1944.

QUEENSLAND.

FORTY-FOURTH 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 Acts,* 1900 *to* 1941").

PRESENTED TO PARLIAMENT BY COMMAND.

BRISBANE:
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A. 48—1944.

FORTY-FOURTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

SIR,—I have the honour to submit the Forty-fourth Annual Report of The Bureau of Sugar Experiment Stations, covering the period 1st July, 1943, to 30th June, 1944.

ARTHUR F. BELL,
Acting Director.

Brisbane, 30th September, 1944.

Director's Report.

General.

Production of cane sugar in Queensland continues to be carried on under conditions of anxiety and difficulty. Crushing of the 1944 crop commenced at Tully on June 1st, and all northern mills, with the exception of Invicta, were in operation by June 30th. The numbers of cane cutters signing on were disappointingly low and the initial outlook was even worse than in the previous year; fortunately, the labour position soon improved and prospects, though far from good, have materially improved.

Seasonal conditions have again fluctuated to a marked extent. The winter of 1943 proved dry and cold and frost damage was considerable, particularly in the Moreton area. Generally good spring conditions followed, especially in the southern part of the cane belt, but the early summer weather was dry in most areas. The monsoonal wet season was somewhat late and short and with the advent of winter, conditions were not promising. However, winter rains were general and excepting the Nambour district, the State experienced a mild season free from serious frosts.

A measure of protection for persons engaged in rural industry, and the release of a number of men from the Armed Forces and the Civil Constructional Corps, improved the labour position slightly and cultivation was rather better than in the previous year. Deliveries of fertilizers and farm machinery have also improved.

Estimate of the 1944 Crop.

The preliminary estimate of the 1944 crop, based on returns submitted from the mills early in May, was that 4,290,110 tons of cane would be available for crushing. Owing to the early cessation of the rainy season, late autumn conditions were dry and cane did not make the growth then expected of it. On the other hand, it is anticipated that all available cane will be crushed if labour conditions permit, In these circumstances, it is estimated that the production of sugar will be about 555,000 tons of bagged sugar, or some 575,000 tons of 94 n.t. sugar. If this estimate be realised, production in terms of 94 n.t. sugar will be 80-90,000 tons better than last year, but still 300,000 tons short of the record production in 1939.

The subjoined table sets out the estimated crushings for 1944, compared with the completed crushings for the 1943 crop. As in the 1942 season, it was necessary to restrict transport of sugar cane on the over-pressed Government railways, and a considerable quantity of cane was therefore hauled to the nearest mill, rather than to the mill to which the cane land in question was assigned. At Ingham, a quantity of Macknade cane was crushed at Victoria owing to labour shortage at the former mill. Consequently, it is necessary to differentiate between the cane actually crushed by each mill and the cane credited to each mill, although a proportion may have been crushed elsewhere. The "actual" crushing therefore represents the cane passing through the particular mill's rollers; the "domestic" crushing is the actual after making additions or deductions for cane crushed by or on behalf of other mills. In other words, the domestic crushing is the tonnage which would have been crushed by each mill in the absence of transport and manpower restrictions, and it is this figure which should be read in conjunction with the preliminary estimates submitted in last year's report.

CROP HARVESTED, 1943—CROP ESTIMATED, 1944.

1943 Crop.		Mill.	1944 Estimate (Preliminary).
Domestic Crushing.	Actual Crushing.		
99,356	99,356	Mossman	109,000
155,534	155,534	Hambledon	153,000
179,098	179,098	Mulgrave	193,910
149,729	149,729	Babinda	184,000
149,385	149,385	Goondi	163,000
177,107	177,107	South Johnstone	220,000
123,876	123,876	Mourilyan	150,000
162,990	162,990	Tully	208,580
137,171	151,079	Victoria	200,000
95,760	81,852	Macknade	185,000
60,810	60,810	Invicta	73,000
98,112	98,112	Pioneer	135,000
139,512	139,512	Kalamia	171,000
139,571	139,571	Inkerman	180,000
105,591	105,604	Proserpine	140,000
49,670	49,670	Cattle Creek	60,000
109,559	108,429	Racecourse	164,000
113,270	114,280	Farleigh	160,000
65,480	65,480	North Eton	80,000
82,947	83,407	Marian	145,000
111,028	110,675	Pleystowe	145,000
101,252	101,252	Plane Creek	150,000
64,402	64,402	Qunaba	72,300
115,140	114,112	Millaquin	160,000
145,470	146,356	Bingera	150,000
117,103	111,063	Fairymead	180,320
46,166	45,292	Gin Gin	32,000
143,796	150,611	Isis	140,000
41,049	41,903	Maryborough	50,000
31,422	30,794	Mount Bauple	26,000
74,119	74,134	Moreton	100,000
10,646	10,646	Rocky Point	10,000
1,303	1,303	Eagleby	..
3,397,424	3,397,424		4,290,110

1943 Crop Statistics.

The production of raw sugar in Queensland during the 1943 season was 486,447 tons on the 94 net titre basis. This depleted crop was the lowest for seventeen years, and but 700 tons greater than that of 1927. The ratio tons of cane/tons of sugar was 6.98 which, although a distinct improvement over the 1942 season, was higher than the average of recent years and may be attributed mainly to increased factory losses.

The following table shows the distribution of production between the areas lying north and south of Townsville:—

SUGAR PRODUCTION, 1939-43.

District.	1939.	1940.	1941.	1942.	1943.
	Tons.	Tons.	Tons.	Tons.	Tons.
North of Townsville ..	351,267	309,437	305,819	263,908	206,634
South of Townsville ..	540,155	450,009	391,526	341,772	279,813
Total	891,422	759,446	697,345	605,680	486,447

It will be seen that the deficiency of approximately 120,000 tons of sugar, compared with the 1942 crop, was almost equally divided between the two zones.

The area harvested for milling purposes was 228,895 acres, a decrease of 9,318 acres, or 3.9 per cent., on 1942 figures. This area was contributed by plant, ratoon, and standover cane as follows:—

	Acres.
Plant cane	75,682
Ratoon cane	137,664·5
Standover cane	15,548·5
	228,895

The low proportion of the area devoted to plant cane (33 per cent.) unquestionably was an important factor influencing the low production. The yield of cane per acre harvested for crushing purposes was 14.84 tons and of sugar 2.125 tons, compared with 18.26 and 2.54 tons respectively in 1942, and 23.14 and 3.41 in 1939. Details of yields in the several major districts of the State are given below:—

ACREAGE YIELDS BY DISTRICT, 1943.

District.	Tons Cane per Acre.	Tons 94 n.t. Sugar per Acre.
Mossman–Ingham	16·08	2·32
Lower Burdekin	18·67	2·91
Proserpine	11·06	1·69
Mackay–St. Lawrence	10·11	1·49
Bundaberg–Gin Gin	18·08	2·33
Childers–Maryborough–Gympie	16·11	2·15
Nambour–Beenleigh	22·39	2·71
State Average	14·84	2·125

Production data for the State are subjoined. The sharp downward trend of production under wartime conditions is very evident and is much more pronounced than the decline in area under cane.

TABLE SHOWING ACRES CULTIVATED AND HARVESTED, YIELDS OF CANE AND SUGAR, ACRE YIELDS, AND QUALITY OF CANE, 1934–1943.

Year.	Acres Cultivated. *	Acres Harvested for Milling.	Total Yields.		Yields per Acre.		Tons Cane to 1 ton Sugar.
			Cane.	Sugar.	Cane.	Sugar.	
			Tons.	Tons.	Tons.	Tons.	Tons.
1934 ..	303,916	218,426	4,269,991	612,570	19·56	2·80	6·97
1935 ..	314,700	228,515	4,220,267	610,326	18·47	2·67	6·92
1936 ..	338,686	245,152	5,171,516	744,261	21·10	3·04	6·94
1937 ..	348,840	249,683	5,132,934	763,325	20·56	3·06	6·73
1938 ..	347,199	251,064	5,342,085	778,136	21·28	3·10	6·87
1939 ..	353,996	261,047	6,038,821	891,422	23·14	3·41	6·77
1940 ..	350,851	265,738	5,180,756	759,446	19·50	2·86	6·82
1941	334,787	246,939	4,793,589	697,345	19·41	2·82	6·87
1942 ..	316,798	238,213	4,350,642	605,680	18·26	2·54	7·18
1943 ..	326,478	228,895	3,397,424	486,447	14·84	2·125	6·98
True Average for 10 years ..	333,625	243,367	4,789,802	694,895	19·68	2·85	6·89

*Data supplied by Government Statistician.

Distilleries again acquired a considerable part of the molasses output of the mills, but transport difficulties reduced the proportion below the average figure for recent years. The quantity used as fertilizer and stockfood was maintained in spite of the reduced total output, and would no doubt have been increased had rail and motor transport facilities been more readily available. Nearly one sixth of the molasses was used as a supplementary fuel, this high consumption being a direct result of increased "lost time" and reduced crushing rates. Details of production and disposal over the last ten years, supplied by the Government Statistician, are:—

TABLE SHOWING DETAILS OF DISPOSAL OF MOLASSES FOR THE TEN-YEAR PERIOD, 1934–1943.

Method of Usage.	1934.	1935.	1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Distilleries ..	4,573,037	4,617,431	6,086,864	7,071,109	8,275,887	9,581,241	11,531,396	12,882,397	10,457,747	7,345,596
Fertilizer ..	2,227,905	2,559,528	3,211,423	3,363,624	3,293,543	4,295,289	3,334,372	1,510,650	1,857,300	2,122,220
Stock Feed ..	3,035,598	3,817,755	4,351,822	3,914,113	4,237,196	4,727,170	5,380,242	3,490,937	3,071,918	3,055,728
Mill Fuel ..	5,339,489	4,103,475	6,354,841	5,576,764	3,748,590	3,834,653	1,781,425	1,232,338	3,024,370	2,176,926
Other Purposes ..	444,680	175,519	397,080	157,496	232,049	188,889	228,450	158,821	303,240	441,522
To Waste ..	1,162,715	1,214,678	560,326	466,481	498,926	457,541	47,069	55,237	31,153	97,643
Total ..	16,783,424	16,488,386	20,962,356	20,549,587	20,286,191	23,084,783	22,302,954	19,330,380	18,745,728	15,239,635

Sugar Values in 1943.

The 1943 production of raw sugar was worth £10,244,000 to this State. The proportion exported from Australia is withheld for security reasons. All sugar was sold in No. 1 Pool, there being no excess, and the average return for all sugar was £21 1s. 3d. per ton of 94 net titre, the highest return since 1927. The average price for home consumption sugar, after deduction of rebates, etc., was £22 10s. 6d. No mills exceeded their mill-peak allocations of raw sugar, and since the average price exceeded £19 no mill was eligible for the payment of the bonus of £1 5s. 0d. per ton of sugar, as recommended by the 1939 Royal Commission.

Economic Review.

The outlook for the national security of Australia had immensely improved at the commencement of the 1943 season. The potential invader had definitely been turned in his tracks, and the confidence and optimism of the community had risen. At the same time, the calls for manpower for national service had increased and, in the sugar belt, the industrial outlook was rather bleak.

Time proved that fears regarding a serious shortage of harvest labour were well founded. This was markedly so in the northern group of mills as, with one exception, the mills situated north of Mackay operated two shifts only. One mill in the central district also operated only two shifts, while the three-shift mills worked at reduced hourly crushing rates. The arithmetic mean of the crushing rates of all mills was only 66.3 per cent. of the adjudged normal rate. On the basis of the amount of cane crushed in relation to the amount which would normally have been crushed in the same period of time, the crushing rate for the State as a whole was 63.9 per cent. of normal. Individual mill rates ranged from 47.6 per cent. to 86.4 per cent.

Transport of cane and sugar again presented difficulty but the general position showed a distinct improvement over 1942, although this was no doubt brought about in part by the materially reduced crop. Cane was again diverted to the nearest mill to reduce transport on the Government railways but the quantity diverted was substantially less than in 1942. Increased storage capacity again enabled the mills to cope with the slow movement of manufactured sugar.

Standards of field cultivation are still much below normal but a somewhat improved field labour postion, together with rather better supplies of tractors, implements, and spare parts, has permitted the planting of an increased area and the proportion of plant cane in the 1944 crop will be considerably higher than in 1943.

In March, 1944, arrangements were made between the Allied Works Council and the Commonwealth Department of Commerce and Agriculture, for the return to the Sugar Industry of 150 reconditioned impressed tractors. These

tractors were impressed early in 1942 for urgent defence work and released tension now permits the return of a proportion. The Allied Works Council has agreed to put the tractors into reasonably good working order and return them at the rate of 25 per month. To date this schedule has been fairly well maintained and this increase in farm power will materially assist production.

On 17th July, 1943, the sale of tractors was brought under Government control and sales cannot now be completed without a release issued by the Machinery Control Officer. During the period 17th July, 1943, to 30th June, 1944, a total of 155 tractors was released for sale in sugar areas. This number is expected to increase materially during the next few months.

