S.J.Q. 813 ..	10 months	20–7–28	17·9	16·05	89·6	13·64	12·7	N.G. 16
B5	S.J.Q. 837 ..	10 months	20–7–28	16·8	13·53	80·5	11·50	9·9	N.G. 16
B5	S.J.Q. 869 ..	10 months	20–7–28	16·0	12·62	78·9	10·73	9·1	N.G. 16
B5	S.J.Q. 879 ..	10 months	20–7–28	17·7	15·38	86·9	13·07	11·9	E.K. 28
B5	S.J.Q. 883 ..	10 months	20–7–28	18·0	16·03	89·0	13·62	12·6	E.K. 28
B5	S.J.Q. 985 ..	10 months	20–7–28	15·9	12·89	81·1	10·96	9·5	E.K. 28
B5	S.J.Q. 986 ..	10 months	20–7–28	18·7	16·87	90·2	14·34	13·4	E.K. 28
B5	S.J.Q. 987 ..	10 months	20–7–28	18·7	16·40	87·7	13·94	12·8	E.K. 28
B5	S.J.Q. 988 ..	10 months	20–7–28	18·5	16·92	91·4	14·38	13·5	E.K. 28
B5	S.J.Q. 1018 ..	10 months	20–7–28	18·9	17·34	91·7	14·74	13·9	E.K. 28
B5	S.J.Q. 1022 ..	10 months	20–7–28	17·5	14·21	81·2	12·08	10·5	E.K. 28
B5	S.J.Q. 1033 ..	10 months	20–7–28	16·4	13·16	80·2	11·19	9·6	D. 109
B5	S.J.Q. 1039 ..	10 months	20–7–28	16·9	13·32	78·8	11·32	9·6	D. 109
B5	S.J.Q. 1040 ..	10 months	20–7–28	14·2	10·93	77·0	9·29	7·75	D. 109
B5	S.J.Q. 1118 ..	10 months	20–7–28	17·4	14·73	84·6	12·52	11·2	D. 109
B5	S.J.Q. 1127 ..	10 months	20–7–28	17·0	13·78	81·0	11·71	10·2	D. 109
B5	S.J.Q. 1136 ..	10 months	20–7–28	14·8	11·82	79·9	10·05	8·6	S.J.Q. 64
B5	S.J.Q. 1139 ..	10 months	20–7–28	15·6	12·36	79·2	10·51	9·0	S.J.Q. 64
B5	S.J.Q. 1141 ..	10 months	20–7–28	16·9	14·45	85·5	12·28	11·1	S.J.Q. 64
B5	S.J.Q. 1149 ..	10 months	20–7–28	18·5	16·79	90·8	14·27	13·4	S.J.Q. 64
B5	S.J.Q. 1150 ..	10 months	20–7–28	16·9	13·26	78·5	11·27	9·55	S.J.Q. 64
B5	S.J.Q. 1153 ..	10 months	20–7–28	17·9	15·79	88·2	13·42	12·3	S.J.Q. 64
B5	S.J.Q. 1157 ..	10 months	20–7–28	13·8	10·28	74·5	8·74	7·1	S.J.Q. 64
B5	S.J.Q. 1165 ..	10 months	21–7–28	16·2	13·11	80·9	11·14	9·7	S.J.Q. 64
B5	S.J.Q. 1254 ..	10 months	21–7–28	16·2	12·73	78·6	10·82	9·2	S.J.Q. 41
B5	S.J.Q. 1256 ..	10 months	21–7–28	18·5	16·38	88·5	13·92	12·8	S.J.Q. 41
B5	S.J.Q. 1259 ..	10 months	21–7–28	17·3	14·29	82·6	12·15	10·7	S.J.Q. 41
B5	S.J.Q. 1267 ..	10 months	21–7–28	15·5	12·11	78·1	10·29	8·7	S.J.Q. 41
B5	S.J.Q. 1270 ..	10 months	21–7–28	17·1	13·66	79·9	11·61	10·0	S.J.Q. 51
B5	S.J.Q. 1272 ..	10 months	21–7–28	15·7	11·46	73·0	9·74	7·8	S.J.Q. 51
B5	S.J.Q. 1277 ..	10 months	21–7–28	18·7	16·09	86·0	13·68	12·4	S.J.Q. 312
B5	S.J.Q. 1299 ..	10 months	21–7–28	16·7	13·73	82·2	11·67	10·2	S.J.Q. 51
B5	S.J.Q. 1308 ..	10 months	21–7–28	16·3	13·27	81·4	11·28	9·8	S.J.Q. 3
B5	S.J.Q. 1310 ..	10 months	21–7–28	19·5	17·11	87·7	14·54	13·3	S.J.Q. 3
B5	S.J.Q. 1316 ..	10 months	21–7–28	20·3	18·59	91·6	15·80	14·9	S.J.Q. 3
B5	S.J.Q. 1323 ..	10 months	21–7–28	17·8	14·94	83·9	12·70	11·3	S.J.Q. 3
B5	S.J.Q. 1339 ..	10 months	21–7–28	15·5	11·54	74·4	9·81	8·0	E.K. 28
B5	S.J.Q. 1340 ..	10 months	21–7–28	18·4	16·60	90·2	14·11	13·2	S.J.Q. 1
B5	S.J.Q. 1361 ..	10 months	21–7–28	19·5	17·61	90·3	14·97	14·0	S.J.Q. 312
B5	S.J.Q. 1364 ..	10 months	21–7–28	16·9	11·81	73·8	10·04	8·1	S.J.Q. 312
B5	S.J.Q. 1370 ..	10 months	21–7–28	18·0	15·66	87·0	13·31	12·1	S.J.Q. 312
B5	S.J.Q. 1389 ..	10 months	21–7–28	17·5	14·90	85·1	12·66	11·4	S.J.Q. 312
B5	S.J.Q. 1404 ..	10 months	21–7–28	13·7	9·61	70·1	8·17	6·3	S.J.Q. 41
B5	S.J.Q. 1417 ..	10 months	21–7–28	17·0	14·52	85·4	12·34	11·1	S.J.Q. 41
B5	S.J.Q. 1430 ..	10 months	21–7–28	18·4	16·21	88·1	13·78	12·7	S.J.Q. 3
B5	S.J.Q. 1461 ..	10 months	21–7–28	15·4	11·65	75·6	9·90	8·15	S.J.Q. 41
B5	S.J.Q. 1486 ..	10 months	21–7–28	17·1	13·99	81·3	11·82	10·3	E.K. 28
B5	S.J.Q. 1497 ..	10 months	21–7–28	13·4	8·56	63·9	7·28	5·1	S.J.Q. 312
B5	S.J.Q. 1504 ..	10 months	21–7–28	16·0	12·81	80·1	10·89	9·4	S.J.Q. 41
B5	S.J.Q. 1513 ..	10 months	21–7–28	14·7	10·58	72·0	8·99	7·1	S.J.Q. 41
B5	S.J.Q. 1528 ..	10 months	21–7–28	16·6	14·84	89·2	12·59	11·7	S.J.Q. 312
B5	S.J.Q. 1529 ..	10 months	21–7–28	16·0	12·05	75·3	10·24	8·4	S.J.Q. 312
B5	S.J.Q. 1538 ..	10 months	21–7–28	16·0	11·74	73·4	9·98	8·0	S.J.Q. 312
B5	S.J.Q. 1576 ..	10 months	21–7–28	15·9	11·99	75·4	10·19	8·4	S.J.Q. 349
B5	S.J.Q. 1577 ..	10 months	21–7–28	18·6	12·61	76·0	10·72	8·85	S.J.Q. 349
B5	S.J.Q. 1582 ..	10 months	21–7–28	16·3	13·34	81·8	11·34	9·9	S.J.Q. 46

8. Work of the Northern Sugar Experiment Station—*continued.*

Second Analytical Examination of South Johnstone Seedling Canes—Plant Crop—August, 1928.

Division.	Seedling Number.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.	Variety from which Seed was taken.
B5	S.J.Q. 356 ..	11 months	20–8–28	18·6	15·99	86·0	13·59	12·3	Q. 903
B5	S.J.Q. 361 ..	11 months	20–8–29	17·8	14·76	82·9	12·55	11·1	Q. 903
B5	S.J.Q. 471 ..	11 months	20–8–28	20·1	18·64	92·7	15·84	15·0	H.Q. 77
B5	S.J.Q. 487 ..	11 months	20–8–28	21·1	20·09	95·2	17·08	16·4	Badila
B5	S.J.Q. 491 ..	11 months	20–8–28	18·1	15·59	86·1	13·25	12·0	Badila
B5	S.J.Q. 492 ..	11 months	20–8–28	16·4	13·34	81·3	11·34	9·9	Badila
B5	S.J.Q. 524 ..	11 months	20–8–28	17·6	14·64	83·2	12·44	11·0	Badila
B5	S.J.Q. 537 ..	11 months	20–8–28	19·2	17·92	93·3	15·23	14·5	Badila
B5	S.J.Q. 567 ..	11 months	20–8–28	19·0	16·41	86·4	13·95	12·65	N.G. 24
B5	S.J.Q. 621 ..	11 months	20–8–28	17·9	16·07	89·8	13·66	12·7	Q. 903
B5	S.J.Q. 638 ..	11 months	20–8–28	20·4	18·33	89·8	15·58	14·5	Q. 903
B5	S.J.Q. 653 ..	11 months	20–8–28	16·7	13·59	81·4	11·55	10·1	Q. 903
B5	S.J.Q. 696 ..	11 months	20–8–28	17·8	16·11	90·5	13·69	12·8	Q. 903
B5	S.J.Q. 725 ..	11 months	20–8–28	17·7	15·46	87·3	13·14	12·0	Q. 903
B5	S.J.Q. 761 ..	11 months	20–8–28	16·9	13·82	81·8	11·75	10·3	Q. 903
B5	S.J.Q. 770 ..	11 months	20–8–28	19·4	17·59	90·7	14·95	14·0	Q. 903
B5	S.J.Q. 813 ..	11 months	20–7–28	19·1	17·68	92·6	15·03	14·1	N.G. 16
B5	S.J.Q. 837 ..	11 months	20–8–28	17·2	14·29	83·1	12·15	10·7	N.G. 16
B5	S.J.Q. 869 ..	11 months	20–8–28	17·0	14·04	82·6	11·93	10·5	N.G. 16
B5	S.J.Q. 879 ..	11 months	20–8–28	18·1	15·93	88·0	13·54	12·4	E.K. 28
B5	S.J.Q. 883 ..	11 months	20–8–28	19·0	17·41	91·6	14·80	13·9	E.K. 28
B5	S.J.Q. 985 ..	11 months	20–8–28	16·2	13·20	81·5	11·22	9·8	E.K. 28
B5	S.J.Q. 986 ..	11 months	20–8–28	18·4	16·67	90·6	14·17	13·25	E.K. 28
B5	S.J.Q. 987 ..	11 months	20–8–28	19·5	17·78	91·2	15·11	14·2	E.K. 28
B5	S.J.Q. 988 ..	11 months	20–8–28	19·0	17·37	91·4	14·76	13·9	E.K. 28
B5	S.J.Q. 1018 ..	11 months	20–8–28	17·7	15·61	88·2	13·27	12·2	E.K. 28
B5	S.J.Q. 1022 ..	11 months	20–8–28	18·2	15·23	83·7	12·94	11·5	E.K. 28
B5	S.J.Q. 1033 ..	11 months	20–8–28	16·8	13·85	82·4	11·77	10·3	D. 109
B5	S.J.Q. 1039 ..	11 months	20–8–28	16·3	12·71	78·0	10·80	9·1	D. 109
B5	S.J.Q. 1040 ..	11 months	20–8–28	16·6	12·98	78·2	11·03	9·3	D. 109
B5	S.J.Q. 1118 ..	11 months	20–8–28	17·7	14·37	81·2	12·21	10·6	D. 109
B5	S.J.Q. 1127 ..	11 months	20–8–28	18·4	15·92	86·5	13·53	12·3	D. 109
B5	S.J.Q. 1136 ..	11 months	20–8–28	16·6	13·83	83·3	11·75	10·4	S.J.Q. 64
B5	S.J.Q. 1139 ..	11 months	20–8–28	17·4	15·51	89·1	13·18	12·2	S.J.Q. 64
B5	S.J.Q. 1141 ..	11 months	20–8–28	16·9	14·62	86·5	12·43	11·3	S.J.Q. 64
B5	S.J.Q. 1149 ..	11 months	20–8–28	17·9	15·38	85·9	13·07	11·8	S.J.Q. 64
B5	S.J.Q. 1150 ..	11 months	20–8–28	16·7	13·10	78·4	11·13	9·4	S.J.Q. 64
B5	S.J.Q. 1153 ..	11 months	20–8–28	16·1	12·65	78·6	10·75	9·1	S.J.Q. 64
B5	S.J.Q. 1157 ..	11 months	20–8–28	14·5	11·68	80·5	9·93	8·6	S.J.Q. 64
B5	S.J.Q. 1165 ..	11 months	21–8–28	16·0	12·70	79·4	10·79	9·2	S.J.Q. 64
B5	S.J.Q. 1254 ..	11 months	21–8–28	18·1	15·65	86·5	13·30	12·1	S.J.Q. 41
B5	S.J.Q. 1256 ..	11 months	21–8–28	19·7	17·90	90·9	15·21	14·25	S.J.Q. 41
B5	S.J.Q. 1259 ..	11 months	21–8–28	17·9	15·47	86·4	13·15	11·9	S.J.Q. 41
B5	S.J.Q. 1267 ..	11 months	21–8–28	16·7	13·85	82·9	11·77	10·4	S.J.Q. 41
B5	S.J.Q. 1270 ..	11 months	21–8–28	16·1	12·57	78·1	10·68	9·0	S.J.Q. 51
B5	S.J.Q. 1272 ..	11 months	21–8–28	16·5	13·03	79·0	11·07	9·4	S.J.Q. 51
B5	S.J.Q. 1277 ..	11 months	21–8–28	19·5	17·23	88·3	14·64	13·5	S.J.Q. 312
B5	S.J.Q. 1299 ..	11 months	21–8–28	17·4	15·51	89·1	13·18	12·2	S.J.Q. 51
B5	S.J.Q. 1308 ..	11 months	21–8–28	16·9	14·06	83·2	11·95	10·6	S.J.Q. 3
B5	S.J.Q. 1310 ..	11 months	21–8–28	19·1	16·93	88·6	14·39	13·3	S.J.Q. 3
B5	S.J.Q. 1316 ..	11 months	21–8–28	21·2	19·64	92·6	16·69	15·8	S.J.Q. 3
B5	S.J.Q. 1323 ..	11 months	21–8–28	19·1	16·60	86·9	14·11	12·85	S.J.Q. 3
B5	S.J.Q. 1339 ..	11 months	21–8–28	17·4	14·30	82·2	12·15	10·7	E.K. 28
B5	S.J.Q. 1340 ..	11 months	21–8–28	18·5	17·18	92·9	14·60	13·85	S.J.Q. 1
B5	S.J.Q. 1361 ..	11 months	21–8–28	20·6	19·22	93·3	16·34	15·5	S.J.Q. 312
B5	S.J.Q. 1364 ..	11 months	21–8–28	17·0	13·41	78·9	11·40	9·7	S.J.Q. 312
B5	S.J.Q. 1370 ..	11 months	21–8–28	18·3	16·00	87·4	13·60	12·4	S.J.Q. 312
B5	S.J.Q. 1389 ..	11 months	21–8–28	17·8	15·42	86·6	13·11	11·9	S.J.Q. 312
B5	S.J.Q. 1404 ..	11 months	21–8–28	14·9	11·49	77·1	9·77	8·2	S.J.Q. 41
B5	S.J.Q. 1417 ..	11 months	21–8–28	18·8	16·70	88·8	14·19	13·1	S.J.Q. 41
B5	S.J.Q. 1430 ..	11 months	21–8–28	19·2	17·30	90·1	14·70	13·7	S.J.Q. 3
B5	S.J.Q. 1461 ..	11 months	21–8–28	18·3	15·53	84·9	13·20	11·8	S.J.Q. 41
B5	S.J.Q. 1486 ..	11 months	21–8–28	18·6	16·19	87·0	13·76	12·5	E.K. 28
B5	S.J.Q. 1497 ..	11 months	21–8–28	14·7	10·52	71·6	8·94	7·0	S.J.Q. 312
B5	S.J.Q. 1504 ..	11 months	21–8–28	16·2	13·30	82·1	11·30	9·9	S.J.Q. 41
B5	S.J.Q. 1513 ..	11 months	21–8–28	15·8	12·07	76·4	10·26	8·5	S.J.Q. 41
B5	S.J.Q. 1528 ..	11 months	21–8–28	17·5	15·81	90·3	13·44	12·5	S.J.Q. 312
B5	S.J.Q. 1529 ..	11 months	21–8–28	17·4	14·14	81·3	12·02	10·45	S.J.Q. 312
B5	S.J.Q. 1538 ..	11 months	21–8–28	16·2	12·71	78·4	10·80	9·15	S.J.Q. 312
B5	S.J.Q. 1576 ..	11 months	21–8–28	18·0	15·19	84·4	12·91	11·5	S.J.Q. 319
B5	S.J.Q. 1577 ..	11 months	21–8–28	17·1	13·93	81·5	11·84	10·3	S.J.Q. 319
B5	S.J.Q. 1582 ..	11 months	21–8–28	16·3	13·07	80·2	11·11	9·6	S.J.Q. 46

8. Work of the Northern Sugar Experiment Station—*continued*

Final Analytical Examination of South Johnstone Seedling Canes—Plant Crop—September, 1928.