Rationing of sugar has been maintained at the level of a domestic ration of sixteen ounces per person per week. The target for Australian production for 1944 was set at the same figure as 1943, viz., 600,000 tons of bagged sugar, but in April it was announced that the target for 1945 would be increased to 650,000 tons. Although it now appears that the target for the current year may be attained, the prospects for an increase by a further 8.5 per cent. are not good.

The appointment of an Inter-Departmental Committee by the Commonwealth Government was implemented during the period under review, and the Queensland Government has been ably represented on this Committee by the Hon. W. Forgan-Smith, LL.D., Chairman of the Sugar Board and the Central Sugar Cane Prices Board. The Committee has advised the Commonwealth Government on requirements of sugar and measures necessary for the maintenance or increase of production. Within the State, the equitable distribution of available manpower has been greatly assisted by the appointment of a Manpower Advisory Committee, on which sugar interests are fully represented.

In last year's report, attention was drawn to the influence of declining fertilizer supplies on sugar production. The 1943 crop, for the growth of which only 15,000 tons of fertilizer were delivered, fell to the very low figure of 486,447 tons. Fortunately, the supply position improved somewhat in 1943, and this, together with a raising of priority after strong representation of the case for sugar, resulted in the delivery of 29,141 tons, made up as follows—

	Tons.
Sulphate of Ammonia	3,577
Nitrate of Soda	14,110
Superphosphate	3,398
Meatworks Manure	6,938
Potash	1,118
Total	29,141

The effect of the application of this increased quantity of fertilizer is seen in the higher crop estimates for the 1944 season, present indications being that the 1944 crop will be some 100,000 tons greater than in 1943. For the purposes of comparison, we have extended and reproduced (Figure 1) the graph published in last year's report, compiled from data set out in the subjoined table. It will be seen that the curves for fertilizer and estimated yield show a sharp upward trend, while the estimated acreage from which the crop will be harvested is almost identical with that or 1943.

FIG. 1.—Showing the relation of fertilizer applied, and acres harvested, to the production of sugar in Queensland from 1936 to 1944 (see Table on page 5).

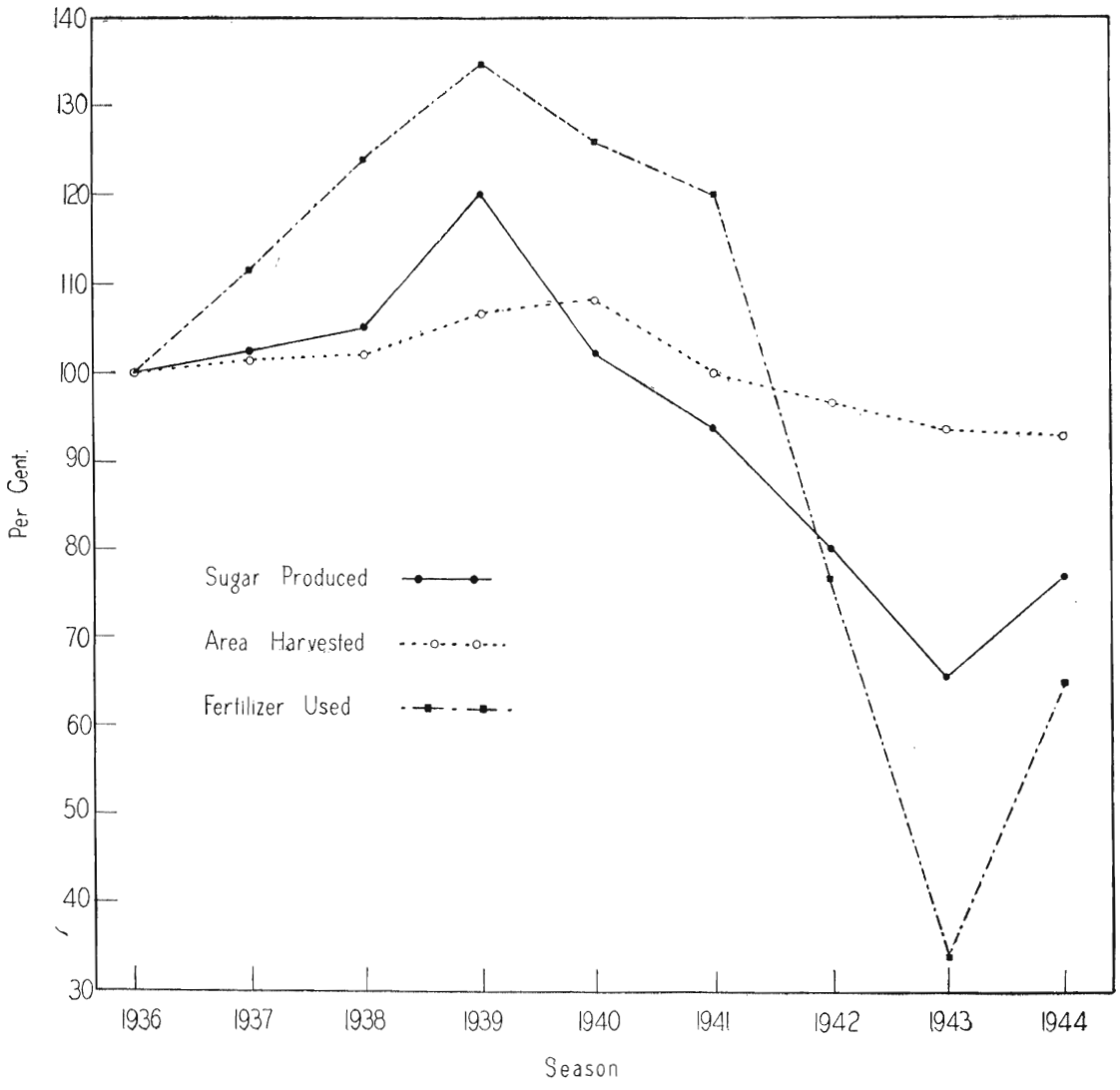

TABLE SHOWI
FERTILIZER

Season.

1936 ..
1937 ..
1938 ..
1939 ..
1940 ..
1941 ..
1942 ..
1943 ..
1944 ..

* Estima
† Approx
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TABLE SHOWING RELATION OF PRODUCTION TO AREA HARVESTED AND FERTILIZER SALES FOR THE YEARS 1936–1944. (*See also* Figure 1.)

Season.	Tons Sugar Made.	Acres Harvested.	Tons Sugar per Acre.	† Tons Fertilizer.
1936	744,261	245,152	3·04	45,000
1937	763,325	249,683	3·06	50,000
1938	778,136	251,064	3·10	56,000
1939	891,422	261,047	3·41	61,000
1940	759,446	265,738	2·86	59,000
1941	697,345	246,939	2·82	54.000
1942	605,680	238,213	2·54	35,000
1943	486,447	228,895	2·125	15,000
1944	*575,000	*228,600	..	29,000

* Estimate.

† Approximate sales for previous year; the effect of fertliizer is seen in the crop harvested the year following its purchase and application.

The very close association between fertilizer supplies and sugar production is very evident from a study of Figure 1, and strongly supports the emphasis laid in our last report upon the necessity for increased and more timely deliveries of fertilizer. The Commonwealth Government has set the target for production in 1945 at 650,000 tons of bagged sugar, of which Queensland's quota will be about 640,000 tons of 94 net titre sugar. An allocation of some 39,000 tons of fertilizer for 1944 delivery was made by the Department of Commerce and Agriculture, but, owing to diversion of meatworks offal to stock-food requirements, and restricted overseas shipping, this allocation has been reduced to 34,000 tons. Up to the present, deliveries have not been up to expectation, and a material improvement will be necessary to ensure production of the target crop.

In May, 1943, a delegation representing the sugar industry waited upon the Prime Minister and requested the payment of an increased price for raw sugar to offset reduced production and rising costs. The Prime Minister indicated that the price stabilisation policy of his Government did not permit the granting of an increased price, but if additional financial returns were found to be warranted adjustment could be made by way of subsidy. He undertook to refer the matter to the Tariff Board for investigation. Subsequently, the Minister for Trade and Customs directed the Tariff Board to investigate, report and make recommendations upon the following questions—

> "Whether the payment of a subsidy to the raw sugar producing industry is warranted.
>
> "If so, what amount of subsidy is justified, and what conditions, if any, should govern the payment of such subsidy."

The Tariff Board conducted its enquiry in Brisbane on May 31st and June 1st, when the case for the millers and that of the growers of New South Wales were presented. The Board then adjourned to Mackay when the Queensland Cane Growers' case was heard on June 5th.

Work of the Bureau.

The reports of the officers supervising the activities of the several sections and regional Experiment Stations will be found in the succeeding pages. Naturally these reports have been condensed to conform to the exigencies of the times, while absence of staff has greatly reduced the scope and quality of work performed.

Routine chemical analyses were carried out in the Brisbane laboratory on the reduced wartime scale, the chief activity being associated with soil analyses for farmers and in conjunction with the fertility surveys which have been proceeding for some years. A considerable amount of time was necessarily devoted to the implementing of the amended fertilizer rationing scheme, which is proceeding smoothly.

The time of the staff of the three stations has been mainly devoted to cane breeding and the preliminary testing of new varieties. For the first time since the extension of the war to the Pacific, seedling raising was resumed on all three stations. The growing of vegetables on the stations was discontinued following the general improvement in food production throughout the State. As usual a considerable number of cane samples were analysed for local farmers.

While the marked decline in production in the tropics somewhat reduces the value of the varietal statistics for 1943, there is no question that Badila easily retains pride of place as the leading variety, the reduction from 37.2 per cent. to 33.2 per cent. being due mainly to the reduced crop in the areas of Lower Burdekin and north. The Javan variety, P.O.J.2878, introduced into Queensland in 1928, retained second place with 17.1 per cent., but Co.290 displaced M.1900 Seedling in third place. The first ten varieties contributed 88.8 per cent. of the crop.

Of the new "Q" series seedlings raised by the Bureau Q.25 has been planted most extensively and in 1943 constituted 8 per cent. of the crop in the sub-tropical districts. Plantings of Q.28 have been extended at a rapid rate in the Central District, and will contribute an appreciable proportion of this year's crop. Q.42, Q.44, and Q.45 are being extended in the Southern, Northern, and Central Districts respectively.

The sugar cane disease position remains satisfactory and the decentralised system of disease control is withstanding the strain imposed by wartime conditions. Due to lack of staff the control of Fiji and downy mildew diseases has deteriorated somewhat in the Bundaberg district, and the reimposition of quarantine measures has been necessary in part of the district. Gumming disease, once the most serious disease in this State, is now recorded on only two farms. The Mackay district, as far as is known, is free from downy mildew disease for the first time in many years; indeed in the period under review the disease was observed on only three farms in the tropical sugar belt.

The cane grub pest was less in evidence than was the case last year, a fortunate circumstance in view of the difficulty of obtaining labour for the injection of fumigant into the soil. Nevertheless, aggregate losses from this pest amounted to the order of 40,000 tons of cane. A visitation of the yellow-winged locust was experienced in the Northern and Central canefields during the summer and, in Mackay at least, serious widespread damage to cane appeared imminent. Fortunately, with the arrival of the delayed rainy season, the parasites of this pest took the upper hand and serious damage was rather narrowly averted. Rat damage to cane increased appreciably in the far North, but economic losses were not great.

The work of the Division of Mill Technology was confined to the general advisory services and some standardisation of equipment. Mill staffs, faced with the major problem of getting cane through the mill at a reasonable rate, had little time to devote to refinements of technique. Crushing rates were low, proportion of lost time high, and mill work generally below standard, as a result of the acute labour shortage.

The shortage of field staff of the Bureau has been relieved somewhat by the return from overseas and discharge from the Army of Messrs. J. T. Elliott and E. V. Humphry. Two cadets, Messrs. K. Leverington and W. D. Gibbons, were also appointed to the soils and pathology laboratories respectively. The writer has acted in a consultative capacity only and the administration of the Bureau has been carried on by Mr. E. R. Behne.

Meetings of the Advisory Board were held at Mackay on December 8th, 1943, and in Brisbane on May 29th, 1944. The Board gave particular attention to the problem of the depleted staff of the Bureau, particularly that of the Mill Technology Division, and resolved that scholarships should be granted for the recruitment of young officers for that Division. Powers and Duties of Cane Pest and Disease Control Boards were revised and amended and promulgated after drafting by the Solicitor General.

"THE SUGAR EXPERIMENT STATIONS ACTS, 1900 1941."

SUGAR FUND.

STATEMENT OF RECEIPTS AND DISBURSEMENTS FROM 1ST JULY, 1943, TO 30TH JUNE, 1944.