Division.	Seedling Number.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.	Variety from which Seed was taken.
B5	S.J.Q. 356 ..	12 months	12–9–28	19·5	16·33	83·7	13·38	12·3	Q. 903
B5	S.J.Q. 361 ..	12 months	12–9–28	19·4	17·08	88·0	14·52	13·3	Q. 903
B5	S.J.Q. 471 ..	12 months	12–9–28	19·8	17·54	88·6	14·91	13·75	H.Q. 77
B5	S.J.Q. 487 ..	12 months	12–9–28	21·2	19·90	93·9	16·91	16·15	Badila
B5	S.J.Q. 491 ..	12 months	12–9–28	17·7	15·82	89·4	13·45	12·5	Badila
B5	S.J.Q. 492 ..	12 months	12–9–28	17·8	14·82	83·2	12·60	11·15	Badila
B5	S.J.Q. 524 ..	12 months	12–9–28	19·1	16·70	87·4	14·19	13·0	Badila
B5	S.J.Q. 537 ..	12 months	12–9–28	19·5	17·87	91·6	15·19	14·3	Badila
B5	S.J.Q. 567 ..	12 months	12–8–28	17·5	14·48	82·7	12·31	10·8	N.G. 24
B5	S.J.Q. 621 ..	12 months	12–9–28	18·5	16·80	90·8	14·28	13·4	Q. 903
B5	S.J.Q. 638 ..	12 months	12–9–28	19·7	17·87	90·7	15·19	14·2	Q. 903
B5	S.J.Q. 653 ..	12 months	12–9–28	15·5	11·96	77·2	10·17	8·5	Q. 903
B5	S.J.Q. 696 ..	12 months	12–9–28	17·2	15·32	89·1	13·02	12·05	Q. 903
B5	S.J.Q. 725 ..	12 months	12–9–28	18·4	16·06	87·3	13·65	12·5	Q. 903
B5	S.J.Q. 761 ..	12 months	12–9–28	18·7	16·33	87·3	13·88	12·7	Q. 903
B5	S.J.Q. 770 ..	12 months	12–9–28	20·5	18·76	91·5	15·95	15·0	Q. 903
B5	S.J.Q. 813 ..	12 months	12–9–28	19·1	17·45	91·4	14·83	13·9	N.G. 16
B5	S.J.Q. 837 ..	12 months	12–9–28	19·1	16·61	87·0	14·12	12·9	N.G. 16
B5	S.J.Q. 869 ..	12 months	12–9–28	17·7	15·19	85·8	12·91	11·7	N.G. 16
B5	S.J.Q. 879 ..	12 months	12–9–28	18·6	16·40	88·2	13·94	12·8	E.K. 28
B5	S.J.Q. 883 ..	12 months	12–9–28	17·5	15·82	90·4	13·45	12·55	E.K. 28
B5	S.J.Q. 985 ..	12 months	12–9–28	18·9	16·96	89·7	14·42	13·4	E.K. 28
B5	S.J.Q. 986 ..	12 months	12–9–28	21·1	19·37	91·8	16·46	15·5	E.K. 28
B5	S.J.Q. 987 ..	12 months	12–9–28	21·1	19·54	92·6	16·61	15·7	E.K. 28
B5	S.J.Q. 988 ..	12 months	12–9–28	20·4	19·05	93·4	16·19	15·4	E.K. 28
B5	S.J.Q. 1018 ..	12 months	12–9–28	19·1	17·23	90·2	14·64	13·7	E.K. 28
B5	S.J.Q. 1022 ..	12 months	12–9–28	18·3	15·54	84·9	13·21	11·85	E.K. 28
B5	S.J.Q. 1033 ..	12 months	12–9–28	17·0	14·64	86·1	12·44	11·3	D. 109
B5	S.J. 1039 ..	12 months	12–9–28	17·0	13·84	81·4	11·76	10·25	D. 109
B5	S.J.Q. 1040 ..	12 months	12–9–28	17·1	14·30	83·6	12·15	10·8	D. 109
B5	S.J.Q. 1118 ..	12 months	12–9–28	18·2	14·23	78·2	12·09	10·2	D. 109
B5	S.J.Q. 1127 ..	12 months	12–9–28	18·7	16·33	87·3	13·88	12·7	D. 109
B5	S.J.Q. 1136 ..	12 months	12–9–28	16·6	14·15	85·2	12·03	10·8	S.J.Q. 64
B5	S.J.Q. 1139 ..	12 months	12–9–28	18·3	16·21	88·6	13·78	12·7	S.J.Q. 64
B5	S.J.Q. 1141 ..	12 months	12–9–28	16·1	12·66	78·6	10·76	9·1	S.J.Q. 64
B5	S.J.Q. 1149 ..	12 months	12–9–28	18·5	16·64	89·9	14·14	13·2	S.J.Q. 64
B5	S.J.Q. 1150 ..	12 months	12–9–28	18·5	15·82	85·5	13·45	12·1	S.J.Q. 64
B5	S.J.Q. 1153 ..	12 months	12–9–28	16·5	13·92	84·4	11·83	10·6	S.J.Q. 64
B5	S.J.Q. 1157 ..	12 months	12–9–28	16·7	14·27	85·4	12·13	10·9	S.J.Q. 64
B5	S.J.Q. 1165 ..	12 months	14–9–28	17·3	14·34	82·9	12·19	10·75	S.J.Q. 64
B5	S.J.Q. 1254 ..	12 months	14–9–28	19·3	17·51	90·7	14·88	13·9	S.J.Q. 41
B5	S.J.Q. 1256 ..	12 months	14–9–28	21·1	19·59	92·8	16·65	15·8	S.J.Q. 41
B5	S.J.Q. 1259 ..	12 months	14–9–28	19·1	16·58	86·8	14·09	12·8	S.J.Q. 41
B5	S.J.Q. 1267 ..	12 months	14–9–28	17·6	14·85	84·4	12·62	11·3	S.J.Q. 41
B5	S.J.Q. 1270 ..	12 months	14–9–28	18·9	16·51	87·3	14·03	12·8	S.J.Q. 51
B5	S.J.Q. 1272 ..	12 months	14–9–28	18·3	16·26	88·8	13.82	12·8	S.J.Q. 51
B5	S.J.Q. 1277 ..	12 months	14–9–28	20·1	17·57	87·4	14·93	13·65	S.J.Q. 312
B5	S.J.Q. 1299 ..	12 months	14–9–28	16·3	13·71	84·1	11·65	10·4	S.J.Q. 51
B5	S.J.Q. 1308 ..	12 months	14–9–28	18·3	15·75	86·1	13·39	12·1	S.J.Q. 3
B5	S.J.Q. 1310 ..	12 months	14–9–28	18·9	16·56	87·6	14·08	12·9	S.J.Q. 3
B5	S.J.Q. 1316 ..	12 months	14–9–28	21·3	19·69	92·4	16·74	15·8	S.J.Q. 3
B5	S.J.Q. 1323 ..	12 months	14–9–28	19·4	16·84	86·8	14·31	13·0	S.J.Q. 3
B5	S.J.Q. 1339 ..	12 months	14–9–28	18·0	15·14	84·1	12·87	11·5	E.K. 28
B5	S.J.Q. 1340 ..	12 months	14–9–28	19·3	18·11	93·8	15·39	14·7	S.J.Q. 1
B5	S.J.Q. 1361 ..	12 months	14–9–28	20·2	18·86	93·4	16·03	15·25	S.J.Q. 312
B5	S.J.Q. 1364 ..	12 months	14–9–28	20·3	18·30	90·1	15·55	14·5	S.J.Q. 312
B5	S.J.Q. 1370 ..	12 months	14–9–28	18·5	16·20	87·6	13.77	12·6	S.J.Q. 312
B5	S.J.Q. 1389 ..	12 months	14–9–28	17·9	15·63	87·3	13·28	12·1	S.J.Q. 312
B5	S.J.Q. 1404 ..	12 months	14–9–28	16·3	12·87	78·9	10·94	9·3	S.J.Q. 41
B5	S.J.Q. 1417 ..	12 months	14–9–28	19·2	17·68	92·1	15·03	14·2	S.J.Q. 41
B5	S.J.Q. 1430 ..	12 months	14–9–28	19·3	17·33	89·8	14·73	13·7	S.J.Q. 3
B5	S.J.Q. 1461 ..	12 months	14–9–28	18·2	15·45	84·9	13·13	11·8	S.J.Q. 41
B5	S.J.Q. 1486 ..	12 months	14–9–28	19·6	17·23	87·9	14·64	13·4	E.K. 28
B5	S.J.Q. 1497 ..	12 months	14–9–28	16·2	12·88	79·5	10·95	9·4	S.J.Q. 312
B5	S.J.Q. 1504 ..	12 months	14–9–29	17·2	14·49	84·2	12·32	11·0	S.J.Q. 41
B5	S.J.Q. 1513 ..	12 months	14–9–28	16·3	13·35	81·9	11·35	9·9	S.J.Q. 41
B5	S.J.Q. 1528 ..	12 months	14–9–28	17·9	16·02	89·5	13·62	12·6	S.J.Q. 312
B5	S.J.Q. 1529 ..	12 months	14–9–28	17·8	15·09	84·8	12·83	11·5	S.J.Q. 312
B5	S.J.Q. 1538 ..	12 months	14–9–28	17·7	14·21	80·3	12·08	10·4	S.J.Q. 312
B5	S.J.Q. 1576 ..	12 months	14–9–28	18·6	15·82	85·0	13·45	12·1	S.J.Q. 319
B5	S.J.Q. 1577 ..	12 months	14–9–28	17·3	14·29	82·6	12·15	10·7	S.J.Q. 319
B5	S.J.Q. 1582 ..	12 months	14–9–28	18·4	15·77	85·7	13·4	12·1	S.J.Q. 46

8. Work of the Northern Sugar Experiment Station—*continued.*

(9) Analytical Examination of Arrowed and Non-arrowed Cane—Badila, Plant and First Ratoons.

The following analyses were made to determine the effect of arrowing on the sucrose contents of cane. The samples were selected from the same field, and had been grown under similar conditions:—

First Analytical Examination of Arrowed and Non-Arrowed Canes—N.G. 15 (Badila)—Plant and First Ratoon Crop—June, 1928.

Variety of Cane.	Age of Cane.	Date of Analysis.	Date of Arrowing.	Cane Used.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% Commercial Cane Sugar in Cane.
N.G. 15 ..	10 months	21–6–28	8–6–28	Plant cane (arrowed) ..	18·2	14·96	82·2	12·79	11·2
N.G. 15 ..	10 months	21–6–28	..	Plant cane (non-arrowed) ..	18·3	15·53	84·9	13·28	11·9
N.G. 15 ..	10 months	21–6–28	2–6–28	First Ratoon cane (arrowed)..	19·7	17·69	89·8	15·04	14·0
N.G. 15 ..	10 months	21–6–28	..	First Ratoon cane (non-arrowed)	19·4	17·41	89·7	14·80	13·75

Second Analytical Examination of Arrowed and Non-Arrowed Cane—N.G. 15 (Badila)—Plant and First Ratoon Crop—July, 1928.

Variety of Cane.	Age of Cane.	Date of Analysis.	Date of Arrowing.	Cane Used.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% Commercial Cane Sugar in Cane.
N.G. 15 ..	11 months	21–7–28	8–6–28	Plant cane (arrowed) ..	18·5	15·83	85·6	13·53	12·2
N.G. 15 ..	11 months	21–7–28	..	Plant cane (non-arrowed) ..	17·9	15·60	87·1	13·34	12·2
N.G. 15 ..	11 months	21–7–28	2–6–28	First Ratoon cane (arrowed)..	20·5	18·72	91·3	15·91	14·95
N.G. 15 ..	11 months	21–7–28	..	First Ratoon cane (non-arrowed)	20·8	19·13	92·0	16·26	15·3

Third Analytical Examination of Arrowed and Non-Arrowed Cane—N.G. 15 (Badila)—Plant and First Ratoon Crop—August, 1928.

Variety of Cane.	Age of Cane.	Date of Analysis.	Date of Arrowing.	Cane Used.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% Commercial Cane Sugar in Cane.
N.G. 15 ..	12 months	20–8–28	8–6–28	Plant cane (arrowed) ..	19·8	17·69	89·3	15·12	14·0
N.G. 15 ..	12 months	20–8–28	..	Plant cane (non-arrowed) ..	19.3	17·68	91·6	15·12	14·2
N.G. 15 ..	12 months	20–8–28	2–6–28	First Ratoon cane (arrowed)..	21·2	19·93	94·0	16·94	16·2
N.G. 15 ..	12 months	20–8–29	..	First Ratoon cane (non-arrowed)	20·8	19·68	94·6	16·73	16·0

Final Analytical Examination of Arrowed and Non-Arrowed Cane—N.G. 15 (Badila)—Plant and First Ratoon Crop—September, 1928.

Variety of Cane.	Age of Cane.	Date of Analysis.	Date of Arrowing.	Cane Used.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% Commercial Cane Sugar in Cane.
N.G. 15 ..	13 months	21–9–28	8–6–28	Plant cane (arrowed) ..	21·2	19·53	92·1	16·7	15·8
N.G. 15 ..	13 months	21–9–28	..	Plant cane (non-arrowed) ..	20·8	19·20	92·3	16·4	15·5
N.G. 15 ..	13 months	21–9–28	2–6–28	First Ratoon cane (arrowed)..	22·6	21·10	93·4	17·9	17·1
N.G. 15 ..	13 months	21–9–28	..	First Ratoon cane (non-arrowed)	22·1	20·70	93·7	17·6	16·8

8. Work of the Northern Sugar Experiment Station—*continued.*

The above tables support the view that the arrowing of the cane makes no difference in the commercial cane sugar of the cane during some considerable period. The above analyses were carried out from June to September.

(10) Experiment in Soaking Plants before Planting.

Plot 1—Plants soaked in limewater containing lime to saturation for forty-eight hours.

Plot 2—Plants soaked in limewater containing lime to saturation and 1 lb. of magnesium sulphate to 50 gallons for forty-eight hours.

Plot 3—Plants soaked in water for forty-eight hours.

Plot 4—Ordinary planting.

This experiment was carried out with the object of obtaining information as to the effect on germination and yield of soaking plants in different solutions for forty-eight hours. The plants were carefully selected for this experiment, and the same number used in each plot. The analytical and crop results are shown hereunder—

Analytical Examination of Cane in Soaking Experiment—N.G. 15 (Badila)—Plant Crop—September, 1928.

Plot Number.	Variety of Cane.	Age of Cane.	Date of Analysis.	Treatment.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	N.G. 15..	12 months	24–9–28	Plants soaked in limewater, containing lime to saturation for forty-eight hours	20·9	19·18	91·8	16·49	15·5
2	N.G. 15..	12 months	24–9–18	Plants soaked in lime water, containing lime to saturation and one pound of magnesium sulphate to 50 gallons, for forty-eight hours	21·0	19·06	90·8	16·39	15·3
3	N.G. 15..	12 months	24–9–28	Plants soaked in water for forty-eight hours	21·0	19·24	91·6	16·55	15·6
4	N.G. 15..	12 months	24–9–28	Ordinary planting	21·2	19·44	91·7	16·72	15·75

Crop Results of Cane in Soaking Experiment—N.G. 15 (Badila)—Plant Crop—September, 1928.

Plot Number.	Variety of Cane.	Age of Cane.	Treatment.	% Germination.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	N.G. 15 ..	12 months	Plants soaked in limewater, containing lime to saturation, for forty-eight hours	95	40·6	6·29
2	N.G. 15 ..	12 months	Plants soaked in limewater containing lime to saturation and one pound of magnesium sulphate to 50 gallons, for forty-eight hours	97	42·2	6·46
3	N.G. 15 ..	12 months	Plants soaked in water for forty-eight hours ..	93	38·5	6·61
4	N.G. 15 ..	12 months	Ordinary planting	88	35·5	5·61

These experiments are being repeated on a much larger scale this year. There is no doubt about the benefits to be derived from soaking, as all the stations have secured good results from these methods.

DATES OF ARROWING.

Varieties.	1928.
Uba	3rd May
Q. 116 Sport	10th May
Co. 213	10th May
Improved Forage ..	16th May
Striped Singapore ..	21st May
S.C. 12 (4)	23rd May
M. 64/14	26th May
E.K. 28	27th May
N.G. 24	27th May
M. 55/1182	28th May
M. 291/08	29th May
Q. 903	29th May
N.G. 24 B.	29th May
Co. 227	31st May
N.G. 16	1st June
Badila	2nd June
Badila Seedling ..	3rd June
H.Q. 458	3rd June
R.P. 6	7th June
N.G. 24 A.	11th June
H.Q. 426	14th June
Malabar	14th June
Co. 290	16th June
M. 55/453	19th June
Q. 813	7th July
Tableland Badila ..	19th July

Arrowing was much more prevalent this year in North Queensland than in the previous season.

8. Work of the Northern Sugar Experiment Station—*continued.*

DISTRIBUTION OF VARIETIES FROM THE SOUTH JOHNSTONE EXPERIMENT STATION.

The annual free distribution of cane was made during August and September, when 122 farmers availed themselves of the opportunity of securing new seedling canes and disease-free standard varieties. The canes most in demand were S.J.Q. 4, S.J.Q. 28, Badila, Tableland Badila, Badila Seedling, Oba Badila, H.Q. 458, E.K. 28, and Q. 813.

Canes were also sent to Mossman, Cairns, Gordonvale, Hambledon, Tully, Ingham, Macknade, and Brisbane.

ANNUAL FIELD DAY.

The Annual Field Day of the South Johnstone Experiment Station was held this year on Wednesday, 4th July. The day selected was overcast, and light showers fell during the early morning, but despite the inclemency of the weather there was a good attendance of growers, mill representatives, and commercial men.

An address of welcome, and a résumé of the work carried out at this station during the past twelve months, were followed by addresses from Mr. A. F. Bell, B.Sc., Pathologist to the Bureau of Sugar Experiment Stations, and Mr. J. H. Buzacott, Assistant Entomologist at Meringa Station. Mr. Bell gave an interesting address on cane diseases and a summary of his travels abroad as a pathological research scholar. In the course of his address Mr. Bell said that a most difficult problem faced the pathologists in instituting disease control in Queensland, and the industry needed closer co-operation of the growers in order to bring about the practical application of the aims of the scientific staff.

A practical address on cane pests and their control was delivered by Mr. Buzacott, and he illustrated his speech with a most complete collection of insects that cause damage to cane in Queensland. This was then followed by a field inspection of the various experimental plots, cane varieties, and South Johnstone seedling canes.

Luncheon was provided at midday, after which a very fine display of tractors and farm implements was made by the local machinery agents.

The thanks of the Bureau are due to Messrs. Robinson Bros., C. J. Fleming, Innisfail Motors, Howe and Carroll, J. Wisniewski, Cantoni and Co., and T. H. Cashin for the machinery display.

NEW EXPERIMENTS INITIATED, 1928-29.

(1) Soaking Experiment—

First Series—

Plot 1—Ordinary planting.

Plot 2—Plants soaked in limewater containing lime to saturation and 1 lb. of magnesium sulphate to 50 gallons for forty-eight hours.

Plot 3—Plants soaked in limewater containing lime to saturation for forty-eight hours.

Plot 4—Plants soaked in water for forty-eight hours.

Plot 5—Plants soaked in limewater containing lime to saturation and 5 lb. of nitrate of soda to 50 gallons for forty-eight hours.

Second Series—

Duplicate of above.

(2) Checker Board Experiments with Coral Lime.

(3) Checker Board Trials with four South Johnstone Seedling Canes and N.G. 15 (Badila).

NEW VARIETIES INTRODUCED TO THE SOUTH JOHNSTONE EXPERIMENT STATION.

B.H. 10/12, from Barbados, through the Mackay Sugar Experiment Station.

P.O.J. 2714, from Java, through the Mackay Sugar Experiment Station.

LIST OF VARIETIES AT THE SOUTH JOHNSTONE SUGAR EXPERIMENT STATION FOR 1928, EXCLUDING S.J.Q. SEEDLINGS.

Badila	E.K. 2
Tableland Badila	E.K. 28
Oba Badila	R.P. 6
Badila Seedling	R.P. 8
N.G. 24	M. 33/95
N.G. 24 A	M. 291/08
N.G. 24 B	M. 55/453
N.G. 16	M. 55/1182
H.Q. 426	M. 64/14
H.Q. 458	M. 131/126
Q. 813	Uba
Q. 903	Improved Forage Cane
D. 1135	S.C. 12 (4)
Q. 116 Sport	Co. 210
Striped Singapore	Co. 213
Rose Bamboo	Co. 227
Malabar	B.H. 10/12
E.K. 1	P.O.J. 2714

YIELD OF CANE HARVESTED FROM THE SUGAR EXPERIMENT STATION AT SOUTH JOHNSTONE, SEASON 1928.

	Tons.
Cane sent to mill	678.25
Used for plants	11.5
Distributed to farmers and used for analyses	10.65
Total	700.40

Nature of Crop—	Per cent.
Plant cane	49.04
First ratoon	37.46
Second ratoon	13.50

Tonnages—	Tons.	Tons per acre.
Badila plant	206.74	37.99
Badila first ratoon	194.8825	36.42
Badila second ratoon	71.4	32.31
Variety plant	88.8675	35.54
Variety first ratoon	26.5	27.90
S.J.Q. Seedling plant	47.85	45.74
S.J.Q. Seedling, first ratoon	40.96	40.39
S.J.Q. Seedling, second ratoon	23.2	22.74

Acreage under cane	19.532
Tons of cane per acre	35.86

From the above table it will be noticed that the tons of cane per acre remain uniformly satisfactory at this station.

9.—Work of the Central Sugar Experiment Station at Mackay.

The Central Sugar Experiment Station at Mackay has now been in existence for some thirty years. It is situate about 3 miles from the City of Mackay, and includes an area of indifferent land on the Lagoon Bank. It was originally a State Nursery. A large proportion of the land is too broken to be used for experiment work.

Mr. F. Keogh is the Chemist in Charge, and has carried out his duties during the past twelve months with ability. He is assisted by Mr. W. Allan, Cadet Student, who has been attentive to his work.

The Field Staff, Messrs. Anderson (foreman), Winton, Bailey, Benson, and Pearce, have carried out their work satisfactorily.

Weather Notes covering period from March, 1927, to end of September, 1928.

The conditions for early planting in 1927 were similar to the previous year, i.e., not too favourable. March was a wet month, 14·53 inches being registered on seventeen wet days. The two following months were favourable, having a total of 3 inches in light showers. All the plantings during this period were satisfactory. June was also fairly good, but July plantings were rather slow as the soil was somewhat wet, the rainfall, which was above the average, being 3 inches as compared with 1·46. The later plantings were mostly good. August was dry; September and October were showery; while November was wetter than usual. Still, the cane up to this period had made very fair growth. December was an abnormal month, the precipitation (36·59 inches) being a record fall. This large rainfall had an adverse effect on the cane, particularly in low-lying places. The soil was waterlogged, so that surface cultivation was considerably delayed, thus allowing an extra growth of grass and weeds. Although January had a low rainfall, there were several wet days (11); the conditions were mostly dull, showery, and overcast, which did not permit the cane to recover properly from the deluge in December, and also tended to interrupt surface cultivation.

The cane had not made much growth from November, 1927, to the end of January, 1928. Moderate rains for the next two months would have been acceptable, but it was the reverse; February recording 28·49 inches on twenty-three wet days, and March 22·5 inches on fifteen wet days. This continued rain did not promote the growth of cane, and most of the days during these two months were overcast. The April rainfall of 5·07 inches was close to the average for this month; May was below the average. The subsequent months remained dry, the falls being much below the average, while the winter growth of cane was negligible.

Judging from this present year, heavy summer rains do not appear favourable for good growth in the cane. The growing periods of 1924-25 and 1926-27 were similar in rainfall distribution with a total of 54 inches approximately, as compared with a total of 106·5 for the present growing period. The two years above mentioned compare in monthly distribution to the average monthly distributions for the past twenty-seven years, and this is probably near the ideal for maximum growth, as both years yielded high tonnages per acre, whereas the present year is considerably lower, with twice the amount of rain.

It was anticipated in the early part of this year that the output in Mackay would possibly be a record, but for the reasons given above this was discounted. The present yield of sugar in this district is now estimated to be 88,000 tons, which is much below that of last year.

RAINFALL SINCE 1900 AT THE SUGAR EXPERIMENT STATION, MACKAY.

Year.	Rainfall in Inches.	Year.	Rainfall in Inches.
1900 ..	45·26	1915 ..	36·27
1901 ..	63·45	1916 ..	82·93
1902 ..	33·93	1917 ..	67·92
1903 ..	64·93	1918 ..	113·97
1904 ..	60·48	1919 ..	58·03
1905 ..	69·50	1920 ..	57·27
1906 ..	99·84	1921 ..	95·89
1907 ..	51·78	1922 ..	34·47
1908 ..	78·88	1923 ..	25·23
1909 ..	63·98	1924 ..	53·37
1910 ..	101·87	1925 ..	54·80
1911 ..	65·35	1926 ..	34·69
1912 ..	42·07	1927 ..	83·87
1913 ..	85·16	1928 (10 months)	62·76
1914 ..	71·71		

Abstract of Meteorological Observations, made at Sugar Experiment Station, Mackay, from 1st September, 1927, to 31st August, 1928—Covering Growth of Experimental Cane Crops.

Month.	Rainfall in Inches.	Number of Wet Days.	Average Rainfall, 27 Years, 1901-1927.	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, 9 a.m.	Mean Relative Humidity of the Air, Saturation equalling 100 at 9 a.m.	Mean Daily Evaporation in Inches.
Sept., 1927 ..	2·17	6	2·04	88·2	73·6	80·9	65·9	49·1	56·7	47·4	54·8	24·2	71·8	73·0	·25
Oct., 1927 ..	1·86	10	1·88	92·4	79·1	84·6	71·9	54·2	64·0	53·3	62·7	20·6	77·3	71·0	·28
Nov., 1927 ..	3·15	7	2·86	92·4	83·2	88·6	71·7	62·0	66·9	61·4	65·6	21·7	81·3	70·0	·26
Dec., 1927 ..	36·59	12	8·36	99·1	77·1	87·5	73·1	63·8	69·7	61·6	68·3	17·8	80·8	85·0	·21
Jan., 1928 ..	3·48	11	15·61	92·5	83·0	87·6	75·1	62·8	69·6	61·6	68·4	18·0	81·5	80·0	·23
Feb., 1928 ..	28·49	23	8·94	97·6	77·4	88·0	76·6	70·3	73·7	69·4	72·7	14·3	80·5	87·0	·15
Mar., 1928 ..	22·52	15	10·15	87·8	76·5	84·4	72·8	63·6	67·6	62·0	65·7	16·8	76·7	83·0	·17
Apr., 1928 ..	5·07	12	5·61	92·2	76·9	84·6	72·3	50·6	66·8	48·0	64·7	17·8	77·2	80·0	·19
May, 1928 ..	2·03	5	3·25	82·4	72·0	76·9	66·2	43·0	54·7	39·4	51·4	22·2	68·3	72·6	·28
June, 1928 ..	1·11	7	2·62	81·9	70·6	75·3	61·0	41·3	51·6	37·0	47·6	23·7	63·7	78·0	·17
July, 1928 ..	Nil	..	1·46	81·5	68·1	75·0	63·1	37·7	49·4	31·1	45·9	25·6	63·5	67·0	·22
Aug., 1928 ..	·05	3	1·09	87·2	71·3	78·0	62·2	42·4	53·5	36·1	49·9	24·5	67·6	76·5	·23
	106·52	111	63·87	..	..	..	..	..	..	..	..	..	..	*76·9	..

* Average.

9. Work of the Central Sugar Experiment Station—*continued.*

EXPERIMENTS DEALT WITH IN FOLLOWING SECTION.

(1) Experiments with fertilisers—two series.

First Series—

Plot 1—300 lb. sulphate of potash per acre.

Plot 2—500 lb. meatworks fertiliser (5·7 nitrogen, 17 per cent. phosphoric acid).

Plot 3—No fertiliser.

Plot 4—500 lb. superphosphate per acre.

Plot 5—500 lb. basic superphosphate per acre.

Plot 6—400 lb. nitrate of soda, 300 lb. sulphate of ammonia, 100 lb. sulphate of potash, and 400 lb. meatworks fertiliser per acre.

Second Series—

Plot 1—400 lb. nitrate of soda per acre.

Plot 2—300 lb. sulphate of ammonia per acre.

Plot 3—No fertiliser.

Plot 4—400 lb. nitrate of soda, and 200 lb. basic superphosphate per acre.

Plot 5—200 lb. nitrate of soda, 150 lb. sulphate of ammonia, 50 lb. sulphate of potash, and 200 lb. meatworks fertiliser per acre.

(2) Trials with Q. 813 and two sports of same, viz., Q. 813 A (striped), and Q. 813 B (green).

(3) Competitive trial with five South Johnstone Queensland seedlings.

(4) Preliminary trial in soaking cane sets in different solutions.

(5) Progressive analyses of canes that arrowed freely.

(6) Analyses of miscellaneous varieties.

(7) Experiments with ploughing under trash with green manure against trash burnt and green manure.

(1) Experiments with Fertilisers—Two Series. Second Ratoon Crop.

First Series—

Plot 1—300 lb. sulphate of potash per acre.

Plot 2—500 lb. meatworks fertiliser per acre.

Plot 3—No manure.

Plot 4—500 lb. superphosphate per acre.

Plot 5—500 lb. basic superphosphate per acre.

Plot 6—400 lb. nitrate of soda, 300 lb. sulphate of ammonia, 100 lb. sulphate of potash, and 400 lb. meatworks manure per acre.

Second Series—

Plot 1—400 lb. nitrate of soda per acre.

Plot 2—300 lb. sulphate of ammonia per acre.

Plot 3—No manure.

Plot 4—400 lb. nitrate of soda and 200 lb. basic superphosphate per acre.

Plot 5—200 lb. nitrate of soda, 150 lb. sulphate of ammonia, 50 lb. sulphate of potash, and 200 lb. meatworks fertiliser per acre.

The above experiment was initiated for the purpose of testing certain fertilisers independently, including heavy dressings of nitrogenous fertilisers against complete mixtures containing nitrogen, potash, and phosphoric acid.

These series of experiments were continued to second ratoons, but owing to the unfavourable season the differences were not as high as expected. This cane was ratooned late in the year, and with the incessant heavy rain in December the grass and weeds made more growth than usual, as it was impossible to work in the cane. February and March were excessively wet, with a large number of wet days, thereafter the season was particularly dry, and very little late growth was made in the cane.

The following tables present the analytical and crop results for the second ratoons:—

Analytical Results in Fertilising Trials—Second Ratoon Crop—7R. 428 (Pompey)—October, 1928.

Division.	Plot.	Treatment—Fertiliser per Acre.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Fibre.	% Sucrose in Cane.	% C.C.S. in Cane.
				First Series.							
Z1	1	300 lb. sulphate of potash ..	10 Oct.	11¼ months	22·6	21·01	·42	92·9	12·0	17·43	16·55
Z1	2	500 lb. meatworks fertiliser ..	10 Oct.	11¼ months	22·3	20·85	·41	93·5	12·0	17·30	16·48
Z1	3	No fertiliser	10 Oct.	11¼ months	22·9	21·40	·39	93·4	12·5	17·65	16·81
Z1	4	500 lb. superphosphate ..	10 Oct.	11¼ months	22·6	20·96	·42	92·7	12·5	17·29	16·39
Z1	5	500 lb. basic superphosphate..	10 Oct.	11¼ months	22·4	20·71	·44	92·4	12·5	17·08	16·16
Z1	6	400 lb. nitrate of soda, 300 lb. sulphate of ammonia, 100 lb. sulphate of potash, 400 lb. meatworks fertiliser	10 Oct.	11¼ months	21·2	18·73	·46	88·3	10·0	15·92	14·65
				Second Series.							
Z2	1	400 lb. nitrate of soda ..	10 Oct.	11¼ months	22·7	21·12	·41	93·0	11·0	17·74	16·85
Z2	2	300 lb. sulphate of ammonia..	10 Oct.	11¼ months	22·4	20·85	·43	93·1	11·0	17·51	16·64
Z2	3	No fertiliser	10 Oct.	11¼ months	22·8	21·07	·40	92·4	12·0	17·49	16·54
Z2	4	400 lb. nitrate of soda, 200 lb. basic superphosphate	10 Oct.	11¼ months	22·6	20·98	·42	92·8	11·0	17·62	16·72
Z2	5	200 lb. nitrate of soda, 150 lb. sulphate of ammonia, 50 lb. sulphate of potash, 200 lb. meatworks	10 Oct.	11¼ months	22·0	20·26	·44	92·1	11·0	17·02	16·07

9. Work of the Central Sugar Experiment Station—*continued.*

Crop Results in Fertilising Trials—Second Ratoon Crop—7R. 428 (Pompey)—October, 1928.

Division.	Plot.	Treatment—Fertiliser per Acre.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
		First Series.			
Z1	1	300 lb. sulphate of potash	11½ months	13·60	2·25
Z1	2	500 lb. meatworks fertiliser	11½ months	16·86	2·78
Z1	3	No fertiliser	11½ months	14·05	2·36
Z1	4	500 lb. superphosphate	11½ months	14·18	2·32
Z1	5	500 lb. basic superphosphate	11½ months	11·11	1·79
Z1	6	400 lb. nitrate of soda, 300 lb. sulphate ammonia, 100 lb. sulphate of potash, 400 lb. meatworks fertiliser	11½ months	26·32	3·85
		Second Series.			
Z2	1	400 lb. nitrate of soda	11½ months	18·01	3·03
Z2	2	300 lb. sulphate of ammonia	11½ months	16·86	2·80
Z2	3	No fertiliser	11½ months	12·26	2·02
Z2	4	400 lb. nitrate of soda, 200 lb. basic superphosphate	11½ months	13·92	2·33
Z2	5	200 lb. nitrate of soda, 150 lb. sulphate of ammonia, 50 lb. sulphate of potash, 200 lb. meatworks	11½ months	15·07	2·42

The results of these second ratoons are poor when compared with the averages of the three crops shown in the crop results to date, appearing a little further on. This has been due to the season. The best results were from the heavy dressing of nitrogen in the first series, which gave an increase of 12·27 tons per acre above the unfertilised plot. The nitrate of soda heavy dressing in the second series gave the best yield, being 5·75 tons per acre in excess of the no fertiliser plot. It will be noted that potash and phosphoric acid used alone gave no results.

The analytical results to date are now given :—

Analytical Results to Date in Fertilising Trials—7R. 428 (Pompey).

Division.	Plot.	Treatment—Fertiliser per Acre.	Plant Crop, 1926. 18½ Months.	First Ratoon, 1927. 11½ Months.	Second Ratoon, 1928, 11½ Months.	Average for Three Crops.
			% Commercial Cane Sugar in Cane.	% Commercial Cane Sugar in Cane.	% Commercial Cane Sugar in Cane.	% Commercial Cane Sugar in Cane.
		First Series.				
Z1 ..	1	300 lb. sulphate of potash	15·92	16·55	16·55	16·34
Z1 ..	2	500 lb. meatworks fertiliser	15·23	16·59	16·48	16·10
Z1 ..	3	No fertiliser	15·30	16·49	16·81	16·20
Z1 ..	4	500 lb. superphosphate	15·52	16·69	16·39	16·20
Z1 ..	5	500 lb. basic superphosphate	15·19	16·63	16·76	15·99
Z1 ..	6	400 lb. nitrate of soda, 300 lb. sulphate of ammonia, 100 lb. sulphate of potash, 400 lb. meatworks fertiliser	14·62	14·69	14·65	14·65
		Second Series.				
Z2 ..	1	400 lb. nitrate of soda	14·24	15·84	16·85	15·64
Z2 ..	2	300 lb. sulphate of ammonia	13·99	15·64	16·64	15·39
Z2 ..	3	No fertiliser	14·76	16·15	16·54	15·82
Z2 ..	4	400 lb. nitrate of soda, 200 lb. basic superphosphate	15·34	16·31	16·72	16·12
Z2 ..	5	200 lb. nitrate of soda, 150 lb. sulphate of ammonia, 50 lb. sulphate of potash, 200 lb. meatworks fertiliser	15·19	14·18	16·07	15·15

9. Work of the Central Sugar Experiment Station—*continued.*

Crop Results to Date in Fertilising Trials—7R. 428 (Pompey).

Division.	Plot.	Treatment—Fertiliser per Acre.	Plant Crop, 1926—18½ Months.		First Ratoon, 1927—11½ Months.		Second Ratoon, 1928—11½ Months.		Total Results for Three Crops.		Average for Three Crops.	
			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.	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.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
		First Series.										
Z1	1	300 lb. sulphate of potash	43·1	6·86	36·3	6·0	13·60	2·25	93·0	15·11	31·0	5·04
Z1	2	500 lb. meatworks fertiliser ..	45·5	6·93	41·4	6·86	16·86	2·78	103·76	16·57	34·59	5·52
Z1	3	No fertiliser	44·2	6·76	34·6	5·70	14·05	2·36	92·85	14·82	30·95	4·94
Z1	4	500 lb. superphosphate	45·9	7·12	35·7	5·96	14·18	2·32	95·78	15·40	31·93	5·13
Z1	5	500 lb. basic superphosphate ..	37·6	5·71	31·7	5·27	11·11	1·79	80·41	12·77	26·80	4·26
Z1	6	400 lb. nitrate of soda, 300 lb. sulphate of ammonia, 100 lb. sulphate of potash, 400 lb. meatworks	45·1	6·59	50·5	7·42	26·32	3·85	121·92	17·86	40·64	5·95
		Second Series.										
Z2	1	400 lb. nitrate of soda	42·8	6·09	47·3	7·49	18·01	3·03	108·11	16·61	36·04	5·54
Z2	2	300 lb. sulphate of ammonia ..	43·4	6·03	41·7	6·52	16·86	2·80	101·96	15·35	33·99	5·12
Z2	3	No fertiliser	40·8	6·02	36·3	5·86	12·26	2·02	89·36	13·90	29·79	4·63
Z2	4	400 lb. nitrate of soda, 200 lb. basic superphosphate	38·3	5·87	38·1	6·21	13·92	2·33	90·32	14·41	30·11	4·80
Z2	5	200 lb. nitrate of soda, 150 lb. sulphate of ammonia, 50 lb. sulphate of potash, 200 lb. meatworks	38·3	5·82	38·8	5·50	15·07	2·42	92·17	13·74	30·72	4·58

The effect of the heavy dressing of nitrogen in the first series will be noted through all three crops.

(2) Comparative Trials of Q. 813 and Two Sports of Same, viz., Q. 813A (Striped) and Q. 813B (Green).

This experiment was initiated for the purpose of ascertaining if the sports were superior to the original cane. The cane was planted on well-prepared land that had previously borne a green crop.

Analytical and crop results are printed below:—

Analytical Examination in Comparative Trial with Q813, Q813A, and Q813B—Plant Crop—1928.

Division.	Plot.	Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Fibre.	% Sucrose in Cane.	% C.C.S. in Cane.
B1	1	Q. 813	27 August	16 months	21·8	19·74	·28	90·5	12·0	16·38	15·31
B1	2	Q. 813A (Striped Sport) ..	27 August	16 months	21·5	19·95	·25	92·8	12·0	16·55	15·70
B1	3	Q. 813B (Green Sport) ..	27 August	16 months	22·2	20·59	·26	92·7	12·0	17·09	16·20

Crop Results in Comparative Trial with Q. 813, Q. 813A, and Q. 813B—Plant Crop—1928.