RECEIPTS.	£	s.	d.
To Balance	31,390	4	5
„ Assessments	7,078	16	9
„ Endowment	7,000	0	0
„ Bundaberg	1,696	4	5
„ Mackay	1,067	16	9
„ Meringa	727	6	11
„ Sundries	129	18	7
	£49,090	7	10

DISBURSEMENTS.	£	s.	d.
By Salaries	7,489	19	8
„ Contingencies	4,259	19	0
„ Bundaberg Contingencies	1,598	13	3
„ Mackay Contingencies	1,405	16	0
„ Meringa Contingencies	1,379	8	8
„ Balance	32,956	11	3
	£49,090	7	10

STATEMENT OF RECEIPTS AND DISBURSEMENTS FROM INCEPTION OF FUND, 1ST DECEMBER, 1900, TO 30TH JUNE, 1944.

RECEIPTS.	£	s.	d.	DISBURSEMENTS.	£	s.	d.
To Assessments	316,273	15	2	By Disbursements	583,640	8	11
„ Endowment	234,199	1	7	„ Balance	32,956	11	3
„ Sugar Experiment Stations	66,124	3	5				
	£616,597	0	2		£616,597	0	2

C.C.S. FORMULA.

For the benefit of readers of this report we would point out that the measure of available sugar in cane (so-called Commercial Cane Sugar or C.C.S.) is given by the equation :—

$$\text{C.C.S. in cane} = \text{Pol in cane} - \frac{\text{Soluble Impurities in Cane}}{2}$$

In practice per cent. C.C.S. is calculated by the empirical formula :—

$$\text{C.C.S.} = \frac{3P}{2}\left(1 - \frac{5+F}{100}\right) - \frac{B}{2}\left(1 - \frac{3+F}{100}\right)$$

where— P = pol in first expressed juice
B = brix in first expressed juice
F = fibre in cane.

DIVISION OF SOILS AND AGRICULTURE.

WORK OF THE BRISBANE LABORATORY.

MR. C. R. VON STIEGLITZ, Chemist.

ANALYTICAL WORK.

The following is a summary of the routine analyses performed at the Brisbane Laboratory for the period 1st July, 1943, to 30th June, 1944:—

Soils	158
Rat baits	8
Waters	6
Sugar Canes	5
Limes	4
Scales	2
Miscellaneous	4
Total	187

During the previous year a considerable number of samples of various kinds was analysed for the United States and our own Services. This work has now ceased, owing to the more effective organisation of chemical manpower and laboratory facilities by the Scientific Liaison Bureau, and it is not anticipated that this laboratory will be called upon to carry out work of this nature during the coming year. The identification of thirty unknown liquids received late in June, 1943, however, meant that analytical work in connection with these samples continued for some time into the 1943-44 year.

Of the soils analysed, 51 samples were received from farmers desirous of checking up on the fertility of their farms, whilst the remaining routine estimations in soils were in connection with the various soil fertility surveys which have been proceeding for some years.

Samples analysed for farmers during the year, have, in many instances, shown grave plant food deficiencies. These deficiencies are due in large measure to the great decrease in fertilizer applications to sugar soils, since the war. As a result of these analyses, the Bureau has been able to give sound advice to farmers as to the most economical method of using their fertilizer rations, and to suggest the most suitable use of the various mill by-products as a means of augmenting these supplies. The soil plant food deficiencies, mentioned above, will no doubt persist for several years after fertilizer rationing ceases.

INVESTIGATIONAL WORK.

Publications.—The following articles were published during the year:—

"*Rationing of Fertilizer Supplies for the Sugar Industry,*" by C. R. von Stieglitz. Australian Sugar Year Book, 1943-4.

"*The Economic Use of Fertilizers for Sugar Cane Culture in War Time,*" by C. R. von Stieglitz. Proceedings of the Queensland Society of Sugar Cane Technologists, 1944.

"*Natural Waters of the Queensland Coastal Belt,*" and "*Exchangeable Sodium and the Physical Properties of Soils,*" both by N. G. Cassidy, and both published in the "Queensland Journal of Agricultural Science," Vol. 1, No. 1.

The first article, by Mr. von Stieglitz, describes the system of fertilizer rationing now in use for the sugar industry and the method of calculating the "basic rations" for the various farms (*i.e.*, the amount of nitrogen, phosphoric acid, and potash required to produce the farm peak), and discusses the formulae necessary for use in distributing the various products to the growers.

The second article discusses the fertilizer requirements for successful sugar-cane culture in Queensland, and puts forward suggestions for utilizing, in the field, the available by-products of the sugar industry to best advantage. A graph shows the inter-relationship between yields of sugar per acre and fertilizer applied for the years 1936 to 1943.

The first article by Mr. Cassidy, dealing with the natural waters of the Queensland coastal belt, lists the analytical results of a number of waters, and discusses the suitability of several analytical methods for water. The data are presented in terms of various ionic ratios and in comparison with the two great divisions of natural water—the ocean and the great rivers of the world. It is shown that the waters of the Queensland coastal area exhibit low ratios of calcium to magnesium, divalent to monovalent bases (cations), and bicarbonate to chloride.

The second paper deals with the effect of sodium salts on the physical properties of soils. The importance of the ratio of divalent to monovalent ions present in an irrigation water is shown, and the conditions for entry of sodium into the exchange complex of irrigated soils defined. It is shown that until exchangeable sodium constitutes about 15 per cent. of the total exchangeable bases of a soil, the physical properties are not adversely affected. Certain tests for assessing the physical properties of soils are described.

FURTHER INVESTIGATIONAL WORK.

The Garradunga soil fertility survey which was commenced in 1940 in collaboration with Mr. Knust, Instructor in Cane Culture, was continued during the year, and will be completed in the near future. This survey, which is of an area where soils derived from both basalt and schist intermingle, has given excellent results, and has shown up clearly the influence of the parent rocks in the soil produced therefrom. Both rocks in this area decompose to give rise to a red loam of very similar physical characteristics, and it is difficult to tell the difference between the types in the field. The reaction to fertilizer is, however, quite different, and because of this the analytical figures on available nutrients have proved of considerable value, as a guide to the correct fertilizer to use.

Mourilyan Survey.—A fertility survey similar to that carried out in the Garradunga area was commenced in Mourilyan during the year. The soil in this particular area is very sandy and porous. The analytical figures determined were: pH in water and normal potassium chloride; available phosphoric acid, B.S.E.S. method (N/100 H_2SO_4 extract); total replaceable bases, determined from N/20 HCl extract, B.S.E.S. method; and replaceable potash by leaching with N/50 HCl.

The results to date show that these soils are mostly in need of lime to correct soil acidity and are all very low in total replaceable bases (usually less than 1 m.e. per 100 g.). The majority, however, are fairly well supplied with available phosphoric acid, a few only being definitely deficient. All samples but one are very low in available potash.

Further fertility surveys are contemplated in the coming year.

Monthly variations of available plant foods and pH in certain selected soils.—Analytical work on this project was continued on certain soils and further observations commenced on the Bundaberg red forest soil and the Mourilyan sand.

It appears to be well established now that the monthly variations in pH values are not of great importance in the soils studied, and the available phosphoric acid figures fluctuate above and below a fixed value. The replaceable potash figures vary considerably from year to year and month to month in certain soil types, whilst remaining relatively constant in others.

It was unfortunately not possible to investigate further the influences of moisture and temperature on the release of replaceable potash from the soil complex as suggested in last year's Annual Report.

Investigational work is being carried out at present on the physical structure of certain sugar soils, with a view to obtaining general information on the fundamental principles underlying soil structure.

FERTILIZER RATIONING.

A considerable amount of the writer's time was taken up in matters connected with fertilizer rationing, and visits were made to practically all the sugar-growing areas during the year. As a result, certain modifications to the original scheme were put into operation.

STAFF.

During the year a cadet, Mr. K. Leverington, was appointed to the chemical staff, and is being trained in routine analytical work. This cadet will take his science matriculation at the end of the year, and if successful will continue his studies at the University as an evening student during 1945.

Mr. Home, who was previously attached to the chemical staff for portion of his time on soil analytical work, has not been available during the year, as owing to the depletion of the staff of the Mill Technology section, it has been necessary for him to devote his whole time to technology matters.

NORTHERN SUGAR EXPERIMENT STATION, MERINGA.

MR. R. W. MUNGOMERY, Officer in Charge.

METEOROLOGICAL AND NOTES ON CROP GROWTH.

The weather was cold and dry for the early part of the 1943-44 crop and, as the preceding months also had been dry, the spring plantings were made under very adverse conditions. In some instances they had to be delayed till September, when the first substantial rain fell; there was no further useful rain until the end of October, and consequently germinations were affected. A hot, dry November, followed by parching northerly winds in December, severely affected both plant and ratoon crops. A record maximum shade temperature of 111 deg. F. was recorded in December and many stools in the drier soils died. Relief came from thunderstorms at the end of the year and most crops made a quick recovery.

The wet season commenced in the middle of January, and copious rains for the following three months kept the cane growing rapidly. However, owing to the drought in the initial stages of the crop, the stooling generally was light and this, combined with an early cessation of growth, made a normal crop unattainable. The rains ceased in the middle of April, temperatures fell, and as the soil dried out, growth virtually ceased; when rain fell again in June the weather was too cold for much growth. Squally winds which accompanied these rains resulted in much of the late grub-damaged cane being lodged; in some instances a large proportion of the stools were uprooted.

The following are the rainfall records taken at this Experiment Station during the past twenty years, and an abstract of meteorological observations for the period 1st July, 1943, to 30th June, 1944:—

Year.	Rainfall in Inches.	Year.	Rainfall in Inches.
1924	95·67	1935	59·91
1925	76·98	1936	88·81
1926	59·12	1937	46·33
1927	90·16	1938	55·86
1928	66·33	1939	118·08
1929	102·28	1940	84·58
1930	107·61	1941	84·65
1931	98·82	1942	60·14
1932	76·31	1943	47·31
1933	96·06	1944 (6 months)	46·05
1934	91·44	Average for 28 years	79·88

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT THE SUGAR EXPERIMENT STATION, MERINGA, FROM 1ST JULY, 1943, TO 30TH JUNE, 1944.

Month.	Rainfall. (Inches.)	Number of Wet Days.	Shade Temperatures.						Mean Diurnal Range.	Mean Temperature 9 a.m.	Mean Per cent. Relative Humidity 9 a.m.
			Maximum.			Minimum.					
			High.	Low.	Mean.	High.	Low.	Mean.			
1943.											
July	0·11	2	87·8	71·5	82·7	69·0	43·3	60·7	22·0	73·6	76
August	0·08	1	91·2	84·0	86·9	67·6	51·5	58·3	28·6	76·0	72
September	2·17	6	98·5	76·0	88·8	70·4	52·1	62·0	26·7	77·6	75
October	1·29	9	96·3	83·6	91·1	74·0	57·2	66·5	24·5	78·4	79
November	0·33	7	97·0	89·0	92·1	74·2	63·0	68·9	23·9	79·6	75
December	2·89	11	111·0	89·0	97·2	76·0	64·8	73·1	23·7	84·8	76
1944.											
January	5·11	14	100·9	85·0	94·1	79·8	69·4	74·3	20·4	81·4	82
February	23·32	22	96·3	83·2	90·0	76·3	68·0	73·0	17·0	79·1	91
March	10·81	24	94·2	81·4	87·9	76·2	65·0	70·9	17·1	76·5	90
April	1·82	9	88·5	84·8	86·5	74·5	55·6	65·9	20·2	78·3	79
May	0·45	2	88·7	80·0	84·8	71·0	48·0	58·2	26·4	72·5	78
June	4·54	17	82·5	73·5	78·3	68·2	50·8	63·1	15·1	71·6	85
Totals	52·92	124	..	..	..	..	..	..	..	..	..

GENERAL.

The better organisation of Australian food production having resulted in vegetables being produced in the most suitable districts, the Northern Queensland wet coastal areas declined sharply in importance as vegetable producing centres; and with the sugar out-turn falling to dangerous levels, it became imperative to use all available cane-land for cane. Accordingly, the vegetable programme on the Station was much restricted and the normal cane-seedling work resumed. Lack of both staff and labour was a serious handicap, but normal plantings of seedlings and parent canes were made and it is considered that the extra effort required has been well worthwhile, since any serious future hiatus in the propagation of commercial seedlings has thereby been avoided.

The cessation of breeding work for one year gave an opportunity to ratoon all seedlings from the originals onwards, and this feature has now been incorporated in the ordinary routine. Whilst this leads to a reduction of approximately 30 per cent. in the number of original seedlings planted each year, owing to the limited area of suitable land available on the Station, it should be very valuable in allowing selection from two crops of every seedling, instead of one, and will give indications of the ratooning abilities at an earlier stage than has hitherto been possible.