Division.	Variety.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.
B1	Q. 813	16 months	44·65	6·83
B1	Q. 813A (Striped Sport)	16 months	36·42	5·72
B1	Q. 813B (Green Sport)	16 months	29·04	4·79

9. Work of the Central Sugar Experiment Station—*continued.*

The germination of all the above canes was good, but the results obtained from the two sports are not by any means equal to the original, although the c.c.s. results were somewhat higher in the sports.

(3) Comparative Trials with Five South Johnstone Queensland Seedlings, viz., S.J.Q. 2, 4, 5, 15, and 16.

Five of the South Johnstone seedlings on the Experiment Station were selected for trial, and planted in prepared land on the 20th July, 1927.

The most rapid germinators were S.J.Q. 4 and 15; numbers 5 and 16 were slower.

The first, second, third, and final examination of these canes are embraced in the following table:—

First Analytical Examination in Comparative Trials with South Johnstone Queensland Seedlings—Plant Crop—June, 1928.

Division.	Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	Purity of Juice.	% C.C.S. in Cane.
A2	S.J.Q. 2	30 June	11 months	20·9	19·38	92·7	15·43
A2	S.J.Q. 4	30 June	11 months	16·5	13·48	81·7	9·90
A2	S.J.Q. 5	30 June	11 months	17·0	14·07	82·8	10·42
A2	S.J.Q. 15	30 June	11 months	19·5	17·36	89·0	13·49
A2	S.J.Q. 16	30 June	11 months	18·2	16·83	92·5	13·38

Second Analytical Examination in Comparative Trials with South Johnstone Queensland Seedlings—Plant Crop—July, 1928.

Division.	Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	Purity of Juice.	% C.C.S. in Cane.
A2	S.J.Q. 2	31 July	12 months	21·5	20·13	93·6	16·12
A2	S.J.Q. 4	31 July	12 months	17·7	14·96	84·5	11·24
A2	S.J.Q. 5	31 July	12 months	17·0	14·41	84·8	10·85
A2	S.J.Q. 15	31 July	12 months	20·0	18·27	91·0	14·42
A2	S.J.Q. 16	31 July	12 months	19·4	18·28	94·2	14·70

Third Analytical Examination in Comparative Trials with South Johnstone Queensland Seedlings—Plant Crop—August, 1928.

Division.	Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	Purity of Juice.	% C.C.S. in Cane.
A2	S.J.Q. 2	30 August	13 months	23·2	21·93	94·5	17·44
A2	S.J.Q. 4	30 August	13 months	21·2	19·30	91·0	15·02
A2	S.J.Q. 5	30 August	13 months	17·7	15·79	89·2	12·13
A2	S.J.Q. 15	30 August	13 months	22·5	21·30	94·6	16·95
A2	S.J.Q. 16	30 August	13 months	21·0	20·30	96·7	16·35

Final Analytical Examination in Comparative Trials with South Johnstone Queensland Seedlings—Plant Crop—September, 1928.

Division.	Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Fibre.	% Sucrose in Cane.	% C.C.S. in Cane.
A2	S.J.Q. 2	20 September	14 months	24·5	23·36	·28	95·3	12·0	19·38	18·66
A2	S.J.Q. 4	20 September	14 months	22·0	20·45	·59	92·9	8·5	17·69	16·81
A2	S.J.Q. 5	20 September	14 months	18·6	16·40	·62	88·2	8·5	14·18	13·05
A2	S.J.Q. 15	20 September	14 months	24·0	22·44	·42	93·5	14·0	18·17	17·30
A2	S.J.Q. 16	20 September	14 months	22·8	21·82	·13	95·7	12·5	18·0	17·37

These canes made fair growth during the season, but S.J.Q. 5 showed a marked yellowing of the leaves as winter approached, and S.J.Q. 15 was affected in the same way to a small extent. The S.J.Q. 5 gave the smallest tonnage, while S.J.Q. 2 was the sweetest cane. The crop results are now given.

9. Work of the Central Sugar Experiment Station—*continued.*

Crop Results in Comparative Trials with South Johnstone Queensland Seedlings—Plant Crop—September, 1928.

Division.	Variety.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.
A2	S.J.Q. 2	14 months	29·24	5·45
A2	S.J.Q. 4	14 months	31·11	5·23
A2	S.J.Q. 5	14 months	26·55	3·46
A2	S.J.Q. 15	14 months	29·45	5·09
A2	S.J.Q. 16	14 months	28·10	4·88

(4) Preliminary Trials in Soaking Cane Sets in Different Solutions.

A preliminary experiment was carried out in the above direction. Three lines each of H.Q. 426 (Clark's seedling) were selected in a field of cane for treatment.

The crop results are set out hereunder:—

Crop Results in Experiments with Soaking of Cane Sets in Various Solutions versus Sets not Soaked. Plant Crop—H.Q. 426—August, 1928.

Division.	Plot.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.
E1	1	Plants not soaked	11½ months	27·37	4·13
E1	2	Plants soaked in saturated solution of lime water	11½ months	31·34	4·80
E1	3	Plants soaked in saturated solution of lime water plus 1 lb. magnesium sulphate to 50 gallons of solution	11½ months	28·16	4·30

The differences are not so pronounced as at the South Johnstone Station, but the Chemist in Charge at Mackay says some damage was caused to Plot 3 by the beetle known as *Pentodon australis.*

The experiment is being repeated this year on a much larger scale, and, in addition, with a Japanese fertiliser known as "Asahi Promoloid." A germination count was made during nine weeks, which is now set out:—

Germination Count in Soaking Experiment with Variety P.O.J. 2714—August, 1928.

Division.	Plot.	Treatment. Plants soaked 24 hours.	Number of days after planting. 28	35	42	49	63
A1 ..	1	Plants not soaked	46	233	337	515	677
A1 ..	1A	Plants not soaked	11	78	124	331	578
A1 ..	2	Plants soaked in water	201	415	492	537	654
A1 ..	2A	Plants soaked in water	200	323	374	464	573
A1 ..	3	Plants soaked in saturated solution of lime water	289	497	535	587	697
A1 ..	3A	Plants soaked in saturated solution of lime water	270	395	424	526	602
A1 ..	4	Plants soaked in lime water with magnesium sulphate	261	492	503	568	641
A1 ..	4A	Plants soaked in lime water with magnesium sulphate	283	444	447	539	598
A1 ..	5	Plants soaked in Asahi promoloid solution	136	362	409	514	593
A1 ..	5A	Plants soaked in Asahi promoloid solution	161	302	322	434	539

These confirm the germination counts made last year.

(5) Progressive Analyses of Canes which Arrowed Early.

The statement is often repeated that canes which arrow frequently show a decline in sugar content, and that arrowing causes a large loss in the crop.

The canes in the district of Mackay, in common with all the Northern sugar areas, arrowed early and freely this season, yet the commercial cane sugar in the cane was never better. The flowering of the cane usually denotes cessation of growth, and may cause pithiness and aerial shoots. This has caused a lighter crop to be harvested than would have been the result had arrowing not taken place.

9. Work of the Central Sugar Experiment Station—*continued.*

The arrowing or flowering has evidently no detrimental effect on the sweetness of the cane, as will be seen from the analyses carried out of arrowed canes from June to September in a number of varieties. The results of the analyses appear below:—

Analytical Results of Varieties which Arrowed freely.

Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	Purity.	% C.C.S. in Cane.	Date of Arrowing.
P.O.J. 100	30 June	10 months	19·2	15·93	82·9	11·81	7 May
P.O.J. 100	31 July	11 months	21·6	19·11	88·5	14·80	
P.O.J. 100	30 August	12 months	21·6	19·45	90·0	15·03	
P.O.J. 100	30 September	13 months	21·8	19·79	90·8	15·37	
P.O.J. 213	30 June	10 months	20·2	18·83	93·2	15·04	10 May
P.O.J. 213	31 July	11 months	21·1	19·78	93·7	15·85	
P.O.J. 213	30 August	12 months	23·2	21·26	91·6	16·61	
P.O.J. 213	30 September	13 months	23·0	21·66	94·2	17·19	
P.O.J. 2714	30 June	10 months	18·3	15·01	82·0	11·04	17 May
P.O.J. 2714	31 July	11 months	20·9	18·81	90·0	14·71	
P.O.J. 2714	30 August	12 months	23·4	21·67	92·6	17·03	
S.J.Q. 4	30 June	10 months	16·5	13·48	81·7	9·90	8 June
S.J.Q. 4	31 July	11 months	17·7	14·96	84·5	11·24	
S.J.Q. 4	30 August	12 months	21·2	19·30	91·0	15·02	
S.J.Q. 4	14 September	12½ months	22·1	20·22	91·5	15·78	
S.J.Q. 4	20 September	13 months	22·0	20·45	92·9	16·11	
S.J.Q. 5	30 June	10 months	17·0	14·07	82·8	10·42	8 June
S.J.Q. 5	31 July	11 months	17·0	14·41	84·8	10·85	
S.J.Q. 5	30 August	12 months	17·7	15·79	89·2	12·13	
S.J.Q. 5	14 September	12½ months	18·6	16·74	90·0	12·94	
S.J.Q. 5	20 September	13 months	18·6	16·40	88·2	12·51	
S.J.Q. 15	30 June	10 months	19·5	17·36	89·0	13·49	15 June
S.J.Q. 15	31 July	11 months	20·0	18·27	91·0	14·42	
S.J.Q. 15	30 August	12 months	22·5	21·30	94·6	16·95	
S.J.Q. 15	14 September	12½ months	23·1	21·78	94·3	17·30	
S.J.Q. 15	20 September	13 months	24·0	22·44	93·5	17·74	

(6) Analyses of Miscellaneous Varieties.

The miscellaneous canes include most of the varieties analysed last year, and four new ones—S.C. 12 (4) and three Coimbatore seedlings. The former is reputed to be resistant to gumming disease. This cane grew well this year, but as the supply was limited, only two analyses were made, one in September and the other early in October. The c.c.s. results are exceptionally good.

Another variety that was commented on favourably last year was P.O.J. 2714; this cane was analysed later in the season this year and reached 17·03 c.c.s. It arrows very freely, and was inclined to be pithy. It promises to be a good ratooner, the ratoons from last year's crop being much better than other good canes, such as Q. 813 and Pompey, grown alongside, in medium sandy soil.

The other new varieties are much similar in analyses to last year, all averaging higher on account of dry weather. The following have been selected for comparative trial, viz.:—H. 5803, H. 456, Luzon 2, Luzon 4, also P.O.J. 2714.

First Analytical Examination of Miscellaneous Canes—Plant Crop—June, 1928.

Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	Purity.	% C.C.S. in Cane.
P.O.J. 100	30–6–28	10 months	19·2	15·93	82·9	11·81
P.O.J. 213	30–6–28	10 months	20·2	18·83	93·2	15·04
H. 456	30–6–28	10 months	17·7	15·18	85·8	11·51
H. 5803	30–6–28	10 months	18·3	16·58	90·6	13·02
Striped Tip	30–6–28	10 months	19·7	17·83	90·5	14·0
Luzon 2	30–6–28	10 months	19·5	18·36	94·1	14·75
Luzon 4	30–6–28	10 months	18·7	17·29	92·4	13·74
M. 291/08	30–6–28	10 months	17·7	15·29	86·4	11·65
M. 64/14	30–6–28	10 months	18·3	16·29	89·0	12·65
M. 55/453	30–6–28	10 months	16·2	12·78	78·8	9·14
H. 146	30–6–28	10 months	17·8	15·89	89·2	12·37
H. 227	30–6–28	10 months	18·3	16·64	90·9	13·10
H. 109	30–6–28	10 months	17·8	15·92	89·4	12·40
P.O.J. 2714	30–6–28	10 months	18·3	15·01	82·0	11·04
Q. 855	30–6–28	10 months	18·2	15·61	85·8	11·84
E.K. 1	30–6–28	10 months	17·4	14·54	83·5	10·84
B. 156	30–6–28	10 months	18·4	16·62	84·9	11·77
Q. 813	30–6–28	10 months	18·8	16·89	89·8	13·20
Q. 813A	30–6–28	10 months	19·2	17·58	91·5	13·90
Q. 813B	30–6–28	10 months	19·1	17·42	91·2	13·73
H.Q. 426	30–6–28	10 months	18·6	15·33	82·4	11·45
S.J.Q. 28	30–6–28	10 months	16·7	13·45	80·5	9·77
Badila	30–6–28	10 months	20·6	18·45	89·6	14·45
Oba. Badila	30–6–28	10 months	18·0	16·11	89·5	12·56
S.J.Q. 3	30–6–28	10 months	19·8	17·02	85·9	12·93

9. Work of the Central Sugar Experiment Station—*continued.*

Second Analytical Examination of Miscellaneous Canes—Plant Crop—July, 1928.

Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	Purity.	% C.C.S. in Cane.
P.O.J. 100	31–7–28	11 months	21·6	19·11	88·5	14·80
P.O.J. 213	31–7–28	11 months	21·1	19·78	93·7	15·85
H. 456	31–7–28	11 months	20·1	18·75	93·3	14·98
H. 5803	31–7–28	11 months	18·1	15·84	87·5	12·17
Striped Tip	31–7–28	11 months	20·7	18·89	91·2	14·90
Luzon 2	31–7–28	11 months	20·3	19·02	93·7	15·24
Luzon 4	31–7–28	11 months	19·8	18·55	93·7	14·86
M. 291/08	31–7–28	11 months	19·0	16·07	84·6	12·08
M. 64/14	31–7–28	11 months	20·4	18·53	90·8	14·57
M. 55/453	31–7–28	11 months	18·8	15·70	83·5	11·70
H. 146	31–7–28	11 months	19·4	17·10	88·1	13·20
H. 227	31–7–28	11 months	19·0	16·87	88·8	13·08
H. 109	31–7–28	11 months	18·2	16·06	88·2	12·41
P.O.J. 2714	31–7–28	11 months	20·9	18·81	90·0	14.71
Q. 855	31–7–28	11 months	18·9	16·28	85·1	12·38
E.K. 1	31–7–28	11 months	18·6	16·16	86·9	12·36
B. 156	31–7–28	11 months	19·5	17·12	87·8	13·20
Q. 813	31–7–28	11 months	21·0	19·55	93·1	15·60
Q. 813A	31–7–28	11 months	19·4	17·44	89·9	13·63
Q. 813B	31–7–28	11 months	20·0	18·43	92·1	14·62
H.Q. 426	31–7–28	11 months	20·9	19·10	91·4	15·08
S.J.Q. 28	31–7–28	11 months	18·3	15·71	85·8	11·92
Badila	31–7–28	11 months	22·1	19·54	88·4	15·12
Oba. Badila	31–7–28	11 months	21·1	19·12	90·6	15·02
S.J.Q. 3	31–7–28	11 months	22·0	20·07	91·2	15·83

Third Analytical Examination of Miscellaneous Canes—Plant Crop—August, 1928.

Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	Purity.	% C.C.S. in Cane.
P.O.J. 100	30–8–28	12 months	21·6	19·45	90·0	15·03
P.O.J. 213	30–8–28	12 months	23·2	21·26	91·6	16·61
H. 456	30–8–28	12 months	20·8	18·68	89·8	14·42
H. 5803	30–8–28	12 months	19·8	16·53	83·5	12·16
Striped Tip	30–8–28	12 months	21·5	18·58	86·4	13·99
Luzon 2	30–8–28	12 months	22·3	21·09	94·6	16·78
Luzon 4	33–8–28	12 months	22·6	21·07	93·2	16·63
M. 291/08	30–8–28	12 months	20·9	18·29	87·5	13·88
M. 64/14	30–8–28	12 months	22·8	21·27	93·3	16·79
M. 55/453	30–8–28	12 months	19·5	16·46	84·4	12·20
H. 146	30–8–28	12 months	19·6	17·09	87·2	12·95
H. 227	30–8–28	12 months	19·8	17·06	86·2	12·82
H. 109	30–8–28	12 months	20·1	18·04	89·7	13·92
P.O.J. 2714	30–8–28	12 months	23·4	21·67	92·6	17·03
Q. 855	30–8–28	12 months	21·4	19·09	89·2	14·67
E.K. 1	30–8–28	12 months	21·5	19·85	92·3	15·57
B. 156	30–8–28	12 months	21·8	19·85	91·0	15·49
Q. 813	30–8–28	12 months	22·6	21·58	95·5	17·26
Q. 813A	30–8–28	12 months	22·8	21·79	95·6	17·44
Q. 813B	30–8–28	12 months	23·0	21·82	94·9	17·39
H.Q. 426	30–8–28	12 months	23·8	22·49	94·5	17·77
S.J.Q. 28	30–8–28	12 months	22·7	21·06	94·5	16·57
Badila	30–8–28	12 months	22·1	19·81	89·8	15·27
Oba. Badila	30–8–28	12 months	22·5	20·61	91·6	16·19
S.J.Q. 3	30–8–28	12 months	23·1	21·61	93·5	17·08

9. Work of the Central Sugar Experiment Station—*continued.*

Final Analytical Examination of Miscellaneous Canes—Plant Crop—September, 1928.

Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	Purity.	% Sucrose in Cane.	% C.C.S. in Cane.
P.O.J. 100	30–9–28	13 months	21·8	19·79	90·8	16·42	15·37
P.O.J. 213	30–9–28	13 months	23·0	21·66	94·2	17·76	17·19
H. 456	30–9–28	13 months	22·3	20·66	92·6	17·14	16·24
H. 5803	30–9–28	13 months	20·9	18·63	89·1	15·46	14·31
Striped Tip	30–9–28	13 months	23·2	21·05	90·8	17·26	16·34
Luzon 2	30–9–28	13 months	21·6	20·42	94·5	16·95	16·24
Luzon 4	30–9–28	13 months	22·8	21·51	94·3	17·85	17·09
M. 291/08	30–9–28	13 months	23·2	21·0	90·5	17·43	16·28
M. 64/14	30–9–28	13 months	23·3	22·07	94·7	18·31	17·57
M. 55/453	30–9–28	13 months	21·6	20·25	93·7	16·80	16·03
H. 146	30/9–28	13 months	20·7	19·03	91·9	15·79	14·89
H. 227	30–9–28	13 months	20·6	19·28	93·6	16·0	15·25
H. 109	30–9–28	13 months	22·3	21·24	95·2	17·63	16·96
H.Q. 426	30–9–28	13 months	24·8	23·77	95·9	19·73	19·05
S.J.Q. 28	30–9–28	13 months	23·0	21·92	95·3	18·19	17·52
Badila	30–9–28	13 months	24·0	22·47	93·6	18·65	17·77
S.J.Q. 3	30–9–28	13 months	24·0	22·65	94·4	18·57	17·78
S.C. 12/4	11–9–28	15 months	24·4	23·31	95·5	19·11	18·42
S.C. 12/4	3–10–28	16 months	24·8	23·95	96·6	19·64	19·03
Co. 210	11–9–28	13 months	22·0	18·84	85·6	15·54	13·42
Co. 213	11–9–28	13 months	22·2	18·88	85·0	15·47	13·38
Co. 227	11–9–28	13 months	22·7	19·76	87·0	16·20	14·22
Co. 210	3–10–28	14 months	21·6	18·96	87·7	15·54	13·72
Co. 213	3–10–28	14 months	22·9	20·31	88·7	16·64	14·79
Co. 227	3–10–28	14 months	23·4	21·0	89·7	17·22	15·41
S.J.Q. 2	9–10–28	13½ months	25·8	24·10	93·4	20·0	19·05

(7) Experiments with the Ploughing Under of Trash with Green Manure versus Trash Burned and Green Manure.

The analytical and crop results are set out hereunder:—

Final Analytical Examination of Cane in Experiments with Trash Ploughed Under and Green Crop versus Trash Burnt off and Green Crop—Plant Crop, S.J.Q. 3—October, 1928.

Division.	Plot.	Treatment.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.	% Fibre.
D2	1	Trash ploughed under, green crop	3–10–28	14 months	24·0	22·65	·30	94·4	18·57	17·78	13·0
D2	2	Trash burnt off, green crop ..	3–10–28	14 months	24·3	23·0	·28	94·6	18·86	18·09	13·0

Crop Results in Experiments with Trash Ploughed Under and Green Crop versus Trash Burnt off and Green Crop—Plant Crop, S.J.Q. 3—October, 1928.

Division.	Plot.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Weight of C.C.S. per Acre in English Tons.
D2	1	Trash ploughed under and green crop ..	14 months	25·6	4·55
D2	2	Trash burnt off and green crop	14 months	28·0	3·25

The plot where the trash was ploughed under gave considerably the highest yield.

9. Work of the Central Sugar Experiment Station—*continued.*

VARIETIES OF CANE GROWING ON MACKAY EXPERIMENT STATION FOR 1929 SEASON.

D. 1135	S.J.Q. 3	H. 5803
H.Q. 426	S.J.Q. 4	Striped Tip
Q. 813	S.J.Q. 5	Luzon 2
Q. 813 A	S.J.Q. 7	Luzon 4
Q. 813 B	S.J.Q. 15	M. 291/08
N.G. 24	S.J.Q. 16	M. 64/14
N.G. 24 A	S.J.Q. 28	M. 55/453
N.G. 24 B	H. 109	H. 146
N.G. 15 (Badila)	S.C. 12 (4)	H. 227
Oba Badila	B.H. 10/12	Q. 1092
Q. 855	P.O.J. 100	Q. 1098
B. 156	P.O.J. 213	Co. 210
E.K. 1	P.O.J. 2714	Co. 213
S.J.Q. 2	H. 456	Co. 227

ANNUAL FIELD DAY.

The Annual Field Day of the Sugar Experiment Station at Mackay was held this year on Friday, 15th June. The attendance was exceptionally good, and great interest was taken by the visiting farmers. After an address of welcome, the Director outlined the programme for the day, which comprised an inspection of the fields, lunch, addresses by the Pathologist (Mr. Bell) and the Assistant Entomologist (Mr. A. N. Burns), and a demonstration of farm machinery and tractors by Messrs. Croker and Sons, D. McCulloch, and Marsh and Webster, including Fordson and Hart Parr tractors. Messrs. J. Larkin and T. Powell also kindly lent implements for demonstration purposes, such as the Oliver plough, and the rotary hoe cultivator.

DISTRIBUTION OF CANE.

A distribution of tested cane varieties known to be free from disease was made in August of this year. Some 150 canegrowers were handed canes, and parcels were forwarded to Bundaberg, Maryborough, Nambour, Beenleigh, Ayr, and Proserpine.

DATES OF ARROWING OF VARIETIES.

P.O.J. 100	7th May, freely
P.O.J. 213	10th May, freely
P.O.J. 2714	17th May, freely
H. 456	30th May, freely
H. 5803	30th May, freely
M. 64/14	30th May, freely
Q. 1092	30th May, freely
Q. 855	2nd June, sparse
B. 156	2nd June, sparse
H. 146	7th June, freely

DATES OF ARROWING OF VARIETIES—*continued.*

H. 109	7th June, sparse
H. 227	7th June, freely
S.J.Q. 2	10th June, few
S.J.Q. 3	10th June, few
S.J.Q. 4	10th June, freely
S.J.Q. 5	10th June, freely
S.J.Q. 15	17th June, freely
S.J.Q. 16	20th June, sparse
7 R. 428 (Pompey)	25th June, sparse
Q. 813	1st July, sparse

NEW EXPERIMENTS UNDERTAKEN.

(1) Soaking experiments, in duplicate—
Sets not soaked.
Soaking sets in water for twenty-four hours.
Soaking sets in saturated solution of lime-water for twenty-four hours.
Soaking sets in saturated solution of lime-water plus 1-500 magnesium sulphate for twenty-four hours.
Soaking sets in Asahi Promoloid solution.

(2) Variety Trial, with new canes—

H. 5803	S.J.Q. 28
H. 456	Badila
Luzon 2	S.J.Q. 3
Q. 813	S.J.Q. 4
P.O.J. 2714	Oba Badila
Luzon 4	

YIELD OF CANE FROM THE SUGAR EXPERIMENT STATION, MACKAY, SEASON 1928.

	Tons.
Cane sent to mill	264·55
Distribution and analyses	10·0
Used for plants	6·0
	280·55

	Acres.	Per cent.
Nature of crop—		
Plant cane	8·85	68·7
First ratoon	·73	5·6
Second ratoon	3·31	25·7
	12·89	

Tonnages—	Tons.		Tons per acre.
Plant cane	233·47	=	26·4
First ratoons	9·51	=	13·0
Second ratoons	37·57	=	11·4
	280·55		
Acreage under cane			12·89
Tons cane per acre			21·76

10.—Work of the Southern Sugar Experiment Station at Bundaberg.

The Southern Sugar Experiment Station is situated about 4 miles from the City of Bundaberg, on Ashfield road. It is at the western end of the Woongarra scrub, where it begins to enter upon poorer quality soil.

The Chemist in Charge of this Station is Mr. J. Pringle, who has been associated with the Bureau for upwards of twenty-six years. Mr. Pringle's work during the time he was in charge of the Station last year was carried out with ability and care. He was, however, absent on long service leave for six months of the period under review. Mr. R. W. Mungomery, Assistant Entomologist, was in charge of the Station during Mr. Pringle's absence, and carried out the work in a highly satisfactory manner.

Mr. Pringle reports that the foreman, Mr. A. E. Evans, the teamster, Mr. C. V. E. Olsen, and the laboratory attendant, Mr. George Dunn, have all carried out their duties in a creditable manner.

METEOROLOGICAL.

The climatic conditions during the period from August, 1927, to March, 1928, could not be regarded as wholly conducive to the growth of cane. The winter of 1927 was more severe than the previous year, the frost extending into the first week of September, causing considerable damage to the cane, while the rainfall during the winter, with the exception of a heavy fall at the beginning of June, was of a light nature,

10. Work of the Southern Sugar Experiment Station—*continued.*

which, combined with the cold condition of the soil in August and September, checked the growth of the autumn plant and young ratoons, and retarded the germination of the spring plant. Warmer conditions, accompanied by good rainfalls, prevailed at the end of September, and the cane commenced to grow vigorously. This continued through the following four months, but the excessive rainfalls and rough weather in February checked the growth to a certain extent; better conditions prevailed in March and the cane made rapid progress, which was again retarded in April owing to the cold atmosphere. The rainfall during May and June was good, but the conditions cold and progress slow.

The past winter was fairly cold, and, though frost was recorded on several occasions, it was not sufficiently severe to damage the cane. Owing to cold, dry weather, the current year's spring plant is not satisfactory, while the growth of the autumn plant and young ratoons has been slow.

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

Month.	Rainfall. Inches.	No. of Wet Days.
August, 1927..	1·13	4
September, 1927	2·58	9
October, 1927	4·09	10
November, 1927	6·15	10
December, 1927	9·51	13
January, 1928	4·95	13
February, 1928	22·66	21
March, 1928	·74	8
April, 1928	15·62	14
May, 1928	·59	6
June, 1928	4·93	8
July, 1928	·98	6
August, 1928..	·09	2
September, 1928	·12	1
October, 1928	·56	2
Total	74·70	127

RAINFALL RECORDS TAKEN AT THIS STATION SINCE 1914.

Year.	Rainfall in Inches.
1914	36·430
1915	19·658
1916	47·307
1917	51·054
1918	37·156
1919	22·120
1920	39·270
1921	49·180
1922	38·775

RAINFALL RECORDS TAKEN AT THIS STATION SINCE 1914 —*continued.*

Year.	Rainfall in Inches.
1923	32·905
1924	38·735
1925	47·672
1926	48·520
1927	71·820
1928 (ten months)	47·240

EXPERIMENTS DEALT WITH IN THIS SECTION OF THE REPORT.

(1) Conclusion of fertilising experiment No. 1, Q. 813—Second ratoons.

(2) Conclusion of fertilising experiment No. 2 (potash trials), Q. 813—Second ratoons.

(3) Potash experiment, Q. 813—Plant.

(4) Analytical examination of one variety (Santa Cruz 12 (4)) from Cuba.

(1) Conclusion of Fertilising Experiment, No. 1. Q. 813, Second Ratoon.

Plot 1—No manure applied.

Plot 2—600 lb. mixed manure per acre, containing 150 lb. sulphate of ammonia, 200 lb. sulphate of potash, and 250 lb. meatworks manure.

Plot 3—Manure as in plot 2.

Plot 4—No manure applied.

Plot 5—Manure as in plot 2.

Plot 6—Manure as in plot 2.

The first ratoon crop was harvested at the beginning of October, 1927, and three weeks later each plot was ratooned by ploughing three furrows about 9 inches deep between the rows, and levelling down with the cultivator. The ratoons came away well and grew vigorously, the manured plots quickly assuming the lead. At the beginning of December the manures were carefully applied as above, and taking advantage of this, the soil being in a fine moist condition, rapid growth was maintained through the whole of the growing period in the treated plots, except that, owing to the excessive wet weather during February, together with a cool atmosphere, progress was retarded till more favourable conditions prevailed in March. No trace of disease was found in any of the plots.

The analytical examination and crop results of above experiment are set out below:—

Analytical Examination of Fertilising Experiment No. 1—Q. 813—Second Ratoon Crop—July, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Fibre in Cane.	% Sucrose in Cane.	% of C.C.S. in Cane
B3	1	Q. 813	No manure	10 months	31–7–28	21·3	20·38	·23	95·7	12·3	16·85	16·26
B3	2	Q. 813	600 lb. mixed manure per acre, containing 150 lb. sulphate of ammonia, 200 lb. sulphate of potash, and 250 lb. meatworks manure	10 months	31–7–28	19·9	19·00	·23	95·5	12·3	15·71	15·14
B3	3	Q. 813	Manure as in Plot 2	10 months	31–7–28	21·0	20·11	·18	95·7	12·3	16·63	16·06
B3	4	Q. 813	No manure	10 months	31–7–28	21·3	20·54	·18	96·4	12·3	16·98	16·45
B3	5	Q. 813	Manure as in Plot 2	10 months	31–7–28	20·0	19·22	·28	96·1	12·3	15·89	15·37
B3	6	Q. 813	Manure as in Plot 2	10 months	31–7–28	19·9	19·03	·28	95·1	12·3	15·73	15·17

10. Work of the Southern Sugar Experiment Station—*continued.*

Crop Results of Fertilising Experiment No. 1—Q. 813—Second Ratoon Crop—July, 1928.

Division.	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.
B3 ..	1	Q. 813	No manure	10 months	13·48	2·19
B3 ..	2	Q. 813	600 lb. mixed manure per acre, containing 150 lb. sulphate of ammonia, 200 lb. sulphate of potash, and 250 lb. meatworks manure	10 months	28·17	4·26
B3 ..	3	Q. 813	600 lb. mixed manure, as in Plot 2	10 months	28·58	4·59
B3 ..	4	Q. 813	No manure	10 months	13·96	2·28
B3 ..	5	Q. 813	600 lb. mixed manure, as in Plot 2	10 months	30·04	4·65
B3 ..	6	Q. 813	600 lb. mixed manure, as in Plot 2	10 months	29·78	4·52

From the crop results of the second ratoons of this experiment it will be gathered that there is a very payable increase for the use of manures. Taking the average of the manured and unmanured plots we get the following differences:—

Treatment.	Tons Cane per Acre.	Tons Sugar per Acre.
Average of plots receiving manure as above second ratoons—10 months' old ..	29·14	4·51
Average of plots receiving no manure	13·72	2·23

The difference in favour of the mixed fertilisers is 15·42 tons of cane and 2·28 tons of sugar per acre.

The following tables set out the analytical and crop results to date of the first, and second ratoon crops:—

Analytical Results to Date of Fertilising Experiment No. 1.

Division.	Plot Number.	Variety of Cane.	Treatment.	First Ratoon Crop, 1927—Age 12 Months.	Second Ratoon Crop, 1928—Age 10 Months.	Average for Two Crops.
				% Commercial Cane Sugar in Cane.	% Commercial Cane Sugar in Cane.	% Commercial Cane Sugar in Cane.
B3	1	Q. 813	No manure	17·06	16·26	16·66
B3	2	Q. 813	600 lb. mixed manure per acre, containing 150 lb. sulphate of ammonia, 200 lb. sulphate of potash, and 250 lb. meatworks manure	16·50	15·14	15·82
B3	3	Q. 813	600 lb. mixed manure, as in Plot 2	16·90	16·06	16·48
B3	4	Q. 813	No manure	17·20	16·45	16·82
B3	5	Q. 813	600 lb. mixed manure, as in Plot 2	17·09	15·37	16·18
B3	6	Q. 813	600 lb. mixed manure, as in Plot 2	16·45	15·7	15·81

Total Crop Results of Fertilising Experiment No. 1.

Division.	Plot Number.	Variety of Cane.	Treatment.	First Ratoon Crop, 1927—Age 12 Months.		Second Ratoon Crop, 1928—Age 10 Months.		Total Results of Two Crops.		Average for Two Crops.	
				Weight of Cane per acre in English Tons.	Yield of C.C.S. per acre in English Tons.	Weight of Cane per acre in English Tons.	Yield of C.C.S. per acre in English Tons.	Weight of Cane per acre in English Tons.	Yield of C.C.S. per acre in English Tons.	Weight of Cane per acre in English Tons.	Yield of C.C.S. per acre in English Tons.
B3	1	Q. 813	No manure	21·11	3·60	13·48	2·19	34·59	5·79	17·29	2·89
B3	2	Q. 813	600 lb. mixed manure per acre, containing 150 lb. sulphate of ammonia, 200 lb. sulphate of potash, and 250 lb. meatworks manure	34·03	5·46	28·17	4·26	62·20	9·72	31·10	4·86
B3	3	Q. 813	Mixed manure, as in Plot 2	34·03	5·75	28·58	4·59	62·61	10·34	31·31	5·17
B3	4	Q. 813	No manure	23·08	4·05	13·96	2·28	37·04	6·33	18·52	3·16
B3	5	Q. 813	600 lb. mixed manure, as in Plot 2 ..	32·16	5·45	30·04	4·65	62·20	10·10	31·10	5·05
B3	6	Q. 813	600 lb. mixed manure, as in Plot 2 ..	36·62	6·34	29·78	4·52	66·40	10·86	33·21	5·43

10. Work of the Southern Sugar Experiment Station—*continued.*

(2) Conclusion of Fertilising Experiment, No. 2 (Potash Trials). Q. 813, Second Ratoons.

Plot 1—700 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 500 lb. sulphate of potash, and 100 lb. meatworks manure.

Plot 2—500 lb. sulphate of potash per acre.

Plot 3—No manure applied.

Plot 4—No manure applied.

Plot 5—500 lb. sulphate of potash per acre.

Plot 6—700 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 500 lb. sulphate of potash, and 100 lb. meatworks manure.

On the removal of the first ratoon crop in the middle of September, 1927, each plot was ratooned in the usual manner. The cane came away strong and healthy, and made rapid growth. The manures as above were applied to each side of the row with the manure distributer, at the beginning of December, and the treated plots, taking advantage of the good supply of moisture, were quickly well in the lead. From October to the end of January, vigorous progress was made, while in February the excessive wet weather checked the growth, but as more favourable conditions prevailed in March further good progress was made until retarded by wintry weather in April. No disease was noticed in any of the plots.

In the tables appearing hereunder are set out the analytical and crop results of the second ratoon crop of this experiment.

Analytical Examination of Fertilising Experiment No. 2 (Potash Trials)—Q. 813—Second Ratoon Crop—July, 1928.

Division.	Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Fibre in Cane.	% Sucrose in Cane.	% C.C.S. in Cane.
E1	1	Q. 813	700 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 500 lb. sulphate of potash, and 100 lb. meatworks manure	10 months	19–7–28	19·9	19·06	·20	95·2	12·3	15·76	15·22
E1	2	Q. 813	500 lb. sulphate of potash per acre	10 months	19–7–28	20·2	19·35	·22	95·7	12·3	16·00	15·45
E1	3	Q. 813	No manure	10 months	19–7–28	20·5	19·78	·19	96·4	12·3	16·36	15·86
E2	4	Q. 813	No manure	10 months	19–7–28	20·3	19·27	·20	94·0	12·3	15·93	15·30
E2	5	Q. 813	500 lb. sulphate of potash per acre	10 months	19–7–28	19·9	18·42	·24	92·5	12·3	15·23	14·42
E2	6	Q. 813	700 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 500 lb. sulphate of potash, and 100 lb. meatworks manure	10 months	19–7–28	20·1	18·93	·21	94·1	12·3	15·65	14·97

Crop Results of Fertilising Experiment No. 2 (Potash Trials)—Q. 813—Second Ratoon Crop—July, 1928.

Division.	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.
E1	1	Q. 813 ..	700 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 500 lb. sulphate of potash, and 100 lb. meatworks manure	10 months	19·43	2·96
E1	2	Q. 813 ..	500 lb. sulphate of potash per acre	10 months	14·33	2·24
E1	3	Q. 813 ..	No manure	10 months	8·38	1·33
E2	4	Q. 813 ..	No manure	10 months	7·66	1·17
E2	5	Q. 813 ..	500 lb. sulphate of potash per acre	10 months	12·13	1·75
E2	6	Q. 813 ..	700 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 500 lb. sulphate of potash, and 100 lb. meatworks manure	10 months	19·43	2·91

The use of potash alone on the Bundaberg Station has given good results for a number of years, but it was definitely expected that a time would come when its application alone would not give results when compared with mixed fertilisers. This time has now apparently arrived, judging by the results shown above.

10. Work of the Southern Sugar Experiment Station—*continued.*

This experiment was carried out in duplicate. The results of the second ratoon crop may be averaged as under:—

Treatment.	Tons Cane per Acre.	Tons Sugar per Acre.
700 lb. mixed manure per acre as above	19·43	2·93
500 lb. sulphate of potash per acre ..	13·23	1·99
No manure	8·02	1·25

This shows a difference between no manures and mixed manures of 11·41 tons of cane per acre, and between potash and no manure of 5·21 tons of cane per acre.