The following trials were harvested during the past season:—

OBSERVATIONAL VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

B.304 31.4	Q.13 35.8	B.282 30.0	Q.13 32.7	B.232 33.6
B.246 38.1	B.224 35.8	B.258 48.5	B.210 35.0	B.205 35.9
B.248 40.3	Q.13 43.5	B.323 36.0	Q.13 39.7	B.206 33.6
B.283 24.4	B.292 25.4	B.212 29.9	B.287 32.6	B.302 30.5

Block.—A.6.
Harvested.—August, 1943.
Age of Crop.—Twelve months.
Plan.—Single plots.
Plots.—0.0525 acre.

SUMMARY OF YIELDS.

Variety.	Cane per Acre.		C.C.S. in Cane.
	Seedling.	Nearest Q.13 Plot.	
	Tons.	Tons.	Per cent.
B.205	35·9	36·2	14·1
B.206	33·6	39·7	18·0
B.210	35·0	36·2	15·8
B.212	29·9	41·6	19·0
B.224	35·8	39·6	17·4
B.232	33·6	32·7	15·1
B.246	38·1	39·6	13·6
B.248	40·3	43·5	13·7
B.258	48·5	37·9	12·0
B.282	30·0	34·2	15·5
B.283	24·4	43·5	18·8
B.287	32·6	39·7	17·8
B.292	25·4	43·5	14·6
B.302	30·5	39·7	15·3
B.304	31·4	35·8	17·9
B.323	36·0	41·6	16·8
Q.13, average 4 plots	37·9	..	17·4

FIELD TREATMENT.

Prior to planting this block of poor clayey soil, it had been out of cultivation for a period of two years, and during this time attempts were made to improve its physical condition by green-manuring. The first attempt with Poona Pea and Giant Cowpea met with little success owing to the prevalence of wilt during the wet season, and these plants were destroyed in their early stages of growth. Later a winter crop of Dun field peas yielded a fairly even, but light, crop which was ploughed under. This was followed by a sowing of *Crotalaria usaramoensis* in the summer. This legume grew vigorously throughout the wet season and had produced a good bulk of green matter by May, when it was ploughed under. After the rotting of this green crop, the land was worked until it was in good tilth, and finally planted to cane in August, 1942. The plots were fertilized in the drills before planting with S.B. No. 1 Planting Mixture at the rate of 2 cwt. per acre.

GROWTH NOTES.

The strike in most varieties was good. The young plants quickly became established and stooled out in the spring-summer period and thereafter made good headway throughout the wet season. From then onwards growth was less spectacular, although still steady, and the block was eventually harvested in August, 1943—just a year after planting. B.232 arrowed freely, whilst B.302, B.323, B.292, B.246, and B.248 arrowed to a lesser degree.

DISCUSSION.

There is very little for discussion in this trial, and although B.232 has been selected for inclusion in a Latin Square trial to be planted this spring, final selections from this trial will be deferred until the ratoons are harvested.

OBSERVATIONAL VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

	A.255 33.5	A.205 28.4	A.210 28.8	
	Q.13 33.7	K.95 33.1	Q.13 19.9	
	A.280 43.2	A.207 37.4	A.243 23.4	
	A.220 42.5	Q.13 43.4	A.253 32.6	
West	A.278 41.6	A.263 28.8	Badila 26.4	East
	Q.13 40.7	Q.46 24.6	Q.13 26.2	
	A.247 36.9	A.228 34.9	A.233 31.9	
	A.224 35.5	Q.13 41.2	A.232 21.8	
	Q.25 24.3	Atlas 33.2	A.229 30.5	

South

Block.—A.4.
Harvested.—August, 1943.
Age of Crop.—Thirteen months.
Plan.—Single plots.
Plots.—0.04 acre.

SUMMARY OF YIELDS.

Variety.	Plant Crop.		First Ratoon Crop.		Total Two Crops.
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.
	Tons.	Per cent.	Tons.	Per cent.	Tons.
A.205	36·0	9·8	28·4	15·9	64·4
A.207	42·7	10·1	37·4	16·1	80·1
A.210	27·5	13·4	28·8	16·1	56·3
A.220	33·2	9·9	42·5	15·2	75·7
A.224	37·0	12·6	35·5	18·2	72·5
A.228	45·1	10·4	34·9	16·4	80·0
A.229	30·4	10·6	30·5	14·9	60·9
A.232	27·6	13·8	21·8	19·1	49·4
A.233	42·6	9·5	31·9	15·7	74·5
A.243	29·1	11·8	23·4	18·3	52·5
A.247	36·4	11·8	36·9	15·7	73·3
A.253	39·0	13·1	32·6	19·4	71·6
A.263	39·5	12·7	28·8	17·4	68·3
A.278	39·2	11·9	41·6	16·9	80·8
A.280	40·5	10·1	43·2	15·0	83·7
K.95	28·0	13·2	33·1	15·4	61·1
Atlas	46·0	10·4	33·2	13·8	79·2
Badila	27·0	13·5	26·4	19·1	53·4
Q.25	42·1	11·4	24·3	15·0	66·4
Q.46	29·6	14·7	24·6	19·7	54·2
Q.13 (average 6 plots)	37·2	12·9	34·2	18·3	71·4

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Ratoon Crop).

East

Total Two Crops.
Cane per Acre.
Tons.
64·4
80·1
56·3
75·7
72·5
80·0
60·9
49·4
74·5
52·5
73·3
71·6
68·3
80·8
83·7
61·1
79·2
53·4
66·4
54·2
71·4

FIELD TREATMENT.

The plant crop of this trial was harvested in the middle of a fairly wet winter of 1942 when most of the varieties in the block were still immature and in a vigorous state of growth. In addition, the heavy blanket of trash on the cold wet soil subjected the stools to rather severe conditions for ratooning, and many varieties either came away slowly or a number of their stools failed to ratoon. Such treatment quickly revealed the reliable ratooners. Trash was rolled into alternate interspaces and the uncovered rows were ratooned by ploughing away and splitting the centres, after which the block was fertilized uniformly with S.B. No. 1 ratooning mixture at the rate of 2 cwt. per acre.

GROWTH NOTES.

The young ratoons made good steady growth throughout the spring months, and later they were given an application of sulphate of ammonia at the rate of one bag per acre. Heavy rains in December completely saturated the soil and vigorous growth was then maintained until the termination of the wet season; further steady growth continued up to the time of their harvest, and some excellent crops resulted.

DISCUSSION.

In assessing the comparative yields of the different varieties, it is well to bear in mind that a gradient exists between the dry schist soil on the eastern side and the heavier clayey loam on the western side of the block. This is well demonstrated by the yields of the plots of the standard Q.13.

Unfortunately, some of the high-yielding and high-quality canes had to be rejected on account of unfavourable disease reactions as revealed by concurrent disease resistance trials, whilst adverse ratooning characteristics eliminated others. Finally, A.224, A.278, and A.233 were chosen for planting with appropriate standards in a 5 x 5 Latin Square trial.

VARIETAL TRIAL (Ratoon Crop).

PLAN AND YIELDS.

K.58 27.5	**Q.10** 27.0	**Comus** 32.0	**Cato** 29.75	**Q.44** 29.5
Comus 32.9	**Cato** 24.3	**Q.44** 37.3	**Q.10** 26.8	**K.58** 25.25
Q.44 27.3	**Comus** 27.4	**Q.10** 21.0	**K.58** 21.2	**Cato** 25.7
Q.10 22.2	**K.58** 22.8	**Cato** 22.7	**Q.44** 32.0	**Comus** 29.0
Cato 22.1	**Q.44** 36.8	**K.58** 24.9	**Comus** 34.3	**Q.10** 22.0

Block.—A.3.
Harvested.—Late September, 1943.
Age of Crop.—13½ months.
Plan.—5 x 5 Latin Square.
Plots.—0.05 acre.

SUMMARY OF YIELDS.

Variety.	Plant Crop.			First Ratoon Crop.		
	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.
	Tons.	Per cent.	Tons.	Tons.	Per cent.	Tons.
Q.44	39·7	14·7	5·84	32·6	17·3	5·64
Comus	38·1	14·9	5·68	31·1	16·1	4·99
Cato	37·1	14·6	5·41	24·9	16·4	4·08
K.58	35·7	13·2	4·71	24·3	16·9	4·09
Q.10 (standard) ..	31·5	15·4	4·85	23·8	17·6	4·18

FIELD TREATMENT.

After harvesting the plant crop in August, 1942, the trash was rolled into alternate interspaces, and the bare interspaces were ratooned by ploughing away from each row and bursting the centres, after which operation the block was fertilized with S.B. No. 1 ratooning mixture at the rate of 2 cwt. per acre. Any lumpy soil was subsequently fined down by cultivating implements during the process of weed control.

GROWTH NOTES.

Q.44, Comus, and Q.10 were quick to ratoon, whilst Cato and K.58 were both rather slow. However, there were virtually no stool failures in any varieties, and all made good headway during the warmer spring months, though Q.44 and Comus were always outstanding in vigour and, in addition, the former variety covered in very well. In November all plots were given a dressing of sulphate of ammonia at the rate of one bag per acre, and thereafter throughout the wet season growth was fairly regular, but it slowed appreciably when the monsoonal rains terminated. Later on towards winter Q.10, Q44, and Comus all arrowed fairly freely, and the block was finally harvested towards the end of September.

DISCUSSION.

Q.44 and Comus gave significantly higher yields than Cato, K.58, and Q.10, whilst the high C.C.S. of Q.44 confirms earlier indications of its excellent quality when harvested as a mid- or late-season variety.

VEGETABLE PRODUCTION.

In addition to the vegetable supplied in the previous year a further 3½ tons of sweet potatoes were harvested and forwarded to the Committee of Direction of Fruit Marketing, under military contract. Thereafter labour had to be diverted to cane cultivation, and vegetable production lapsed. However, another small area of approximately half an acre was planted to sweet potatoes in order to maintain stocks of some of the most promising named varieties.

LABORATORY WORK.

The following is a summary of the analyses carried out during the year:—

Cane (Experiment Station samples)	130
Cane (farm trials)	39
Cane (growers' samples)	4
Soil (lime tests)	2
Total	175

CROP SUMMARY.

	Tons.
Cane sent to mill	325·5
Cane used for plants, samples, &c.	34·8
Total	360·3
Total area harvested	15·1 acres
Tons per acre harvested	23·86 tons
Class of cane—	Per cent.
Plant cane	10·4
Ratoon cane	89·6

CENTRAL SUGAR EXPERIMENT STATION, MACKAY.

MR. D. L. McBRYDE, Chemist in Charge.

METEOROLOGICAL AND CROP GROWTH REPORTS.

Exceptionally dry weather conditions prevailed throughout the months of July and August, during which period no rain whatever was recorded. As a consequence, mature crops were severely affected by the droughty conditions, but were freshened somewhat by the rain which fell in September and early October. These falls, which were well above average, gave the young cane an excellent start which enabled it to continue growing satisfactorily to the end of the year, despite the fact that November was a dry month, and only half the average monthly rainfall was received for December.

Grasshoppers made their appearance in the district towards the end of the year, and their numbers reached plague proportions in January and February. This pest was responsible for the defoliation of much of the cane, so that with the advent of the wet season in early February, the cane was given little or no cover. Grass and weeds were thus enabled to grow at a much greater rate than normal and undoubtedly influenced adversely the yields of crops which were inclined to be backward.

The rainfall for the months of February and March was appreciably above normal. The cane made rapid growth during these months and became so well established that it was able to stand up to the dry conditions of April and May, and yields generally are expected to be higher than those of last year.

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT THE SUGAR EXPERIMENT STATION, MACKAY, FROM 1ST JULY, 1943, TO 30TH JUNE, 1944.

Month.	Rainfall. (Inches.)	Number of Wet Days.	Average Rainfall.	Shade Temperatures.					
				Maximum.			Minimum.		
				High.	Low.	Mean.	High.	Low.	Mean.
1943.									
July	0	0	1·35	82·5	69·0	75·9	61·5	37·0	47·7
August	0	0	1·03	87·5	71·0	79·5	60·5	39·5	50·5
September	4·77	6	1·70	91·0	70·0	82·7	71·5	48·5	60·4
October	2·74	11	1·67	93·0	79·0	86·3	73·0	54·0	64·4
November	0·20	5	3·14	96·5	84·0	88·6	72·0	57·5	65·7
December	3·19	9	7·01	96·0	77·0	91·0	76·5	65·0	69·9
1944.									
January	6·97	13	13·63	94·5	82·0	89·1	77·0	61·0	70·7
February	18·33	24	12·16	91·0	77·0	85·9	75·0	67·5	70·9
March	17·44	29	10·57	95·0	73·5	82·8	75·0	63·5	69·7
April	1·38	11	5·54	87·0	76·0	82·2	69·0	51·5	61·1
May	1·17	7	3·18	84·5	74·5	79·7	65·0	43·5	50·8
June	2·48	10	2·62	79·0	64·5	74·2	63·5	37·0	54·6
Totals	58·67	125	63·60	..	..	..	..	..	..