The analytical and crop results to date now follow:—

Analytical Results to Date of Fertilising Experiment No. 2 (Potash Trials).

Division.	Plot Number.	Variety of Cane.	Treatment.	Plant Crop, 1926—Age 13 Months	First Ratoon Crop, 1927—Age 11 Months	Second Ratoon Crop, 1928—Age 10 Months	Average for Three Crops.
				% Commercial Cane Sugar in Cane.	% Commercial Cane Sugar in Cane.	% Commercial Cane Sugar in Cane.	% Commercial Cane Sugar in Cane.
E1	1	Q. 813 ..	700 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 500 lb. sulphate of potash, and 100 lb. meatworks manure	15·65	17·60	15·22	16·16
E1	2	Q. 813 ..	500 lb. sulphate of potash per acre ..	17·13	17·65	15·45	16·74
E1	3	Q. 813 ..	No manure	15·42	17·50	15·86	16·26
E2	4	Q. 813 ..	No manure	15·55	17·53	15·30	16·12
E2	5	Q. 813 ..	500 lb. sulphate of potash per acre ..	15·10	16·94	14·42	15·48
E2	6	Q. 813 ..	700 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 500 lb. sulphate of potash, and 100 lb. meatworks manure	15·07	17·33	14·97	15·79

Total Crop Results of Fertilising Experiment No. 2 (Potash Trials).

Division.	Plot Number.	Variety of Cane.	Treatment.	Plant Crop, 1926—Age 13 Months.		First Ratoon Crop, 1927—Age 11 Months.		Second Ratoon Crop, 1928—Age 10 Months.		Total Results of Three Crops.		Average for Three Crops.	
				Weight of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.	Weight of Cane per Acre in English Cane.	Yield of C.C.S. per Acre in English Tons.	Weight of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.	Weight of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.	Weight of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.
E1	1	Q. 813	700 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 500 lb. sulphate of potash, and 100 lb. meatworks manure	7·58	1·23	31·12	5·48	19·43	2·96	58·13	9·67	19·37	3·22
E1	2	Q. 813	500 lb. sulphate of potash per acre	8·73	1·49	25·66	4·53	14·33	2·24	48·72	8·26	16·24	2·75
E1	3	Q. 813	No manure	5·23	0·81	12·75	2·22	8·38	1·33	26·36	4·36	8·78	1·45
E2	4	Q. 813	No manure	6·71	1·04	10·84	1·90	7·66	1·17	25·21	4·11	8·40	1·37
E2	5	Q. 813	500 lb. sulphate of potash per acre	10·24	1·54	20·65	3·50	12·13	1·75	44·02	6·79	14·67	2·26
E2	6	Q. 813	700 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 500 lb. sulphate of potash, and 100 lb. meatworks manure	8·47	1·28	23·49	4·07	19·43	2·91	51·39	8·26	17·13	2·75

From the average in the three crops the mixed manures have given the best results.

10. Work of the Southern Sugar Experiment Station—*continued.*

(3) Potash Experiment with Q. 813, Plant Crop.

This was an experiment to test the value of sulphate of potash as against muriate of potash. In the analytical tests, the purity and commercial cane sugar were practically identical. The experiment on the plant crop did not yield high tonnages. It was conducted in two series, and the averages are given hereunder: —

Average Crop Results of Potash Experiment with Q. 813—Plant Crop—September, 1928.

Division.	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.
B4	1	Q. 813 ..	300 lb. sulphate of potash per acre	13 months	14·59	2·59
B4	2	Q. 813 ..	300 lb. muriate of potash per acre	13 months	16·38	2·83
B4	3	Q. 813 ..	500 lb. sulphate of potash per acre	13 months	16·95	2·85
B4	4	Q. 813 ..	500 lb. muriate of potash per acre	13 months	18·45	3·05
B4	5	Q. 813 ..	No manure	13 months	15·46	2·60

The highest yields go to the muriate of potash, but all the tonnages are on the low side compared with previous experiments with potash on this Station. The fertilisers are expected to show better results on the ratoon crops.

(4) Analytical Examination of One Variety from Cuba—Santa Cruz 12 (4).

This variety was received on the 26th September, 1927, from Brisbane, where the original sets had been planted. The plants received at this Station germinated well, and the cane grew vigorously. During September of this year further plantings were made, together with other varieties, in a disease resistance trial.

The following table gives the analysis of this variety at Bundaberg. It may be compared with the analysis in the Mackay section of this report, where it will be seen much higher results were obtained:—

Analytical Examination of One Variety from Cuba—Santa Cruz 12 (4).

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.	% Sucrose in Cane.	% C.C.S. in Cane.
Cuba ..	Santa Cruz 12 (4) ..	13 months (Plant)	25–9–28	19·5	18·58	·52	95·2	14·37	14·98	14·42

BRIEF DESCRIPTION OF SANTA CRUZ 12 (4).

Fairly stout olive-green cane with rose to orange blush on exposure: eyes full, large, and pointed, reposing in distinct groove; joints 3 to 5 inches long with slight black wax and distinct white ring at top, and an occasional longitudinal skin crack. Stick straight, bulging slightly at nodes; cane inclined to lodge, flesh white, brittle; foliage broad and plentiful; strong deep root system; good stooler and ratooner.

CULTIVATION EXPERIMENT.

It was mentioned in last year's report that a cultivation experiment comprising different numbers of ploughings, harrowings, subsoiling, &c., was to be laid down. The results, however, were so inconsistent and unsatisfactory that the experiment was abandoned.

ANNUAL FIELD DAY.

The eleventh Annual Field Day of the Bundaberg Sugar Experiment Station was held on Saturday, 14th July, when upwards of 600 farmers, millers' representatives, and commercial men visited the Station.

Addresses on cane cultivation and fertilising, cane diseases, and insect pests of sugar-cane were delivered by the Director, and Messrs. Bell and Mungomery. An inspection of the work of the Station followed. After lunch a fine demonstration of farm implements and tractors was made.

NEW EXPERIMENTS INITIATED.

Planting Experiment—

Plot 1—March planting.

Plot 2—August planting.

Fertilising Experiment—

First Series.

Plot 1—200 lb. sulphate of ammonia and 200 lb. superphosphate per acre.

Plot 2—200 lb. sulphate of ammonia and 200 lb. sulphate of potash per acre.

10. Work of the Southern Sugar Experiment Station—*continued.*

Plot 3—200 lb. sulphate of ammonia, 200 lb. sulphate of potash, and 200 lb. superphosphate per acre.

Plot 4—No manure applied.

Second Series.

Duplicate of above.

Plant Soaking Experiment—

First Series.

Plot 1—Soaking plants in water only for twenty-four hours.

Plot 2—Soaking plants in saturated solution of lime water for twenty-four hours.

Plot 3—Soaking plants in saturated solution of lime water and 1 lb. of sulphate of magnesia to 50 gallons for twenty-four hours.

Plot 4—Soaking plants in saturated solution of lime water and 5 lb. of nitrate of soda to 50 gallons for twenty-four hours.

Plot 5—No soaking.

Second Series.

Duplicate of above.

Disease Resistance Trials with the following varieties:—

Q. 1098, M. 28/10, N.G. 15, S.C. 12 (4), H. 227, M. 55, Q. 812 A, Co. 210, Q. 813, Uba, Korpi, Nanemo, M. 189, P.O.J. 2714, Co. 213, B.H. 10/12, Oramboo, Co. 227, D. 1135, M. 1900 Seedling.

Field Trials with Coimbatore varieties—

Co. 210, Co. 213, Co. 227, with Q. 813 as standard.

LIST OF VARIETIES GROWING ON SUGAR EXPERIMENT STATION, BUNDABERG, 1928-29.

Q. 813	Uba
Q. 1098	Korpi
M. 28/10	Oramboo
M. 55	Nanemo
M. 1900 Seedling	N.G. 15 (Badila)
Co. 210	Q. 812 A
Co. 213	B.H. 10-12
Co. 227	S.C. 12/4
M. 189 (Black Innis)	P.O.J. 2714
D. 1135	

NEW VARIETY INTRODUCED.

From Mackay—B.H. 10/12.

ARROWING OF VARIETIES.

P.O.J. 2714	19th July.
Co. 213	13th June.

TOTAL TONNAGE OF CANE HARVESTED FROM THE SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG, DURING 1928.

	Tons.
Cane sent to mill	222·28
Cane cut for plants	16·00
Total	238·28
	Tons.
Nature of crop—	
Plant cane	164·68
Second ratoon cane	73·6
Tonnages—	Per cent.
Q. 813	95·07
Mixed varieties	4·93
Acres harvested	12·87
Average tons of cane per acre	18·51

11.—Seedling Propagation at the South Johnstone Sugar Experiment Station.

The raising of seedling canes was commenced at the South Johnstone Sugar Experiment Station in 1921, and up to the present considerable progress has been made. Previous to 1926, all the seed came from field crosses and self-pollination. In 1926, the Hawaiian sulphurous acid method was introduced, and this has facilitated artificial crossing. A programme of self-pollination is carried out with the object of obtaining breeding material from which undesirable qualities have been eliminated. One of the aims at South Johnstone is to obtain a cane which is better than N.G. 15 (Badila), in so much that it will mature earlier and be less susceptible to disease.

METHODS OF SEEDLING PROPAGATION AND SELECTION.

Crossing—

The following three methods are employed:—

1. Hawaiian sulphurous acid method. This is the chief method used, and most of the artificial crossing is obtained this way.
2. Dusting. Good results have been obtained by this method, but it requires considerable time and care.
3. Field crosses. The highest per cent. of fertile seed is obtained by this method, but the isolation of cane plots on a large scale is difficult.

Sowing—

Sowing is done in wooden boxes 24 inches by 12 inches and 5 inches deep. The boxes are filled to within 1 inch of the top, with sterilised soil consisting of one-third fine sifted loam, one-third sand, and one-third stable manure. The seed is spread in a thin layer over the soil and pressed firmly down. It is then watered by means of a fine pump spray and the box covered with glass. Germination usually takes place in from two to six days. The percentage of germinations varies greatly in the same and different crossings.

Transplanting—

The young seedlings are transplanted, when they are from four to five weeks old, to bottomless tin and paper tubes. The young plants remain six to seven weeks in the tubes and are then planted in the field in 5-foot rows, the seedlings being placed 2 feet 6 inches apart. Very few seedlings are lost during transplanting, the percentage being less than 0·05.

11. Seedling Propagation at the South Johnstone Sugar Experiment Station—*continued.*

Selection—

The first selection of seedlings is made when they have reached maturity; generally twelve months after germination. The principal characteristics looked for in selection are—

Habit—Erect, vigorous, and number of sticks per stool.

Internodes—Length, shape, and uniformity.

Eye—Size, shape, and tendency to quick germination.

Leaf-sheath—Not adhering.

Leaf—Breadth and colour.

Total solids—Not below 19·5 per cent.

Second Year Selection—

In the second trial, the cane is planted in 5-foot rows, and each seedling occupies 20 feet of line. The sucrose content, weight of cane, and disease resistance are the deciding factors in this selection.

Selection after Second Year—

Further selection is based on field trials covering plant, first, and second ratoons. The eliminating factors are tonnage, sucrose content, stooling habit, early covering, and disease resistance. The final selection is made in field chessboard trials against the standard variety, N.G. 15 (Badila), over plant and ratoon crops.

The following are particulars of the number of seedlings raised each year, from 1921 to 1928:—

Year.	*Number.*
1921	736
1922	246
1923	344
1924	3,005
1925	460
1926	3,000
1927	15,000
1928	12,045
	34,836

Seedlings transplanted to nursery, first stage:—

Year.	*Number.*
1921	390
1922	55
1923	123
1924	656
1925	460
1926	600
1927	3,000
	5,284

SEEDLING WORK, 1928.

This year most of the varieties arrowed early and to a greater extent than in any previous year. In a large number of arrows the anthers died off without opening, and to this is due the low per cent. of germination obtained this year. The crossing of Uba with a number of varieties was taken up on a large scale with only a small amount of success. Uba arrows early and freely, and is one of our few male sterile canes. An experiment was conducted with the aim of restricting arrowing of canes to periods most suitable for crossing. Success was obtained with the early arrowing varieties, and they were kept arrowing throughout the whole crossing season. The attempt to control the late arrowing canes proved a failure, as in no case could these canes be made to arrow early.

PROGRESS REPORT.

From the results obtained by the competitive trials of the 1921 and 1922 seedlings, two canes—viz., S.J.Q. 4 and S.J.Q. 28—have been chosen for their commercial value, and distributed to growers. Competitive trials are still being carried out with the remainder of these canes.

1923 Seedlings.—Only three canes remain from this year's raisings, and they are at present undergoing field trials.

1924 Seedlings.—The selected twenty-nine canes from this year's seedlings are still under analytical trials.

1925 Seedlings.—From the seedlings raised during this year, eight canes remain under analytical examination.

1926 Seedlings.—Thirty-two canes have been selected from this year's seedlings, and are being subjected to their second-year trials.

1927 Seedlings.—Of the 15,000 seedlings raised during this year, sixty-eight have been chosen and planted out to be subjected to analytical trials.

12.—Introduction of New Varieties.

The following canes were introduced from Java in March of this year:—

P.O.J. 2878
P.O.J. 2364
Kassoer-pisoeroean.
Glagah = saccharum spontaneum.

The above canes were introduced by Mr. Arthur Bell on his return from Java, and were planted in the Botanic Gardens, Brisbane.

The following varieties were also sent from Java, at the request of Dr. Kerr:—

Kassoer	D.I. 52
P.O.J. 2364	S.W. 3
P.O.J. 2722	S.W. 409
P.O.J. 2875	E.K. 28
P.O.J. 2878	Zwart Cheribon
P.O.J. 2940	(Black Cheribon).

The above canes were planted in the Brisbane Botanic Gardens, in September of this year.

12. Introduction of New Varieties—*continued.*

From Hawaii, the following seedlings were introduced at the request of Mr. A. F. Bell. These were held up for some time in the recent shipping disturbance, and were eventually planted in Brisbane in October of this year.

It is proposed to use some of these varieties in the propagation of seedlings.

Seedling.	Parentage.	Source of Seed.
25 C 4	Y. C. x H. 109	Mid-Pacific Institute
25 C 7	ditto	ditto
25 C 16	ditto	ditto
25 C 19	ditto	ditto
25 C 28	ditto	ditto
25 C 34	ditto	ditto
26 C 48	ditto	Kahuku Plantation Company
26 C 52	ditto	ditto
26 C 88	ditto	ditto
26 C 89	ditto	ditto
26 C 99	Y. C. x H. 109 or D. 1135	ditto
26 C 113	ditto	ditto
26 C 118	ditto	ditto
26 C 122	ditto	ditto
26 C 148	Y. C. x H. 109	ditto
26 C 149	ditto	ditto
26 C 152	ditto	ditto
26 C 163	ditto	ditto
26 C 182	ditto	ditto
26 C 188	ditto	ditto
26 C 189	ditto	ditto
26 C 216	ditto	ditto
26 C 250	ditto	ditto
26 C 254	ditto	ditto
26 C 270	ditto	ditto
27 C 340	ditto	Mid-Pacific Institute
27 C 445	ditto	ditto
27 C 503	ditto	ditto
27 C 548	ditto	ditto
27 C 556	Y. C. x D. 1135	ditto
H. 456	H. 240 x ?	ditto
H. 3001	ditto	ditto
H. 5909	H. 109 x ?	Waialua Agricultural Co.
H. 86465	Striped Mexican x ?	Waipio
H. 86484	ditto	Waipio
H. 8965	H. 109 x ?	Mid-Pacific Institute
H. 8988	ditto	ditto
H. 8994	ditto	ditto
H. 9806	Badila x ?	ditto
H. 9811	ditto	ditto
H. 9812	ditto	ditto
U. D. 1	Uba x D. 1135	Kailua
U. D. 39	ditto	ditto
U. D. 50	ditto	Manoa
U. D. 58	ditto	ditto
U. D. 62	ditto	Kahuku Plantation Co.
U. D. 65	ditto	Kailua
U. D. 75	ditto	ditto
U. D. 100	ditto	ditto
U. D. 110	ditto	ditto
U. H. 1	Uba x H. 109	Manoa
U. H. 4	ditto	Kailua
Manoa 198	Striped Mexican x ?	Manoa
Manoa 213	Badila x ?	ditto
Manoa 301	Striped Tip x ?	ditto
Manoa 304	ditto	ditto
Wailuku 2	H. 109 x ?	Waipio
Wailuku 4	Lahaina x ?	Mid-Pacific Institute
Wailuku 12	ditto	Waipio
McBryde 6	ditto	Kahuku Plantation Co.
McBryde 7	ditto	Waipio
Paia F	Striped Mexican x ?	Mid-Pacific Institute
Paia F 150	H. 109 x ?	ditto
Kohala 202	D. 1135 x ? (Tip)	ditto
Kohala 107	ditto	ditto
20 S 16	Striped Mexican x ?	ditto
Ewa 371	Unknown	Waialua Agricultural Co.

13.—Experiment Plot at Bonna, near Bundaberg, on the Farm of Mr. P. Knudsen.

An experiment plot on Mr. Knudsen's property, at Bonna, was initiated in 1926, at the request of the Branyan Farmers' Association. The area occupied is one acre and is situate on the river bank. The area was divided into four plots as under:—

Plot 1—Planted with cowpea, ordinary ploughing.

Plot 2—Planted with cowpea, and subsoiled.

Plot 3—Planted with cowpea, not subsoiled but mixed manures applied.

Plot 4—No cowpea, manures, or subsoiling. (Check plot.)

The cowpea on Plots 1, 2, and 3 was planted in October of 1926, and it was intended to plant the cane in March, 1927. Owing to the very heavy rain at that time planting had to be postponed till August of that year.

The following table shows the results of the four plots:—

Results of Experiment Plot on Mr. P. Knudsen's Farm at Bonna in the Bundaberg District.

Plot Number.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Weight of Commercial Cane Sugar per Acre in English Tons.
1	Ploughed four times to 10 inches and planted with cowpea	12 months	40·30	5·39
2	Ploughed four times and subsoiled to 18 inches; planted with cowpea	13 months	42·11	5·60
3	Ploughed four times to 10 inches and planted with cowpea and fertilised at following rate per acre, viz., sulphate of ammonia 200 lb., sulphate of potash 100 lb., meatworks 300 lb.	12 months	49·05	5·99
4	Four ploughings only, to 10 inches	12 months	39·40	4·44

13. Experiment Plot at Bonna, near Bundaberg, on the Farm of Mr. P. Knudsen—*continued.*

Owing to an error in judgment, Plot 2 was not harvested at exactly the same time as the other three plots.

The results are extremely satisfactory, the cost of treatment not being excessive. The yield of the manured plot gave an increase of 9·65 tons of cane for an expenditure for manure of £4 15s. per acre.

The work throughout was performed in a most competent manner by Mr. Knudsen and his sons, to whom the thanks of the Bureau are due.

Ratooning of Plots 1, 3, and 4 was done on 12th September, 1928, while Plot 2 was not ratooned till 3rd October, 1928.

Irrigation Experiment at Home Hill State Farm, Lower Burdekin District.

Hawaiian system of irrigating in the furrow versus the ordinary method used in the lower Burdekin district, of irrigating between the rows. The water in the Hawaiian system is applied in smaller quantities but more frequently.

Particulars of the experiment are given below :—

Treatment, &c.	Hawaiian Method.	Ordinary Method.
Date of planting	10–8–27	10–8–27
Date of fertilising	9–9–27	9–9–27
B3 fertiliser applied	6 cwt. per acre	6 cwt. per acre
Date of harvesting	18–9–28	19–9–28
Tons cane per acre	43·6	25·5
Inches of rain during growth	43·16	43·16
Inches of irrigation	67·80	44·60
Per cent. commercial cane sugar in cane	15·90	15·80

This shows decidedly in favour of the Hawaiian system. The Bureau is indebted to Mr. C. G. Munro, manager of the Home Hill State Farm, who carried out the experiment. Mr. Munro says the Hawaiian system easily leads the ordinary methods on the commercial area of the farm, and the extra weight and quality of the former indicates it would pay to hand weed at the critical period of a cane crop's existence rather than sacrifice the principle of watering down the cane rows.

14.—Work of the Laboratories.

Chemical laboratories are attached to the three Sugar Experiment Stations, and at these a good deal of work is carried out, apart from the sugar chemical work involved in the various tables appearing in this report. The greater part of the soil analyses are made in the Laboratory of the Chemist to the Department of Agriculture, in Brisbane, and the thanks of the Bureau are due to Mr. J. C. Brünnich, Agricultural Chemist, and his staff for the help freely rendered to the Bureau on many occasions. The Bureau's own analyst in Brisbane is Mr. C. R. von Stieglitz, who has carried out a great deal of work for the Experiment Stations with ability and skill.

Proposals are now on foot for the establishment of a laboratory to deal with soil and sugar-mill problems.

The tables set out below represent the number of analyses carried out during the year—

Detailed Report of Analytical Work performed at the Laboratory of the Southern Sugar Experiment Station, Bundaberg, from 1st November, 1927, to 31st October, 1928.

Materials.	No. of Analyses.
Sugar-canes and juices for growers	420
Sugar-canes and juices for Agricultural Show, Bundaberg	252
Sugar-canes and juices for Agricultural Show, Gin Gin	360
Sugar-canes and juices for Agricultural Show, Maryborough	46
Sugar-canes and juices for Experiment Station	35
Cane fibres	3
Total	1,116

Detailed Report of Analytical Work performed at the Laboratory of the Sugar Experiment Station, Mackay, from 1st November, 1927, to 31st October, 1928.

Materials.	No. of Analyses.
Sugar-cane for growers	132
Sugar-canes for Station	144
Sugar-canes for Mackay Show	77
Sugar-canes for Gin Gin Show	182
Sugar-cane fibres	15
Milk samples for show	12
Milk testing for Dairy Branch (Herd Book)	16
Waters	1
Total	579

Detailed Report of Analytical Work performed at the Laboratory of the Sugar Experiment Station at South Johnstone, from 1st November, 1927, to 31st October, 1928.

Materials.	No. of Analyses.
Sugar-canes for growers	19
Sugar-canes for South Johnstone Show	8
Sugar-cane juices for Experiment Station	548
Sugar-cane fibres	44
Coral Lime	6
Fertilisers	5
Waters	2
Soils	4
Total	327

14. Work of the Laboratories—*continued.*

ANALYSES COMPLETED AT AGRICULTURAL LABORATORY FOR SUGAR EXPERIMENT STATIONS FROM 1ST NOVEMBER, 1927, TO 31ST OCTOBER, 1928.

Materials.	No. of Analyses.
Soils	66
Subsoils	3
Lime	1
Limestones	2
Guanos	2
Shell lime	1
Fertilisers	2
Combustion chamber ash	1
Sugar-house products	3
Liquor	1
Syrups	2
Total	84

In addition to the above, a number of samples of soil for special investigation has recently been sent in by Dr. H. W. Kerr—thirteen samples arrived before 31st October and twenty-one since that date.

15.—Abstract of Reports on other Sugar-growing Countries by the Travelling Research Scholars.

The following are abstracts from the last reports of the Travelling Sugar Scholars on the countries visited by them just before returning to Queensland:—

CANE CULTURE IN THE PHILIPPINES.

By ARTHUR F. BELL.

Although sugar-cane has been grown commercially for very many years, the Philippine industry must be considered as being in the infancy of its development. Only a small proportion of the available land is at present devoted to cane culture, and this land is confined to the two islands—Luzon and Negros—the latter being the more important. For the season 1926-27 the total production was nearly 500,000 tons of raw sugar, the greater part of this being exported to the United States. There has recently been some agitation to persuade the United States Congress to limit the amount of Philippine sugar which shall be admitted duty free, and the amount suggested was 500,000 tons. Should this proposal come into effect, it will naturally be a serious blow to the future of the Philippine sugar industry. On the other hand, next to Java the labour is probably the cheapest in the sugar world, and the profitable production of sugar should soon be achieved even without the assistance of the American tariff barrier. To achieve this end it will be necessary to bring about an almost complete change-over in the varieties of cane grown. At the present time the bulk of the crop is composed of the so-called "native" canes—Luzon White, Luzon Red, Cebu Purple, Negros Purple, &c.—canes which yield neither heavy crops nor rich juices, and which cannot be ratooned successfully. It seemed to me that the yield per acre could probably be increased by at least one-third, merely by the substitution of varieties which are already in the country. Moreover, these varieties will yield two or three ratoon crops, thus eliminating the necessity and cost of planting every year. Of these new varieties, Badila is one of the most promising varieties being grown on the island of Negros, and is giving an average yield (both plant and ratoon) of about 25 to 30 tons per acre for a twelve months' crop. Whether Badila will become the standard variety, or whether it will be but a transition variety while other varieties are developed and tested remains to be proved.

Unlike Java and Hawaii, the industry is not conducted on the estate system, but approximates to the farm system of Australia. The mill owns the permanent tramways, hauls the cane from the tramway siding, and is responsible for the allocation of cane cars to the individual farmers. At the beginning of the season an estimate is made of the total yield and of the probable yield for each farm, and on this basis each farmer is allotted so many cars per day. This means, of course, that harvesting is going on each day on practically every farm. Each car is weighed as it comes into the mill and, as a general rule, the farmers are paid on the basis of 55 per cent. of the value of the sugar extracted from their cane, the mill retaining 45 per cent. Until comparatively recently the Calamba Sugar Company ran their properties on the estate system, but have now subdivided into farms of 15 acres, which are leased out to the Filipinos. This type of farmer is called an Aparcero, and pays a fixed rent according to the quality of his land; he may provide his own animals and implements, or these may be leased from the company. The company pays the Aparcero a flat rate, of about £13 per acre for plant cane, providing the returns are up to standard; for every ton over 20 tons per acre on first-class land, and 18 tons on second-class land, the Aparcero receives a bonus. The contracts dealing with the leasing of the land specify that the Aparcero must do certain amounts of weeding and cultivation. The estate is divided up into a number of divisions, and in each division there is one farm set aside for experimental and demonstration purposes.

The two islands of Negros and Luzon differ considerably insofar as their climates are concerned. Although the total rainfalls are of the same order, the distribution is more even on Negros, and there is not the pronounced dry season to be found on Luzon. There are small irrigation schemes for the purpose of growing rice—the staple food of the country—but all cane is grown under the conditions of natural rainfall. The planting season is during the dry months, and this is, no doubt, one of the reasons why Badila is not grown with much success on Luzon. It is the general practice to use top seed; special gangs go in one or two days ahead of the canecutters and top the cane, so that planting and harvesting must be carried out at the same time. In some places the seed is soaked in water for about twenty-four hours before planting, but the majority of farms have not the facilities for doing this.

The comparatively high rainfalls are responsible for the rapid growth of weeds and the control of these presents a serious problem, especially on Negros, and represents a considerable item in the costs of production. In order that

15. Abstract of Reports on other Sugar-growing Countries by the Travelling Research Scholars— *continued.*

the cane will close in as quickly as possible, it is the practice to place the rows only about 4 feet apart.

Tractors are not in wide use, except on the Calamba Estate, but their numbers are increasing. On Calamba the tractors are owned by the Estate and the ploughing is done for the Aparcero at approximately cost rates. At present most of the cultivation is done with small native ploughs drawn by caribao (water buffaloes), and while the rows are spaced only 4 feet apart, it is unlikely that light tractors can be used successfully for cultivating between the rows. It is the custom to burn off all trash, but fallowing is practised to some extent, and the use of artificial fertilisers is increasing each year. Recent experiments on the Calamba Estate have demonstrated the advantages of cultivation for ratoons immediately after the cane has been cut. The management has now made it a rule to cultivate with a disc harrow within two days of harvesting; this is done diagonally across the field twice and then off-barring is carried out as soon as possible, and at least within two weeks. From the standpoint of cultural methods, the limiting factor in the Philippines is undoubtedly the very poor drainage found in most parts of the islands, standing water being a common sight even after only moderate falls of rain.

Although a large proportion of the more serious sugar-cane diseases is present in the Philippines, nevertheless the aggregate loss due to disease does not appear to be very great, except in the districts heavily infected with mosaic. Whether this condition will continue in the face of the change-over to sweeter varieties of cane is another question, but no doubt adequate tests will be made for disease resistance before the planting of any particular variety is advised. Leaf-scald, mosaic, Fiji, smut, and Bunga are the most important diseases present; downy mildew was found on one property in 1921, having been introduced from Formosa, but now appears to have been eradicated by roguing.

The College of Agriculture at Los Banos provides courses in agriculture and the technology of sugar manufacture, and has a well-equipped model mill for the instruction of the students. Excellent contributions to tropical pathology have been made from this department of the college. The Genetics department is carrying out an extensive programme of seedling raising, this being the only cane-breeding station in the islands. The method of crossing is similar to that adopted in India—*i.e.*, the stalk of the male parent is surrounded by a bamboo cylinder containing soil, and after the production of roots in this soil the stalk is cut off below the cylinder and the rooted stalk and arrow are carried to the female parent, which is left growing in the field. Some 50,000 seedlings are germinated annually in flats in the open air, and about 2,000 of these are selected when 12 to 18 inches high, and are then planted out in the field and selected at maturity on the basis of visible characters, weight, and analysis.

In conclusion, it must be stated that, presupposing the continuance of some measures of protection and freedom from serious political strife, the future of the Philippine sugar industry appears to be exceptionally bright.

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ABSTRACT OF REPORT ON THE HAWAIIAN SUGAR INDUSTRY.

By Norman Bennett.

I arrived in Honolulu at the commencement of the crushing season. Four weeks were spent in studying local conditions of the industry and in visiting factories on the various islands of the Hawaiian group.

Previous to reaching Hawaii, I had met several of the staff of the Experiment Station in Havana, and these gentlemen were of much assistance in arranging my trip.

After my visits to other important cane sugar countries, the Hawaiian visit was undoubtedly the culmination of the four from a viewpoint of maximum efficiency and co-operation of scientific work of those engaged in sugar manufacture. Once more I have to draw attention to results obtained by proper co-ordination of the factors influencing the prosperity of the sugar industries in those countries where true scientific investigation of the growth of cane and manufacture of sugar has been fostered by all concerned. The sugar industries of Hawaii and Java have had the assistance of an adequate staff of Experiment Station officers for many years. As a consequence, these countries have attained world-wide reputations in the scientific and economic manufacture of sugar.

Varieties of Cane.

Whilst H. 109 is the major variety of cane grown, its production is limited to those lands particularly suited to irrigation methods. The cane attains considerable height, and even though growing in a tangled mass and even lodging does not appear to suffer much by falling over.

The percentage of different varieties for 1926 as compared with that for 1918 was—

—	Tons per Acre.	1926.	1918.
		%	%
H. 109	69·4	48·7	4·0
Yellow Caledonia	44·8	25·6	42·9
D. 1135	49·3	12·1	7·5
Yellop Tip	41·0	4·5	·5
Striped Tip	31·5	2·1	1·5
Striped Mexican	..	1·5	·6
Lahaina	..	1·5	37·9
Rose Bamboo	..	1·1	1·1
Other Varieties	..	2·9	4·0

The Yellow Caledonia quota comes almost entirely from the non-irrigated group of factories situated on Hawaii. The percentage of Y.C. on these plantations was—

	Per cent. of Yellow Caledonia.
Olaa	89
Onomea	82
Hilo	92
Hakalau	77
Laupahoehoe	39
Honomu	31
Pepeekeo	86
Honomi	98

In connection with the introduction of foreign canes into Queensland, it must be pointed out that many canes introduced have achieved reputations in the country of origin only when grown under optimum conditions. One hears so much

15. Abstract of Reports on other Sugar-growing Countries by the Travelling Research Scholars— *continued.*

of H. 109 that the failure of this variety under Queensland conditions may appear surprising until such an analysis as above is made.

In so far as new seedlings are concerned, much work is being done by the Experimental Station itself, assisted by independent work of the individual plantations.

Organisation.

The industry is carried on by independent sugar companies operating both field and factory. The central organisation of the Hawaiian Sugar Planters' Association is composed of representatives of the various companies and individual mills. This association interests itself in the general welfare of the industry, has made arrangements for a continuous supply of labour from the Philippine Islands, and also controls the Sugar Experiment Station. The budget for the whole operations of the association, including that of the Experiment Station, is prepared by a directing committee, and the amount necessary raised by one levy on the actual amount of sugar produced by the mills.

All the estates, with one exception, turn out a sugar of 97·5 deg. polarisation. The bulk of this sugar is shipped to the C. and H. Refinery in San Francisco, and marketed there in competition with western beet sugar. The refining company is owned and operated by a group of Hawaiian interests, and the price of the raw sugar produced is largely dependent on the refinery costs and trading operations of the refinery.

For many years past, the refinery staff has been working with a Raw Sugar Technical Committee appointed by the H.S.P.A. in Honolulu.

A report on every shipment of sugar is furnished by the refinery. This report covers (1) keeping quality, (2) grain size, (3) colour, (4) hard sugar, (5) sour sugar, (6) ash content including sulphates. Based upon these, the sugar is classified in respect to its refining value and an attempt made to bring the quality up to a set standard.

The work of the Experimental Station, as applied to actual manufacturing problems, is divided into the following sections:—

(i.) Preparation of a system of control based upon latest work in analytical methods and apparatus.

(ii.) Standardisation and repair of apparatus used in the control work of the factory.

(iii.) Advice on manufacturing methods given during regular visits of an officer of the Department of Technology.

(iv.) Research investigations, both on a laboratory as well as a mill scale, in regard to manufacturing problems.

Visits are made by the senior officers of the Department of Technology on request of the plantation manager. These visits are made for a period of three to seven days. Each visiting officer arrives on the plantation with equipment brought from the Experiment Station, and where no manufacturing difficulty needs investigation, the station officer institutes his own system of control at various places in the process.

Weekly reports of factory operations are forwarded to the Experiment Station, where they are filed, comparative results published and distributed among the executives of the factories. Some forty mills furnish figures for these comparative statements, and interest in good work is maintained by a cup competition for all-round factory efficiency.

The grinding season commences about the end of November and continues for eight to nine months. Most of the cane ground is eighteen months to twenty-four months old, and many of the factories have so far increased their tonnage return per acre that extended grinding seasons are necessary. The policy of spreading the grinding period over the entire year has distinct advantages where cane can be obtained for milling that gives an adequate rendement of sugar per ton.

Some of the smaller factories do not operate continuously over a twenty-four-hour period. Cane is milled for twelve hours, and the mill is shut down overnight. In these factories special precautions must be taken to prevent deterioration of the thin juices stored for eight to twelve hour periods.

The basis of factory control in Hawaii is well known from the official publications of the Technological Association printed and published by the H.S.P.A. Owing to the differing methods of cane transportation, it is not always possible, especially in those factories fluming cane to the mill, to institute a control based upon weights or measurements of cane or juice, and in these cases an empirical method of calculating back to a weight of cane is used.

Every factory, with two exceptions, weighs or measures the amount of juice entering manufacture.

REPORT ON JAVA.

By Norman Bennett.

One month was spent in Java after my visit to the Philippines. Having spent three months on the island in 1924, the object of this visit was not undertaken with the idea of extensive travel through the country.

In company with Mr. Bell, I visited Buitenzorg to inspect the gardens and tropical agricultural departments. From there I went to Soerabaia and to Pasoeroean in order to inquire into newer development since my last visit. Latest development in manufacturing process in Java are—

(i.) Installations of a small 14-inch diameter feeding roll in front of the feeding roll in a mill set. This smaller roll serves the same purpose as a pusher.

(ii.) Continued extension of the number of fifteen roller mill installations. In 1924, no milling plant had fifteen rollers. For the coming campaign, thirty-two factories will operate with additional equipment.

15. Abstract of Reports on other Sugar-growing Countries by the Travelling Research Scholars— *continued.*

(iii.) Introduction of the Nobel process of bath maceration. This process has been installed in four factories. No additional installations will be made this year, but several are now under consideration for 1929.

(iv.) Gradual introduction of various shredding equipments. Two installations of the Maxwell shredder are being made for the coming season.

(v.) Introduction of pH control of clarification station.

(vi.) Experiments with the La Feuille crystalliser and crystalliser pan.

Since my previous visit, the Handelsveerinigen Amsterdam (the largest sugar company operating in Java) has erected two new factories. Three more are to be erected before 1931, of which one is now commenced. This extension of factories is taking place in districts not previously opened up for sugar production. Further extensions are improbable, as the other sugar companies are looking more to an increase in their present acreage quota than to new developments on virgin land.

Two of the new factories will operate this year, both producing white sugar by the de Haan carbonatation process. These two factories are electrically equipped; the mills are directly driven through reduction gearing by D.C. motors. The boiler installation produces steam for turbo generators at 17 atmospheres pressure.

Sweetland presses have been introduced at the filter station. All pans are of coil type, 360 H. litre capacity, and the effet station is a quintuple effet—the first two bodies are of semi-Kestner type and the other three of standard type. The two factories are the first in Java to use the gravity system at the end stage of the process.

The third factory just commenced is not as elaborately equipped as the two now in operation. The mills are to be steam driven by independent engines. Capacity of the pans (all of coil type) is to be increased to 500 H. litres capacity.

The most important development in Java is the raising of the new P.O.J. 2878. From a milling viewpoint, the new cane has given some trouble in the milling station. Of small barrel and hard tough rind fibre, milling conditions have had to be changed somewhat from those used to treat the softer E.K. 28. The newer cane is of typical P.O.J. type, and milling treatment corresponds more to that previously used in the treatment of B. 247.

The cane is not as early a ripener as those previously grown, and attention this year is to be given to investigations on the length of the grinding season for the newer variety and the most profitable period for harvesting.