ANNUAL RAINFALL SINCE 1920 AT THE SUGAR EXPERIMENT STATION, MACKAY.

Year.	Rainfall in Inches.	Year.	Rainfall in Inches.
1920	57·27	1933	71·94
1921	95·89	1934	37·57
1922	34·47	1935	45·15
1923	25·23	1936	97·37
1924	53·37	1937	56·60
1925	54·80	1938	52·18
1926	34·60	1939	56·14
1927	83·87	1940	84·97
1928	72·28	1941	71·38
1929	64·03	1942	77·92
1930	55·81	1943	60·11
1931	30·01	1944 (6 months)	47·77
1932	48·48	Average 24 years	59·27

The following varietal and fertilizer trials were harvested during the period:—

VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

I.21	I.26	I.15	Q.813	H.45
20.0	22.4	12.2	6.0	12.8
H.45	I.15	Q.813	I.21	I.26
16.4	13.0	17.2	12.0	21.4
Q.813	I.21	H.45	I.26	I.15
18.4	15.4	14.8	22.0	7.8
I.26	H.45	I.21	I.15	Q.813
26.4	19.0	18.8	8.2	8.0
I.15	Q.813	I.26	H.45	I.21
22.0	21.0	24.2	15.2	13.6

Block.—A.4.
Planted.—August, 1942.
Harvested.—September, 1943.
Age of Crop.—13½ months.
Plan.—5 x 5 Latin Square.
Plots.—0.0625 acre.
Fertilizer.—2 cwt. meatworks in drills before planting. No nitrogenous fertilizer applied to the crop.

SUMMARY OF YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.
	Tons.	Per Cent.	Tons.
H.45	15·6	15·5	2·42
I.15	12·6	15·7	1·98
I.21	16·0	16·0	2·56
I.26	23·3	16·5	3·84
Q.813	14·1	16·3	2·30

GROWTH NOTES.

Cane did well till December, but the field was too wet for cultivation thereafter, and the crop suffered from this neglect. Soil was water-logged in February, and most of the varieties failed to make a satisfactory showing afterwards.

DISCUSSION.

Statistical analysis shows that the yield of I.26 exceeds those of I.21, H.45, Q.813 and I.15 at the 1 per cent. level of significance. No other differences are significant. It is considered that I.26 is the only one of these new seedlings which is worth further trial, and it will be planted out in small propagation plots in the Mackay district.

VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

G.22	Q.20	Q.28	Q.813	Q.25
24.0	12.0	28.9	13.1	30.4
Q.813	Q.25	G.22	Q.20	Q.28
5.8	24.9	23.0	12.0	29.0
Q.20	Q.28	Q.813	Q.25	G.22
14.8	21.6	7.2	29.0	24.0
Q.25	G.22	Q.20	Q.28	Q.813
26.5	22.2	7.4	29.0	7.2
Q.28	Q.813	Q.25	G.22	Q.20
32.1	4.8	25.0	21.0	17.0

Block.—B.2.
Harvested.—October, 1943.
Age of Crop.—14 months.
Plan.—5 x 5 Latin Square.
Plots.—0.0625 acre.
Fertilizer.—2 cwt. meatworks at ratooning, and one top-dressing of 1½ cwt. per acre sulphate of ammonia at later date.

SUMMARY OF YIELDS.

Variety.	Plant.			Ratoon.		
	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.	Cane. per Acre.	C.C..S in Cane.	C.C.S. per Acre.
	Tons.	Per Cent.	Tons.	Tons.	Per Cent.	Tons.
G.22 ..	22·9	13·0	2·98	22·8	14·3	3·26
Q.20 ..	16·6	16·6	2·76	12·6	13·5	1·70
Q.25 ..	22·4	14·1	3·16	27·2	15·4	4·19
Q.28 ..	25·9	15·5	4·01	28·1	15·3	4·30
Q.813 ..	14·3	17·2	2·46	7·6	14·3	1·09

GROWTH NOTES.

The cane did well until late in the wet season when the excessive wetness and lack of cultivation seriously retarded growth. The crop was very parched by drought for some weeks before being harvested at the end of October.

DISCUSSION.

Statistical analysis shows that on yield of cane per acre, Q.28 exceeds G.22, Q.20 and Q.813 at the 1 per cent. level of significance; Q.25 exceeds Q.20 and Q.813 at the 1 per cent. level of significance, and G.22 at the 5 per cent. level. G.22 exceeds Q.20 and Q.813 at the 1 per cent. level of significance, and Q. 20 exceeds Q.813 at the 5 per cent. level of significance.

It is considered that G.22 is not worth further trial, and it is being discarded. Q.20, chiefly owing to its very bad growth habit and rather low vigour, is rapidly losing favour in the Mackay district. Q.25 is still under observation, whilst Q.28 is becoming very popular and is being planted on a large scale.

OBSERVATIONAL VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

B.154 7.3	B.120 11.0	Q.813 9.0
Q.813 17.3	B.141 7.3	B.169 26.3
B.175 10.3	B.164 13.8	B.174 25.5
B.160 16.0	B.138 12.0	Q.813 9.8
Q.813 12.0	B.158 13.3	B.137 17.8
B.172 17.8	B.153 5.8	B.118 9.0
B.156 5.8	Q.813 8.5	B.173 16.0

Block.—A.4.
Harvested.—September, 1943.
Age of Crop.—13½ months.
Plan.—Single plot.
Plots.—0.05 acre.
Fertilizer.—2 cwt. meatworks in drills at planting time. No nitrogenous fertilizers applied.

SUMMARY OF YIELDS.

Variety.	Cane per Acre.	Cane per Acre of nearest Q.813 Plot.	C.C.S. in Cane.
	Tons.	Tons.	Per Cent.
B.118	9·0	8·5	14·0
B.120	11·0	13·1	12·5
B.137	17·8	9·8	15·9
B.138	12·0	10·9	14·6
B.141	7·3	17·3	14·9
B.153	5·8	10·2	14·0
B.154	7·3	17·3	14·9
B.156	5·8	8·5	14·5
B.158	13·3	10·9	12·8
B.160	16·3	12·0	15·9
B.164	13·8	13·5	13·5
B.169	26·3	9·0	12·9
B.172	17·8	10·2	14·4
B.173	16·0	8·5	14·9
B.174	25·5	9·8	15·0
B.175	10·3	17·3	15·6
Q.813 (average of 5 plots)	11·3	..	15·8

GROWTH NOTES.

All canes grew reasonably well until the middle of the wet season, when water-logging occurred. This, combined with the bad effects of insufficient cultivation, checked appreciably the growth of most of the varieties.

DISCUSSION.

The difference in yields of the five Q.813 plots shows that the fertility of the block is somewhat variable, and in comparing the yields of the different varieties, reference should be made to the yield of the nearest Q.813 plot. The crop will be ratooned and selections made at the completion of the next harvest.

OBSERVATIONAL VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

A.103 25.0	A.130 32.5	A.147 27.0	A.178 18.3
Atlas 16.0	Q.813 16.0	A.101 18.3	Q.813 14.5
A.124 25.0	A.150 20.0	A.192 17.5	A.123 12.3
A.155 19.8	A.100 17.5	A.187 21.3	A.146 22.0
Q.29 16.0	Q.813 13.5	A.143 13.8	Q.813 13.8

Block.—B.2.
Ratooned.—September, 1942.
Harvested.—October, 1943.
Age of Crop.—13 months.
Plan.—Single plot.
Plots.—0.05 acre.
Fertilizer.—2 bags meatworks at time of ratooning, and 1½ cwt. sulphate of ammonia as a top dressing in December, 1943.

SUMMARY OF YIELDS.

Variety.	Plant.			Ratoon.		
	Cane per Acre.	Nearest Q.813 Plot.	C.C.S. in Cane.	Cane per Acre.	Nearest Q.813 Plot.	C.C.S. in Cane.
	Tons.	Tons.	Per Cent.	Tons.	Tons.	Per Cent.
A.100 ..	17·8	16·8	..	17·5	13·5	15·4
A.101 ..	21·5	18·5	..	18·3	15·2	15·8
A.103 ..	20·0	19·5	14·0	25·0	16·0	..
A.123 ..	14·5	17·5	..	12·3	14·5	16·2
A.124 ..	22·8	19·5	..	25·0	16·0	15·7
A.130 ..	25·5	19·5	14·1	32·5	16·0	14·8
A.143 ..	16·8	16·5	..	13·8	13·8	15·6
A.146 ..	20·8	16·3	..	22·0	13·8	14·2
A.147 ..	22·5	18·5	15·1	27·0	15·2	15·7
A.150 ..	14·5	19·5	..	20·0	16·0	15·3
A.155 ..	22·0	16·8	..	19·8	13·5	15·5
A.178 ..	18·0	17·5	..	18·3	14·5	15·4
A.187 ..	20·0	16·5	15·2	21·3	13·6	13·5
A.192 ..	23·3	18·5	..	17·5	15·2	16·0
Q.29 ..	19·3	16·8	..	16·0	13·5	15·3
Atlas ..	21·0	19·5	..	16·0	16·0	13·9
Q.813 ..	17·5	..	16·7	14·4	..	16·0

GROWTH NOTES.

The cane grew well until the middle of the wet season, when excessive moisture caused waterlogging and this, combined with the consequent lack of necessary cultivation, was responsible for the comparatively poor yields.

DISCUSSION.

A.130 and A.147 were the most impressive canes in this trial and together with A.124 and A.146 have been planted in a Latin Square trial.

FERTILIZER TRIAL (Third Ratoon Crop).

PLAN AND YIELDS.

(1N0P1K) 1N 25.8	(2N0P2K) 2N 27.0	(0N2P1K) 0N 17.0
(2N2P0K) 2N 29.0	(0N1P2K) 0N 21.4	(1N1P0K) 1N 25.6
(1N2P2K) 1N 22.2	(2N1P1K) 2N 30.2	(0N0P0K) 0N 21.0
(0N0P2K) 0N 20.2	(1N1P2K) 1N 22.4	(2N0P1K) 2N 26.0
(2N2P2K) 2N 23.8	(1N0P0K) 1N 24.0	(0N2P0K) 0N 16.0
(0N1P1K) 0N 24.0	(1N2P1K) 1N 24.8	(2N1P0K) 2N 27.8
(2N2P1K) 2N 31.8	(0N1P0K) 0N 16.4	(0N0P1K) 0N 20.0
(1N0P2K) 1N 28.6	(1N1P1K) 1N 22.0	(0N2P2K) 0N 21.4
(2N1P2K) 2N 27.2	(2N0P0K) 2N 27.1	(1N2P0K) 1N 26.4

Block.—B.3.
Harvested.—October, 1943.
Age of crops.—14 months.
Variety.—Q.28.
Plan.—3 x 9 randomised blocks.
Fertilizer.—Figures in brackets apply to the fertilizers received by plant, 1st ratoon, and 2nd ratoon crops only. Plots did not receive any phosphatic or potassic fertilizers for the third ratoon crop. All N plots received a top-dressing of sulphate of ammonia in December, 1942, the 1N plots receiving 200 lb. per acre, and the 2N twice that amount.

SUMMARY OF YIELDS

(Based on Treatments to the Plant, First and Second Ratoon Crops).

Treatment.	Cane per Acre.			
	Plant.	1st Ratoon.	2nd Ratoon.	3rd Ratoon.
	Tons.	Tons.	Tons.	Tons.
0N	30·2	22·2	17·6	17·5
1N	30·8	25·5	25·3	22·1
2N	31·7	26·5	26·2	25·0
0P	30·5	24·6	22·9	22·1
1P	31·0	23·9	22·0	22·4
2P	31·1	25·7	24·3	20·2
0K	30·9	25·3	22·1	20·5
1K	30·8	23·8	22·7	22·1
2K	30·9	25·2	24·4	22·2

GROWTH NOTES.

The ratoons came away well in all plots and made good headway until the land became water-logged in February, when further growth was considerably retarded.

DISCUSSION.

Statistical analysis shows that the yields from 1N and 2N are both highly significantly greater than 0N and those from 2N are significantly greater than 1N. This shows the need for heavy nitrogenous applications to ratoons on this soil. There was no significant increase to either P or K in plant, first or second ratoon crops, and no carry over effect of these fertilizers was noticeable in the yields of the third ratoons.

This crop has been carried on to fourth ratoons as a nitrate of soda/sulphate of ammonia comparison trial, all plots receiving ample P and K.

LABORATORY WORK.

The following C.C.S. determinations were made at the Station during the year:—

Station samples	58
Farmers' samples	[illegible]
Farm trials	[illegible]
Show canes	41
Total	103

CROP RETURNS.

Total cane harvested	506·4 tons
Total area harvested	28·0 acres
Average Tons per Acre	18·1

Class of Cane—	per cent.
Plant	48·3
Ratoons	51·7
	100·0

SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG.