The juice is of slightly lower purity and does not treat so readily in the clarification stage. Tonnage per hour is slightly decreased together with the extraction figure, but the bagasse obtained being considerably coarser than that from E.K. 28 is more readily adapted to the type of furnace grate developed for Javan conditions.

Much more valuable data on the milling and manufacturing characteristics of this cane will be available at the end of the 1928 crop. The percentage of P.O.J. 2878 for 1928 is 66½ per cent. of the total cane produced.

REPORT UPON SOME FEATURES OF THE SUGAR INDUSTRIES OF HAWAII AND JAVA.

By Dr. H. W. Kerr.

On my return voyage from America to Australia, I had the opportunity of spending about two months in each of the two cane-growing countries of the world where agricultural development is most highly advanced—Hawaii and Java. Although conditions in these islands are quite different from those obtaining in Queensland, still it is interesting to study the marked advances which have been effected during the last forty years, by the application of the scientific method of control to the agriculture of cane-growing. In contradistinction to Queensland, the crop yields per acre are continuously on the increase in these countries. While the yield of sugar per acre in Java, forty years ago, was about equal to that of Queensland to-day (2 tons of sugar per acre), the application of methods of intensive cultivation has raised the sugar tonnage per acre to about three times that amount, but it must, of course, be remembered that the costs of labour in Java are remarkably low.

Naturally, many of the reforms which have been introduced could find but limited application in Queensland; but it must be recognised that there is very much scope for improvement in this country, and many fruitful avenues for investigational work lie open. A review of the problems which have confronted workers in other lands, moreover, yields many important facts and clues, which will prove of very great assistance in the solutions of our own difficulties. I will attempt to sketch briefly, some of the salient features of sugar-cane culture as practised in Java and Hawaii, to demonstrate what has been accomplished.

Java.

Java—justly called the "Pearl of the Orient"—is a small island, just one-twelfth of the total area of Queensland; and only about one-eightieth of its surface is devoted each year to sugar-cane. Yet the crop yield for this season is estimated at 3,000,000 tons of sugar. The island is blessed with climatic conditions which are admirably suited for cane culture. The mean temperature is uniformly high, and shows but little seasonal variation. The rainfall comes during the north-west monsoon, which lasts from October until May. The average fall for Java is about 80 inches per annum. The planting is done during the dry season, and irrigation is practised almost generally to carry the cane through until the wet monsoon breaks.

The lands of Java are rather uniformly fertile, but their physical properties leave very much to be desired. They are often heavy, intractable clays, which in this country would be worthless.

15. Abstract of Reports on other Sugar-growing Countries by the Travelling Research Scholars— *continued.*

The preparation of the land is carried out by hand labour, trenches being dug by the use of mattocks and spades. The earth thus removed is piled up in ridges between the cane furrows, and is filled in, a little at a time, by the subsequent hand cultivations as cane growth progresses. Finally, the cane rows are ridged up, leaving furrows between the rows to act as drainage channels for the excessive water during the rainy season.

In some places mechanical methods of land preparation are practised. Tractors are then used, but the results are rather unsatisfactory. The chief virtue they present is the speeding up of the work, which is very important when labour is inadequate. One wonders how the soil, which at the time of furrowing for planting contains clods larger than one's head, would ever be brought to produce a yield of over 7 tons of sugar per acre, yet this is the case. It leads one to believe that the many ploughings and harrowings which numbers of our lands receive are of questionable value—that is, where fertilisation and irrigation are practised.

Fertilisation is carried out on all lands in Java. It is significant that nitrogenous fertilisers only are applied generally. That chiefly employed is ammonium sulphate, which is applied at the rate of 400 lb. or more to the acre. But the optimum amount required by the soil and crop is very carefully established by well-conducted field trials. Phosphates are used to a limited extent, but here again only where the land has demonstrated the value of the practice. Potash salts are never applied, for the land is able to supply sufficient to meet the demands of the heaviest crops.

The soils of Java are notoriously deficient in organic matter, many of the better soils containing only a fraction of 1 per cent. of humus. Green manuring is never practised, and trash conservation is unknown. Many of the soils are composed of fresh volcanic ash, which is being thrown out constantly by the many active volcanoes which exist there. Hence, if nitrogen is supplied in adequate amounts to supplement the ready supply of other plantfood materials, soil humus is not essential for maximum crop growth.

By the system of land tenure operating in Java, no ratoons are grown; for the land must be turned over to the natives for their food crops after the plant cane is harvested.

Much attention is devoted to seed selection. The advent of scientific agriculture came as the result of a serious outbreak of "sereh" disease, which threatened the industry with extermination. And since that time every care has been exercised to ensure that only the best canes—and those perfectly free from disease—will be used for plants. The seed may be picked over three times before it is planted, and the ends of the sets are often carefully disinfected before they are transported to the planting field. It was often necessary to provide special mountain nurseries in which to grow disease-free seed, which was then brought down to the plains at considerable expense.

The Experiment Station at Pasoeroean is the outcome of the development which arose after the value of scientific control had been appreciated. It is probably the finest privately-supported institution of its kind in the world. The majority of the sugar companies contribute to its support, and each year about £125,000 are spent in experimental work. The levy is calculated on the basis of 5s. per acre of land under cultivation, and this averages about 1d. per ton of cane produced.

An important branch of the station is that which supervises the carrying out of plot experimental work. Each year 2,000 or more experiments are initiated on the various plantations, having as their object the determination of fertiliser requirements, selection of the best varieties for each field, cultural tests, &c. When it is remembered that each trial involves the setting out and harvesting of twenty or thirty small plots, the magnitude of the work will be appreciated. Yet the value of the results is so firmly established that the scope of this department is continually on the increase.

During the past two years much of this work has been concerned with varietal trials and fertiliser requirement tests with the new cane variety, P.O.J. 2878, the introduction of which has brought about phenomenal increases in the already high yields of the Javan lands. This cane was produced as the result of many years of patient endeavour and hard work of the cane-breeding department. Each year 50,000 to 80,000 seedlings are raised at the station, and these are subjected to rigorous selection during a period of four or five years, when the number may have been reduced to five or six promising canes. These, in turn, are tested against the standard varieties, and, if of sufficient merit, are grown where conditions are suitable. P.O.J. 2878 was produced in 1921. It was bred on specially planned lines to try and combine the disease-resistance quality of the wild cane with the yielding quality and sugar content of the noble or commercial canes. This particular variety possesses phenomenal properties. While not markedly superior to the older varieties (E.K. 28 and D.I. 52) on the better lands, it is a very decidedly better yielder on the poorer soils. Whereas a large crop for Java yielded 1,750,000 tons of sugar a few years ago, the combination—new cane variety with favourable growing conditions—has enabled the production of a 3,000,000 ton crop this year. The increased value of the crop for one year, due to the introduction of this variety, will more than offset the cost of maintenance of the entire station for probably a decade—a striking exposition of the value to be derived from organised scientific endeavour. The next crop to be harvested in Java will be made up of 95 per cent. of P.O.J. 2878, showing the wide adaptability of this cane.

A very interesting feature of the harvesting operations is the carrying out of very thorough tests to determine the state of maturity of the canes, and, as far as it is possible, all fields are harvested when the cane is fully mature, but not overripe. The method is to divide the areas

15. Abstract of Reports on other Sugar-growing Countries by the Travelling Research Scholars— *continued.*

into blocks, each of which has been planted with the same variety at one period. The fields may be from 15 to 25 acres in area. From twenty to fifty stools are selected throughout the block a few weeks before the milling season begins. From each stool is taken one stick, at intervals of ten days. The composite sample is brought to the mill, and the sticks are divided into three portions—top, middle, and butt. The combined samples of each section of the stick are crushed separately, and the juice tested for sucrose, glucose, and purity. The values obtained are entered on a special graph for each field. This process is continued until the three curves approximately meet, and the glucose is at a minimum. It is found that the cane is then ready for harvesting.

Of course, the system cannot be applied absolutely rigidly, for the harvesting operations are governed also by the location of fields, availability of harvesting equipment, and climatic conditions; but the employment of the method as a guide to harvesting sequence is very highly valued. In other words, the whole organisation aims at obtaining the maximum returns for the money expended in all of the various cultural operations.

Hawaii.

In Hawaii, conditions are distinctly different, and the cultural methods are modified accordingly. The climate of the islands is decidedly more temperate than that of Java. Indeed, on some of the wet uplands the temperature is considerably below that required for optimum growth of the cane, for a large portion of the year. The rainfall varies from a few inches on the leeward side of the islands, to 200 inches and more on the windward slopes. Consequently, much of the cane is grown under irrigation entirely, and large sums of money have been expended in the construction of elaborate irrigation schemes to bring the water from the regions of higher rainfall to the drier leeward plantations. The yields on the latter are much greater than those on the unirrigated plantations.

The soils of Hawaii are, in general, deep volcanic loams and clay loams. They could not be classed as very fertile soils, but they possess very desirable physical properties, and any deficiency in natural fertility is supplemented by fertilisers up to the economical limit. Thus, many fields receive up to 1½ tons of mixed fertiliser for one crop. The conditions favour the growing of an eighteen to twenty-four months crop, and yields as high as 18 tons of sugar per acre have been recorded.

The land is ploughed very shortly after the last ratoons are harvested. Steam ploughs and tractors are employed in giving the land a thorough preparation, for it will be under cane for about ten years before replanting. A plant crop and probably five ratoons will be harvested in that period. On the irrigated plantations, deep planting furrows are made, for these serve as watercourses in the succeeding irrigations. Water is applied immediately after planting, and the applications are repeated at intervals of four to five days for the first three weeks. This gives the seed every chance to germinate rapidly, by providing a suitable, moist seedbed. The interval between applications is increased up to ten to twenty days, and irrigation is continued until about three months before harvesting. In all, 150 inches per acre are sometimes applied to produce one crop. The costs of water are comparatively high on many plantations—as much as 90s. being expended for a million gallons; and irrigation costs may amount to one half-penny per pound of sugar produced.

Weeding is carried out very thoroughly until the cane closes in. Fertiliser is used on all lands, and the formula employed varies with each plantation. Mixed fertiliser is applied when the cane is a few weeks old, and the land has been first of all carefully weeded. This is followed up by a second application about six weeks later. Supplementary dressings of nitrogenous fertiliser are given at intervals, but the last application is made almost a year before harvesting. Dr. Arrhenius, of Java, has shown that if a cane plant receives an adequate supply of nitrogen during the first six months of its growth, a light supply throughout the latter growth stages is not prejudicial. Early fertilisation is favoured in both Hawaii and Java.

The mixed fertilisers used in Hawaii vary within the following limits:—

9 to 12 per cent. nitrogen (N).
5 to 9 per cent. phosphoric acid (P_2O_5).
6 to 10 per cent. potash (K_2O).

It is significant, also, that organic fertilisers are not often employed. Most mixtures are composed of ingredients such as—ammonium sulphate, sodium nitrate, potassium nitrate, chloride and sulphate, and superphosphate. Lime is not extensively employed. Filter press cake is ploughed under before planting, particularly on poorer spots and low-lying lands. Green manure crops are not grown, and on most plantations trash is burned prior to harvesting.

The latter operation is essential where the crop is heavy and the canes have fallen down. Harvesting operations are thereby expedited and cheapened. Every effort is made to ensure that the burnt cane shall be brought into the mill within a day of burning, as a rule. Deterioration is thus reduced to a minimum. Mechanical loading devices are employed on many plantations; one of these may load 400 tons of cane per twelve-hour day. The cane is transported on light trucks, which are brought into the fields along portable tracks. On the wet slopes, much of the cane is brought to the mill or loading station by the process of fluming.

The experimental work in Hawaii is very highly developed, and is controlled by the staff of a well-equipped station, supported by the local industry. The expenditure on experimental work amounts to about the same as that for Java. Field work embracing cultural, fertility, and varietal tests are made; seedling raising is carried out on a large scale; and disease control, soil research work, and other problems receive considerable attention. The variety H. 109 was bred at the station, and is now grown on almost one-half of the cultivated lands of Hawaii.

16.—Review of the Industry in 1927.

The sugar yield last year was the best ever produced up to that time, although the tonnage of cane was not quite so great, nor the yield of cane per acre so good as in 1925. The following is the comparison:—

Year.	Acreage of Cane Crushed.	Tons of Cane.	Tons of Sugar.	Tons of Cane per Acre.	Tons of Sugar per Acre.
1925	189,466	3,668,252	485,585	19·36	2·56
1927	203,748	3,555,827	485,745	17·54	2·38

It will be observed that it took 14,282 acres more cane to produce the extra 160 tons of sugar over 1925. On the other hand, the tonnage of cane wanted to make one ton of sugar was a record, being 7·32 as against 7·55 in 1925.

The yields of cane and sugar per acre in the different sugar areas of Queensland during 1927, according to the Government Statistician, were as under—

Districts.	Tons of Cane per Acre.	Tons of Sugar per Acre.
Mossman to Ingham	18·22	2·55
Ayr	20·67	3·06
Proserpine	16·58	2·26
Mackay	17·46	2·40
Bundaberg, Gin Gin, etc. ..	14·42	1·86
Maryborough, Childers, etc. ..	16·08	1·82
Nambour to Beenleigh	13·48	1·64

The tons of cane required to make a ton of sugar in 1927 were the lowest yet recorded—viz., 7·32. As previously pointed out, this figure is to a large extent an index of efficiency, and has much improved in recent years. This year it is anticipated it will be even lower, owing to the higher cane sugar in the cane.

The lowest tonnage of cane required to make a ton of sugar **in 1927** was 6·74, in the Ayr district, and the **highest** 9·52, at Beenleigh.

The average acreage to each planter during 1927 is given by the Registrar-General as follows:—

	Acres.
Cairns to Townsville	50
Townsville to Mackay	43
Bundaberg to Bauple	30
Maroochy (Nambour) to Logan (Beenleigh)	8

The average acreage to each planter in Queensland is given as 38. The total area under cane in 1927 was 274,838 acres. The number of plantations of 5 acres and over was 6,587, and under 5 acres 655, making a total of 7,242.

The number of sugar-mills operating in 1927 was 35. There are two refineries in addition—one at Millaquin and one at Brisbane. The Millaquin refinery, which was destroyed by fire in 1927, has now been re-erected.

The value of the Australian output is given as £11,210,136.

The consumption of sugar in Australia is now estimated to be 340,000 tons.

The table now given shows the amount of cane estimated to be crushed in last year's report, with the totals actually crushed by the sugar-mills as returned by them for the purposes of assessment:—

Mills.	Tonnages of Cane to be Crushed, Estimated in October, 1927.	Tonnages actually Crushed at end of Season.
Mossman	75,000	76,698
Hambledon	156,000	150,784
Babinda	180,000	178,357
Mulgrave	166,000	163,706
Goondi	156,000	151,430
South Johnstone	155,750	157,240
Mourilyan	163,000	164,882
Tully	195,000	201,956
Victoria	172,000	172,857
Macknade	185,000	188,773
Invicta	65,000	59,045
Pioneer	95,750	93,741
Kalamia	108,000	105,464
Inkerman	126,000	125,449
Proserpine	120,000	121,672
Cattle Creek	62,000	61,188
Racecourse	108,000	105,855
Farleigh	126,000	118,772
North Eton	70,000	64,558
Marian	110,000	123,965
Pleystowe	138,000	140,282
Plane Creek	125,000	121,349
Qunaba	50,500	48,976
Millaquin	87,000	88,949
Bingera	114,000	115,563
Fairymead	110,500	109,968
Gin Gin	45,000	43,621
Childers	91,000	87,814
Isis	97,000	93,484
Maryborough	28,000	25,600
Mount Bauple	33,000	30,342
Moreton	47,000	46,356
Eagleby	2,166	2,166
Alberton	1,892	1,892
Rocky Point	11,534	11,535
	3,576,092	*3,554,289

* This total is very close to that given by the Registrar-General, viz., 3,555,827.

17.—General.

The following table gives the average annual rainfall and mean temperatures in the majority of the sugar districts in Queensland:—

District.	Rainfall.	Mean Temperature.
Mossman	82·91	..
Cairns	90·49	76·5
Innisfail	149·20	73·8
Ingham	80·53	..
Ayr	44·48	74·1
Proserpine	76·96	..
Mackay	68·52	72·1
Bundaberg	44·40	70·1
Childers	42·07	69·8
Maryborough	46·14	69·6
Nambour	60·93	..
Beenleigh	48·87	..

Cane Harvesters.

Experiments with the harvesting of cane by machinery are still proceeding, and the Miller-Owen, or Mackay Cane Harvester, is now being tried out. The general feeling is that it should ultimately prove successful in the cutting and topping of cane, but further trials on a commercial scale are awaited.

Publications, 1927.

Several leaflets on fertiliser trials with financial results, on diseases, cane varieties, and on cane pest control by means of fumigants have been issued.

THE SUGAR EXPERIMENT STATIONS ACT.

Receipts and Payments, 1927-1928.

Receipts.	£	s.	d.
To Balance, 1st July, 1927	10,190	0	10
,, Assessments	7,404	13	11
,, Endowment	7,404	13	11
,, Bundaberg S.E.S.	589	9	8
,, Mackay S.E.S.	598	2	11
,, Johnstone S.E.S.	762	6	5
,, Sundries	3	1	10
(Total Receipts 1927-28—£16,762 8s. 8d.)			
	£26,952	9	6

Payments.	£	s.	d.
By Salaries	6,765	17	3
,, Wages, travelling expenses, chemicals, etc.	2,913	6	11
,, Subsidy—Destruction cane grubs ..	1,985	6	4
,, Contingencies—			
Bundaberg S.E.S.	1,094	0	3
Mackay S.E.S.	1,600	15	5
,, Gordonvale Sugar Experiment Station	896	12	0
,, Johnstone Sugar Experiment Station	2,697	14	8
	17,953	12	10
,, Balance, 30th June, 1928	8,998	16	8
	£26,952	9	6

Acknowledgments.

The thanks of the Bureau are due to the secretaries and presidents of the various district executives, mill suppliers' committees, farmers' associations, canegrowers' associations, and the managers and officers of the Queensland sugar-mills for their kindly help and interest at all times.

The Curator of the Botanic Gardens (Mr. E. Bick) is also warmly thanked for permission to grow imported varieties in quarantine in the Gardens, also the Immigration Agent, Mr. Abell, and various owners of private gardens in Brisbane, who have taken charge of cane varieties in order that they may be grown in isolation.

The Bureau also acknowledges with thanks the help of the Registrar-General and his staff in supplying statistical information.

The indebtedness of the Bureau is also expressed to the metropolitan and country press for the publication of articles and reports affecting the sugar industry, especially to the "Agricultural Journal" and the "Australian Sugar Journal," which specially illustrate many articles. Thanks are also due to the "Producers' Review," the organ of the Queensland Cane Growers' Council, as well as to the Government Printer for the care taken in the preparation and issuing of the Bulletins and Annual Reports.

For her great help in arranging sugar data, indexing, typing of this report, and assistance in correspondence, &c., during the past year, the Director desires to accord special thanks to Miss Wyllie, the typiste of the Bureau.

H. T. EASTERBY, Director.

Brisbane, 3rd December, 1928.

Price, 1s. 9d.]

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