MR. N. J. KING, Chemist in Charge.

METEOROLOGICAL AND NOTES ON CROP GROWTH.

The rainless July, rather than being a factor adversely affecting the crop, was more beneficial than otherwise. The previous month was one of killing frosts and the dry weather allowed crops to be harvested without the serious loss in sugar content through deterioration which would have occurred had rain subsequently fallen. From this time to the end of 1943, rains far better than avearge fell throughout the district and the young plant and ratoon cane made marked growth. Generally the southern district experiences a long dry period at this time of the year, making the early growth of plant and ratoons slow and precarious, but by December it appeared as if a record season was in sight for 1944. Further good rains were received during January and early February, but from mid-February onwards to the end of June,, 1944, the rains were deficient and badly distributed, resulting in slow and erratic crop growth over the last four months of the year under review. What promised to be a record season for Bundaberg turned out to be just an average one. Actually, the rain which fell was sufficient to produce much more cane than it did, but the shortage of fertilizer and the larger than usual percentage of old ratoon cane, due to labour shortage, militated against rapid growth in the favourable months.

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT THE SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG, FROM 1ST JULY, 1943, TO 30TH JUNE, 1944.

Month.	Rainfall. (inches).	Number of Wet Days.	Shade Temperatures.						Mean Diurnal Range.
			Maximum.			Minimum.			
			High.	Low.	Mean.	High.	Low.	Mean.	
1943.									
July	0·00	0	75	65	71·2	57	35	43·5	27·7
August	0·88	3	83	61	72·6	65	35	46·8	25·8
September	2·24	4	83	68	77·3	70	47	57·2	20·1
October	12·30	11	89	65	78·8	70	54	61·2	17·6
November	3·20	9	87	78	81·8	71	55	64·6	17·2
December	5·03	7	89	82	84·8	77	62	67·9	16·9
1944.									
January	9·36	9	90	82	86·5	76	66	70·3	16·2
February	6·04	8	88	76	84·1	78	66	70·1	14·0
March	3·27	9	92	75	83·2	73	59	65·8	17·4
April	0·32	3	86	80	83·2	68	44	59·7	23·5
May	1·71	4	85	69	75·7	63	41	51·2	24·5
June	0·87	3	78	67	71·7	67	39	56·0	15·7

The following are the rainfall records taken at this station since the Experiment Station began operations in 1914. To conform with the year covered by the report, the rainfalls are given for the growing season beginning in July and ending in June:—

1914–1915	31·99	1929–1930	43·16
1915–1916	28·54	1930–1931	47·19
1916–1917	58·08	1931–1932	22·88
1917–1918	49·85	1932–1933	36·81
1918–1919	24·24	1933–1934	71·45
1919–1920	28·20	1934–1935	40·01
1920–1921	45·16	1935–1936	44·24
1921–1922	44·97	1936–1937	31·65
1922–1923	37·14	1937–1938	44·40
1923–1924	34·16	1938–1939	41·01
1924–1925	50·96	1939–1940	41·69
1925–1926	37·62	1940–1941	43·26
1926–1927	68·18	1941–1942	33·52
1927–1928	74·69	1942–1943	40·75
1928–1929	31·16	1943–1944	45·22

WORK OF THE STATION.

VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

Q.42 35.5	**I.6** 38.0	**I.15** 48.5	**I.11** 34.8	**I.12** 31.1
I.15 32.9	**I.11** 25.0	**I.6** 32.9	**I.12** 32.0	**Q.42** 29.3
I.12 34.5	**I.15** 39.4	**I.11** 32.9	**Q.42** 23.8	**I.6** 28.4
I.6 31.8	**I.12** 27.5	**Q.42** 35.7	**I.15** 28.4	**I.11** 26.3
I.11 30.9	**Q.42** 30.2	**I.12** 26.6	**I.6** 32.7	**I.15** 28.8

Block.—A.1.
Harvested.—November, 1943.
Age of Crop.—Fourteen and one-half months.
Plan.—5 x 5 Latin Square.
Rows per plot.—Eight.
Plot.—0.0546 acre.
Fertilizer.—Three cwt. per acre Sugar Bureau No. 2 Mixture.

SUMMARY OF YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.
	Tons.	Per cent.	Tons.
Q.42	30·9	15·7	4·85
I.6	32·8	14·3	4·69
I.11	30·0	14·5	4·35
I.12	30·3	14·5	4·39
I.15	35·6	13·9	4·95

GROWTH NOTES.

All varieties struck well. Q.42 was slowest in germination but soon caught up. Fair progress was made during September, October, and November, 1942, and the good December rains promoted rapid growth. A dry spell in January gave a check to growth, but favourable growing conditions in February forced rapid growth in that month and March. Prior to harvest, growth was again taking place in October and November, 1943, as a result of good rains. This late growth made the sugar content drop.

DISCUSSION.

Analysis of results shows that there is no significant difference between the yields per acre of the different varieties. The trial will be ratooned and the results of both crops considered before making any decision concerning the new canes. In the meantime, disease resistance trials have demonstrated that all these canes are resistant to downy mildew, but that I.6 is unfortunately susceptible to Fiji.

VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

I.6 46.5	**I.11** 34.5	**I.9** 38.4	**H.6** 44.6	**Co.290** 25.1
I.9 51.2	**Co.290** 29.4	**H.6** 50.2	**I.11** 32.6	**I.6** 38.1
H.6 37.4	**I.9** 45.6	**I.6** 43.8	**Co.290** 24.4	**I.11** 33.1
I.11 30.2	**I.6** 36.4	**Co.290** 26.3	**I.9** 33.8	**H.6** 50.8
Co.290 28.9	**H.6** 51.9	**I.11** 36.4	**I.6** 41.5	**I.9** 44.5

Block.—A.2.
Harvested.—November, 1943.
Age of Crop.—Thirteen months.
Plan.—5 x 5 Latin Square.
Rows per plot.—Eight.
Plot.—0.0518 acre.
Fertilizers.—Three cwt. per acre Sugar Bureau No. 3 Ratooning Mixture, plus one bag per acre sulphate of ammonia.

SUMMARY OF YIELDS.

Variety.	Plant Crop.			First Ratoon Crop.		
	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.
	Tons.	Per cent.	Tons.	Tons.	Per cent.	Tons.
H.6	29·6	13·0	3·85	47·0	14·3	6·72
I.6	26·1	15·9	4·15	41·3	15·4	6·36
I.9 (Q.48)	27·9	13·7	3·82	42·7	14·4	6·15
I.11	24·5	15·3	3·75	33·4	15·6	5·21
Co.290	23·1	12·4	2·86	26·8	13·8	3·70

GROWTH NOTES.

All ratoons came away strongly in spring, 1942. H.6 was always ahead and most plots appeared superior to the standard Co.290. I.9, which is now designated Q.48, also looked promising right through the growing period. In dry spells, when Co.290 showed distress and wind burn, H.6 and I.9 (Q.48) kept fresh and green. No varieties were affected by the heavy frosts. I.9 gives excellent cover and may be a good standover type.

DISCUSSION.

The trial is an excellent illustration of the wisdom of considering both plant and ratoon crop performances before making any decisions; results from the plant crop were inconclusive (so that I.6 and I.11 were planted in another Latin Square trial for further test, *vide* Block A.1), but considered with those from the ratoons, when H.6. I.6, and Q.48 all outyielded the C.290 at the 1 per cent. level of significance, they show that at least three of the seedlings yield better than the standard. Q.48, in resistance trials, gave evidence of being commercially resistant to both downy mildew and Fiji diseases, and has now been propagated in the Bundaberg area; H.6 has also been planted off the Station.

VARIETAL TRIAL (Second Ratoon Crop).

PLAN AND YIELDS.

P.O.J.2878 26.0	Co.290 33.0	Q.25 29.0
Q.25 28.5	P.O.J.2878 19.1	Co.290 25.6
Co.290 26.6	Q.25 24.2	P.O.J.2878 19.2
Q.25 26.2	P.O.J.2878 18.0	Co.290 20.5
P.O.J.2878 21.0	Co.290 21.7	Q.25 26.2
Co.290 21.2	Q.25 23.6	P.O.J.2878 19.2

Block.—B.3.
Harvested.—October, 1943.
Age of crop.—Twelve months.
Plan.—Duplicate 3 x 3 Latin Square.
Rows per plot.—Ten.
Plots.—0.0847 acre.
Fertilizer.—Three cwt. per acre Sugar Bureau No. 3 mixture, plus 250 lbs. per acre sulphate of ammonia in December, 1942.

SUMMARY OF YIELDS.

Variety.	Plant Cane.			First Ratoon Cane.			Second Ratoon Cane.		
	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.
	Tons.	Per cent.	Tons.	Tons.	Per cent.	Tons.	Tons.	Per cent.	Tons.
Co.290	28·5	14·6	4·16	22·3	13·2	2·94	24·8	15·2	3·77
P.O.J.2878	33·9	14·0	4·75	23·9	13·8	3·30	20·4	14·7	3·00
Q.25	36·8	13·9	5·12	25·5	14·0	3·57	26·3	14·3	3·76

GROWTH NOTES.

This block was rather poor throughout the period of growth. P.O.J.2878 lagged behind badly and the C.290 and Q.25 were always superior in height. The cane did not appear to react well to the good growing months—December and February—although the ultimate crop was fairly satisfactory as a second ratoon. This cutting completes the rotation of this experiment.

DISCUSSION.

This trial was planted in 1940, when Q.25 was one of the new seedlings and was designed to test Q.25 against the popular varieties, Co.290 and P.O.J.2878 on the red volcanic soils. Three crops have now been harvested, and in the absence of a standover, when it would be expected that P.O.J.2878 would show to advantage, it appears that Q.25 is somewhat superior to the others. The analysis of the crop results for the second ratoons shows that Q.25 and C.290 outyielded P.O.J.2878 at the 5 per cent. level of significance.

OBSERVATIONAL VARIETAL TRIAL (Second Ratoon Crop).

PLAN AND YIELDS.

I.6 34.6	I.31 26.3	I.11 20.5	I.43 27.0
Co.290 23.8	I.46 28.5	Co.290 22.3	I.62 16.6
I.12 26.3	I.38 21.9	I.35 32.4	I.9 35.6
I.27 28.1	Co.290 15.9	I.15 20.9	Co.290 20.9
I.25 25.9	I.64 17.7	I.49 18.0	I.41 20.2

Block.—D.1.
Harvested.—November-December, 1943.
Age of crop.—Thirteen months.
Plan.—Single plots.
Rows per plot.—Eight.
Plots.—0.0347 acre.
Fertilizer.—Three cwt. per acre Sugar Bureau No. 2 Mixture was applied uniformly, followed later by a top dressing of one bag of sulphate of ammonia.

SUMMARY OF YIELDS.

Variety.	Plant Cane.		First Ratton Cane.		Second Ratoon Cane.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.	Tons.	Per cent.
I.6	49·0	15·1	40·1	15·2	34·6	13·4
I.9 (Q.48)	41·5	15·8	32·3	15·0	35·6	14·1
I.11	51·2	15·1	40·7	14·8	20·5	14·4
I.12	37·8	15·2	31·5	14·4	26·3	15·2
I.15	39·4	14·3	30·1	15·8	20·9	14·1
I.25	38·2	15·7	20·6	15·9	25·9	15·4
I.27	35·7	15·7	28·4	15·2	28·1	14·3
I.31	45·5	14·9	35·2	15·4	26·3	13·0
I.35	48·3	14·8	39·9	15·5	32·4	15·4
I.38	49·5	14·0	40·2	15·2	21·9	15·1
I.41	33·6	17·4	26·4	14·8	20·2	15·7
I.43	56·3	14·5	42·8	14·9	27·0	15·0
I.46	46·3	12·8	36·7	15·2	28·5	12·4
I.49	37·1	16·0	29·3	14·6	18·0	16·0
I.62	40·4	16·2	31·9	15·0	16·6	12·7
I.64	40·8	14·9	32·7	14·9	17·7	13·9
Co.290 (4 plots) ..	37·0	14·4	26·9	14·5	20·7	14·1

GROWTH NOTES.

Ratoons came away well and made fair progress, but growth was at no time rapid. The upper end of the block was always ahead, owing to the moisture gradient, as is shown by the difference in yield of the standard cane plots. All varieties were growing fast at harvest time.

DISCUSSION.

Selections from this trial have already been tested further (Block A.2), but it is of interest to note the performances in this plot in comparison with the adjacent standard Co.290—

Variety.	Tons Cane per Acre.			
	Plant.	First Ratoon.	Second Ratoon.	Total.
I.6	49·0	40·1	34·6	123·7
Co.290	37·8	26·4	23·8	88·0
I.11	51·2	40·7	20·5	112·4
Co.290	44·7	29·3	22·3	96·3
Q.48	41·5	32·3	35·6	109·4
Co.290	38·9	27·6	20·9	87·4

OBSERVATIONAL VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

Co.290 25.5	**P.O.J.2878** 22.9	**Q.42** 29.0	**I.65** 31.9
Q.20 17.5	**30S.N.673 (Atlas)** 27.1	**P.O.J.2878** 21.8	**C.P.29/116** 43.3
H.3 37.9	**Q.25** 27.2	**I.17** 6.7	**P.O.J.2878** 30.8
P.O.J.2878 30.9	**I.10** 26.2	**I.21** 38.2	**I.4** 30.1

Block.—A.3.
Harvested.—November, 1943.
Age of crop.—Fourteen months.
Plan.—Single plots.
Rows per plot.—Eight.
Plots.—0.0785 acre.

The varieties for this trial were selected as being suitable types for standover purposes.

SUMMARY OF YIELDS.

Variety.	Standover Plant.		First Ratoon Crop.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.
H.3	48·3	12·3	37·9	15·0
I.4	45·5	11·7	30·1	15·8
I.10	40·8	12·2	26·2	15·3
I.17	32·0	8·9	6·7	12·9
I.21 (Q.49)	51·8	12·6	38·2	..
I.65	37·4	12·1	31·9	14·1
Q.20	20·4	13·6*	17·5	16·4*
Q.25	36·1	12·2	27·2	15·8
Q.42	45·5	13·8	29·0	16·7
Co.290	17·7	10·3	25·5	13·8
C.P.29/116	60·4	13·7	43·3	15·9
30 S.N.673 (Atlas)	39·9	12·9	27·1	16·7
P.O.J.2878 (4 plots)	36·2	13·0	26·6	16·0

* Mixture of Q.20 and P.O.J.2878 due to heavy supplying.

GROWTH NOTES.

The plant crop—which was a standover one—was harvested in 1942. After burning crop residues, ratooning and fertilizing, the ratoons all came away well, except I.17, which was very slow. Owing to its excellent initial growth, C.P. 29/116 established an early lead, and produced a heavy crop. I.21 was outstanding amongst the others for growth and freshness during dry spells. All other varieties performed well on what is considered one of the driest blocks on the station. The cane on Atlas was not long, but the stools were exceptionally large.

DISCUSSION.

In examining the results from yield observation trials it should always be borne in mind that comparisons are made between individual plots of the standard and the seedling under test, and that full value is not obtained from a comparison with averaged figures. Accordingly, data of both crops for the outstanding canes are detailed below in comparison with the adjacent plot or plots of the P.O.J.2878—

Variety.	Tons per Acre.		
	Plant.	Ratoon.	Total.
Atlas	39·9	27·1	67·0
P.O.J.2878	29·8	22·3	52·1
C.P.29/116	60·4	43·3	103·7
P.O.J.2878	38·4	26·3	64·7
Q.25	36·1	27·2	63·3
P.O.J.2878	35·3	26·3	61·6
Q.42	45·5	29·0	74·5
P.O.J.2878	29·8	22·3	52·1
Q.49	51·8	38·2	90·0
P.O.J.2878	45·7	30·8	76·5

C.P.29/116 was the outstanding cane of the plot; Q.42 also performed well, as did the new cane, Q.49. In the good, red volcanic soil of the Station, Atlas was also apparently superior to P.O.J.2878.

OBSERVATIONAL VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

A.11 25.8	**A.31** 34.1	**A.24** 27.0	**A.45** 28.1
Co.290 28.1	**A.18** 44.5	**Co.290** 28.9	**A.36** 28.1
A.16 35.7	**32-8560** 36.2	**A.22** 31.0	**A.21** 37.5
A.41 27.0	**Co.290** 28.6	**A.43** 34.4	**A.27** 32.0
A.26 36.7	**A.13** 32.8	**A.14** 36.2	**Co.290** 28.6

Block.—E.2.
Harvested.—November, 1943.
Age of crop.—Fourteen months.
Plan.—Single plots.
Rows per plot.—Eight.
Plots.—0.048 acre.
Varieties selected from 40-stool plots of seedlings.

SUMMARY OF YIELDS.

Variety.	Plant Crop.		First Ratoon Crop.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.
A.11	26·8	10·7	25·8	13·9
A.13	18·2	10·8	32·8	12·0
A.14	26·0	11·5	36·2	14·4
A.16	31·3	11·5	35·7	12·2
A.18	25·3	9·0	44·5	12·9
A.21	23·7	10·9	37·5	13·4
A.22	19·5	11·8	31·0	13·8
A.24	25·6	12·3	27·0	13·8
A.26	25·6	9·7	36·7	14·3
A.27	14·1	12·2	32·0	14·9
A.31	28·2	12·3	34·1	16·0
A.36	17·7	7·7	28·1	11·5
A.41	14·6	10·3	27·0	14·4
A.43	24·7	10·5	34·4	12·9
A.45	24·5	9·9	28·1	14·5
32-8560	28·2	11·1	36·2	14·9
Co.290 (4 plots) ..	22·2	10·3	28·6	13·9

GROWTH NOTES.

After harvesting, all crop residues were burnt and the field ratooned and fertilized. All varieties ratooned well and growth was fair during October and November. December rains promoted a rapid advance, but a dry January gave a check during a period when conditions are usually advantageous. A good February rainfall assisted recovery of the crop, but no satisfactory rains fell after this month. Severe frosts failed to affect any of the varieties.

DISCUSSION.

After considering the results of the downy mildew and Fiji disease resistance trials, which caused the discard of several of the seedlings, A.16, A.24, and A.26 were selected as the most promising of this series. They were planted, together with 32-8560, against Co.290 in a Latin Square trial for further testing.

TRASH TRIAL (Standover First Ratoon Crop).

PLAN AND YIELDS.

No Trash	Trash	Trash	No Trash
47.5	43.2	42.6	39.8

Block.—E.3a.
Harvested.—August, 1943.
Age of crop.—Twenty-two and one-half months.
Plan.—Duplicate plots.
Rows per plot.—Twelve.
Plots.—0.382 acre.
Variety.—P.O.J.2878.
Fertilizer.—Four cwt. per acre Sugar Bureau No. 2 Mixture at ratooning, followed by top dressing of one and a-half bags per acre of sulphate of ammonia.

SUMMARY OF YIELDS.

Treatment.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
All trash conserved	42·9	15·1
All trash burned	43·6	15·3

GROWTH NOTES.

After ratooning in 1941 a severe drought delayed growth of the crop until February, 1942. Late growth was not very good, and it was decided in spring, 1942, not to harvest the crop but to stand it over. The standover crop made good progress in December, 1942, and February, 1943, with a resultant good heavy crop of cane for the 1943 harvest.

DISCUSSION.

Since the inauguration of this experiment in 1933 seven crops have been cut from the block. The aggregate tonnage per acre for the seven crops has been:—Trash plots, 222.4; no trash plots, 219.1. There has therefore been no significant increase in yield, on the red volcanic soil, due to conservation of trash combined with normal fertilizer applications.

FORMS OF NITROGEN AND INTERSPACE TRIAL
(Standover Second Ratoon Crop).

Interspace 4 ft. 9 in. 10 rows	32.5	37.1	28.5	36.0	38.0
	A	E	B	D	C
4 ft. 12 rows	37.7	38.6	38.6	37.1	36.5
4 ft.	31.4	26.5	27.0	32.2	37.7
	D	C	A	B	E
4 ft. 9 in.	31.4	23.8	27.3	30.2	36.8
4 ft. 9 in.	35.1	29.9	24.2	34.8	32.5
	C	B	D	E	A
4 ft.	43.7	36.8	38.0	33.4	34.2
4 ft. 9 in.	39.4	36.8	32.5	35.4	46.0
	E	D	C	A	B
4 ft.	42.3	33.0	29.9	31.6	39.1
4 ft.	43.5	31.6	26.8	37.1	40.3
	B	A	E	C	D
4 ft. 9in	40.3	31.1	27.0	28.5	38.3

Block.—B.6.
Harvested.—September, 1943.
Age of crop.—Twenty-four months.
Plan.—Latin Square for nitrogen and half plot method for interspace.
Plots.—Main plots 0.087 acre.
Variety.—P.O.J.2725.
Fertilizer treatments.—
A. No nitrogen.
B. 200 lb. per acre ammonium sulphate.
C. 264 lb. per acre sodium nitrate.
D. 342 lb. per acre dried blood.
E. 200 lb. per acre cyanamide.

All plots received uniformly 3 cwt. per acre of Sugar Bureau No. 3 Ratooning Mixture.

The ratooning mixture and dried blood applications were made alongside the stool at ratooning time. The other nitrogen dressings were applied late in November, 1941, and scarified in.

SUMMARY OF YIELDS.

Treatment.	Plant.		First Ratoon.		Second Ratoon.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.	Tons.	Per cent.
No nitrogen ..	47·9	15·6	29·1	13·7	32·1	14·4
N as sulphate of ammonia ..	49·6	15·2	32·0	13·2	36·5	13·6
N as nitrate of soda	48·9	15·3	31·0	13·4	33·2	14·4
N as dried blood ..	50·6	14·8	31·5	13·3	34·7	14·1
N as cyanamide ..	46·4	15·4	29·9	13·5	35·4	14·0
Interspace 4 ft. 0 in.	47·9	15·3	31·5	13·3	35·4	14·4
Interspace 4 ft. 9 in.	49·5	15·2	29·8	13·5	33·3	13·8

GROWTH NOTES.

After ratooning in 1941, the young crop suffered during an extremely dry period until late in February, 1942. Growth was good for two months, but owing to dry weather the crop was considered too small to harvest when one year old, and it was stood over to 1943. Fortunately no arrowing took place and it was a successful standover crop. Very little dead cane was found at harvest time.

DISCUSSION.

An analysis of the results shows that in this experiment there was no significant difference in yield between the various forms of nitrogen and between the nitrogen treatments and the no nitrogen. The variation in the width of the interspace from four feet to four feet nine inches was also without significance.

FERTILIZER AND PLANT RESIDUE TRIAL (Plant Crop).

PLAN AND YIELDS.

PK	NK	C	NPK	Trash burnt; no green manure
46.5	41.2	36.0	41.5	
NPK	C	PK	NK	Green manure
47.5	32.0	36.8	42.5	
NK	NPK	C	PK	Trash and green manure
48.9	39.0	41.6	44.9	
C	PK	NPK	NK	Trash and green manure
41.6	41.2	40.2	43.7	
PK	NK	C	NPK	Green manure
45.0	46.2	37.7	40.3	
NPK	C	NK	PK	Trash burnt; no green manure
41.3	40.2	42.7	43.2	

Block.—E.4.
Harvested.—October, 1943.
Age of crop.—Nineteen and one-half months.
Plan.—Six randomised blocks.
Rows per plot.—16.
Plots.—0.1074 acre.
Variety.—Q.25.
Treatments.—
a. No trash; no green manure.
b. Green manure.
c. Trash and green manure.

On the green manure plots the legume was grown when the plots were fallowed from cane, and it was ploughed in early in February, 1942. On trash plots the cane was harvested green and on the remainder it was burnt.

N. No nitrogen for the plant crop but all treatments containing N will receive it for the first ratoon crop.
P. 200 lb. superphosphate per acre.
K. 200 lb. muriate of potash per acre.
C. Check plots; no fertilizer.

SUMMARY OF YIELDS.

Treatment.	Fertilizer.				
	C.	NK.	PK.	NPK	Mean.
	Tons.	Tons.	Tons.	Tons.	Tons.
A	38·1	42·0	44·8	41·4	41·6
B	34·8	44·4	40·9	43·9	41·0
C	41·6	46·3	43·0	39·6	42·6

GROWTH NOTES.

The entire block grew well throughout the period—it being one of the best blocks of its age in the district. N and K deficiencies were noticeable after six months, particularly on those sections which had had no green manure crop.

DISCUSSION.

This planting of Q.25 was the second rotation of the same experiment. Plots were planted on exactly the same sites as in the previous planting. This is therefore the fourth crop under the same experimental plan. The crop residues from the trash plots were all ploughed in when the last cutting was made. Peas were sown on the legume plots and ploughed in prior to planting cane.

As mentioned under treatments, no nitrogen was applied to the crop just harvested and the recorded results of the NK and PK plots are really those of K and PK, the N merely being residual from the previous rotation. Although there is a definite suggestion of response to fertilizer in this experiment, the results are not significant, and there is no significant difference between treatments, *a*, *b*, and *c*.

QUALITY OF PLANTING MATERIAL TRIAL (Standover Plant Crop).

PLAN AND YIELDS.

E 48.2	B 22.7	A 23.2	D 47.0	C 18.2
D 47.8	C 20.6	B 18.2	E 40.0	A 19.2
C 20.9	A 17.1	D 39.5	B 14.8	E 44.2
A 19.8	D 40.6	E 39.0	C 18.2	B 15.3
B 19.9	E 41.7	C 18.9	A 18.7	D 41.4

Block.—B.2.

Harvested.—August-September, 1943.

Age of crop.—Thirty months.

Plan.—5 x 5 Latin square.

Rows per plot.—8.

Plots.—0.081 acre.

Variety.—P.O.J.2878.

Treatments.—

A. Phosphate-rich plants: water soaked.

B. Phosphate-rich plants: only top half used.

C. Phosphate-rich plants: not soaked.

D. Phosphate-poor plants: soaked in 5 per cent. superphosphate solution.

E. Phosphate-poor plants: water soaked.

The phosphate-rich planting material was grown on a soil containing 416 p.p.m. available phosphate and the cane juice contained 182 p.p.m. phosphate. The phosphate-poor material was grown on a soil containing 21 p.p.m. available phosphate and the cane juice contained 68 p.p.m. phosphate.

Fertilizer.—Four cwt. per acre of Sugar Bureau No. 2 Mixture at planting; no sulphate of ammonia, but a crop of Poona pea was ploughed in during January, 1941.

SUMMARY OF YIELDS.

Treatment.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
A	19·6	14·6
B	18·2	14·5
C	19·4	14·5
D	43·3	16·2
E	42·6	16·1

GROWTH NOTES.

After planting in February, 1941, the top half of the phosphate-rich plants gave by far the best germination. All plots were supplied with plants from the original sources and a fairly solid stand was established. All plots were frosted to the ground in the winter of 1941 and then followed a drought of six months, with only 3½ inches of rain. The A, B and C plots came away more strongly than D and E after the frost, but the greater leaf area exposed was evidently not beneficial during the dry spell, and the progress after rain fell was slower than on D and E. The crop was too small for harvest in 1942 and was left to standover to 1943. Much dead cane was present in A, B and C at harvest.

DISCUSSION.

This experiment was originally designed to test out the assumptions that cane plants from a phosphate-rich soil gave better germinations and crops than those from a polsphate-poor soil. The germinations were far from satisfactory, and were as follows—

Treatment A, 62 per cent; B, 93 per cent.; C, 72 per cent.; D, 50 per cent.; and E, 73 per cent.; and misses were supplied from the original sources. From the results it is obvious that the yields from D and E are greatly superior to those on A, B and C, but as the seed pieces used on D received treatment with a phosphate solution before planting, the presence or absence of a high phosphate content in the seed pieces cannot be the cause. It would seem that the unsatisfactory germinations, combined with adverse weather conditions, have seriously affected the results, and it is planned to repeat the experiment in the coming season.

FERTILITY ROTATIONAL TRIAL (Plant Crop).

PLAN AND YIELDS.

3.	2.	1.	1.	2.	3.
0K 34.4	2K 37.5	..	..	0K 24.0	1K 46.6
2K 41.0	1K 39.4	..	..	2K 35.0	0K 30.0
1K 46.2	0K 26.8	..	..	1K 30.9	2K 45.0
Q.25	P.O.J.2878			P.O.J.2878	Q.25

Block.—B.4.

Harvested.—September-October, 1943.

Age of crop.—Nineteen months.

Rows per plot.—14.

Plots.—0.236 acre.

Varieties.—Q.25 and P.O.J.2878.

Rotations.—1. Legumes grown for eighteen months then plant cane and one ratoon crop.

2. Legumes grown for six months then plant cane and two ratoon crops.

3. As for (2) but the cane variety changed in each rotation.

Fertiliser.—

0K. No potash.

1K. 150 lb. per acre muriate of potash.

2K. 300 lb. per acre muriate of potash.

A Poona pea crop was ploughed in during January, 1942, but no further nitrogen was given to the plant cane. All plots received 225 lb. per acre of superphosphate.

SUMMARY OF YIELDS.

Variety.	Cane per Acre.
	Tons.
Q.25	40·5
P.O.J.2878	32·3
TREATMENT.	
0K	28·8
1K	40·8
2K	39·6

GROWTH NOTES.

The mild winter of 1942 allowed this block to progress without frosting. Good growth took place during the summer and autumn of 1943 and all Q.25 plots appeared to be ahead of the P.O.J.2878 plots. The good December and February rains promoted rapid growth during these hot months although a rather dry January caused a check in growth. The 0K plots were obviously behind from when the crop was six months old.

DISCUSSION.

This is the second planting of this block, which is a long range rotational trial. Treatments 1K and 2K were both better than 0K at the one per cent. level of significance. There was no significant difference between varieties.

FACTORIAL FERTILITY TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

1N 1P 0K 17.4	2N 1P 1K 31.8	0N 2P 0K 26.9
2N 2P 2K 34.5	0N 0P 1K 26.7	1N 0P 2K 29.6
0N 1P 2K 23.5	1N 2P 1K 23.0	2N 0P 0K 21.1
2N 0P 1K 27.4	0N 1P 0K 14.6	1N 2P 2K 29.6
0N 0P 2K 22.4	1N 0P 0K 14.9	2N 2P 0K 16.8
1N 1P 1K 24.6	2N 1P 2K 28.4	0N 2P 1K 26.5
0N 1P 1K 24.6	1N 2P 0K 19.6	2N 2P 1K 32.5
2N 1P 0K 24.3	0N 0P 0K 22.6	1N 0P 1K 33.0
1N 1P 2K 30.4	2N 0P 2K 31.6	0N 2P 2K 29.1

Block.—B.1.

Harvested.—October-November, 1943.

Age of crop.—Thirteen and one-half months.

Plan.—3 x 3 x 3 Factorial trial.

Rows per plot.—12.

Plots.—0.067 acre.

Variety.—Q.25.

Fertiliser Treatments.—

0N = No nitrogenous manure.

1N = 120 lb. ammonium sulphate per acre.

2N = 240 lb. ammonium sulphate per acre.

0P = No phosphatic manure.

1P = 400 lb. superphosphate per acre.

2P = 800 lb. superphosphate per acre.

0K = No potassic manure.

1K = 180 lb. muriate of potash per acre.

2K = 360 lb. muriate of potash per acre.

SUMMARY OF YIELDS.

Treatment.	Plant Crop.		First Ratoon Crop.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.
0N	22·2	13·4	24·1	15·3
1N	22·5	14·0	24·7	15·0
2N	23·8	13·2	27·6	14·9
0P	22·4	13·7	25·5	15·2
1P	22·3	13·5	24·4	15·1
2P	23·8	13·4	26·5	15·0
0K	19·6	13·3	19·8	14·8
1K	25·0	13·3	27·8	15·1
2K	24·0	13·9	28·8	15·3

GROWTH NOTES.

Right from ratooning time nitrogen deficiency was apparent in the 0N plots. Later, potash deficiency was obvious. The fully fertilised plots grew well and stooled out well. Q.25 ratooned in the usual slow fashion, with only a single shoot showing for some time.

DISCUSSION.

The analysis shows that both the 1K and 2K treatments were highly significantly better than the 0K treatment, whilst the 2N treatment (but not the 1N) was better than the 0N. There was no significant response to P in this experiment.

These results merely confirm those of previous experiments on this soil type. When the experiment was first commenced in 1939 all plots in this block were well supplied with replaceable potash, as shown by chemical analysis, and no response to this plant food was obtained for the first rotation. It is now evident from a study of the last lot of crop yields that potash is now a serious limiting factor on the growth of the cane and the low state of available potash in the soil is confirmed by the results of chemical analyses of recent samples from the 0K plots.

NEW VARIETIES.

No new varieties were established on the station during the current year, but the following were propagated further for trial purposes—Akbar, Vesta, Trojan, Eros, Q.28. Q.44, and Q.45. Trojan has given a very poor performance on this soil type and under conditions of natural growth.

The varieties Q.42 and C.P.29/116 were distributed to growers in the Millaquin, Qunaba, Fairymead, Bingera and Gin Gin mill areas during the spring of 1943. Simultaneously propagation plots of the varieties Q.48 and Q.49 were planted in the same mill areas and two plots were established of the variety Q.47. During the same period plantings for propagation purposes were made in the Isis district of Q.47, Q.48, Q.28, Q.42, and C.P.29/116, and in the Maryborough district of Q.42, C.P.29/116 and Q.28.

VEGETABLE PRODUCTION.

Vegetable production was not continued during the year owing to labour shortage. A small planting of peanuts was made and these produced a highly successful crop, approximating to two tons per acre.

LABORATORY WORK.

Cane samples—	
Station	325
Farmers	26
Farmers' irrigation waters	19
Total	370

CROP SUMMARY.

	Tons.
Cane sent to mill	836·1
Sold for plants	14·8
Used for plants	9·2
Used for samples	4·0
Total	864·1
Total area harvested	26·2 acres
Tons cane per acre harvested	33·0 tons
Class of cane—	Per cent.
Plant	40·15
First ratoon	41·25
Second ratoon	18·60
Varieties—	Per cent.
P.O.J.2878	26·32
P.O.J.2725	9·50
Q.25	28·33
Co.290	3·38
Seedlings	32·47

REPORT OF THE COMMITTEE ON SEEDLING PROPAGATION.

By C. G. HUGHES, Assistant Pathologist.

The cross-pollination work at Meringa was again carried out under considerable difficulties; shortage of staff continued and the arrowing season was not a good one. Throughout North Queensland the arrowing of various varieties was either lighter than usual or occurred much later. Crops in the locality of the Experiment Station were generally poor and many had been damaged by grubs pruning the roots, thus increasing the difficulty of obtaining satisfactory arrows, and several desired crosses could not be made. The insect pests may have been responsible for unavailability of arrows in individual cases, but obviously some broad, climatic factor also operated. In previous years, there has appeared some correlation between the arrowing and weather conditions, as measured by the amount of rain and the number of wet days, but this year, although weather data were practically identical with those of 1943, the degree of arrowing was very much less. It may be that some general factor, or factors, other than climate are involved, and some research on these lines is desirable.

As a matter of interest, and for possible future use, the weather data at Meringa for the pre-pollination months for the last four years are detailed in Table I., together with comments on the arrowing—

TABLE I.

RELATION OF ARROWING AT MERINGA TO WET SEASON CONDITIONS.

Year.	Rainfall.	Jan.	Feb.	Mar.	Apr.	Totals.	Arrowing.
1937	Rain in inches ..	8·4	4·7	16·4	4·9	32·4	Poor
	Wet days ..	18	15	20	6	59	
1938	Rain in inches ..	18·8	18·9	2·7	0·5	40·9	Poor
	Wet days ..	14	18	9	6	47	
1939	Rain in inches ..	26·1	36·9	34·7	9·3	107·0	Excellent
	Wet days ..	19	14	19	22	74	
1940	Rain in inches ..	12·7	18·9	34·4	7·3	73·3	Excellent
	Wet days ..	14	21	25	17	77	
1941	Rain in inches ..	12·2	24·2	15·4	18·7	70·5	Excellent
	Wet days ..	25	19	23	26	93	
1942	Rain in inches ..	3·2	12·0	3·8	8·4	27·4	Mediocre
	Wet days ..	11	20	13	19	63	
1943	Rain in inches ..	5·3	26·6	3·9	1·6	37·4	Excellent
	Wet days ..	14	24	14	14	66	
1944	Rain in inches ..	5·1	23·3	10·8	1·8	41·0	Poor
	Wet days ..	14	22	24	9	69	

All male and nearly all female arrows were maintained in the standard solution of dilute phosphoric and sulphurous acids during pollination and subsequent ripening of the seed. The poor arrowing and the damp weather during pollination subjected the technique to a severe test; although one cross was lost in its entirety, and many crosses lost single arrows through premature death, seed-setting was nevertheless generally satisfactory. It was found that, in the shelter of the light, young forest regrowth, pollen clouds of satisfactory viability were released some time during the day, even in the dampest weather.

Seventy-nine crosses were effected during the season, and virtually all the fuzz was packed in air-tight tins and placed in cold store for use next year. The combinations obtained are tabulated in Table II. It will be noted that some more crosses with *S. robustum* have been made and further nobilizations carried out.

Owing to shortage of staff fuzz was not sown at Bundaberg in 1943, for the second year in succession, but the other two stations continued as usual. Only 1941 seed was available, as there had been no crossing done in 1942, and although germinations were good, the subsequent growth of the tiny seedlings was not vigorous, and in some families there was a high mortality. The choice of families for field plantings was therefore not generally satisfactory.

Eventually, 7,034 seedlings were planted out into the field at Meringa in October, 1943. The weather was very hot and dry at that time, and for some while afterwards, and several irrigations were necessary; high temperatures and drying winds caused much windscald and it was not until the monsoonal rains in February that conditions were favourable for growth. Henceforward the seedlings grew well until the dry period in autumn. There was some sporadic grub damage, but it did not interfere unduly with the selection work in June, 1944. Eighty-five seedlings, comprising 80 commercial selections and five for use as future parents, were selected and planted out in 40-sett plots. Twenty families were represented in this selection. In addition to these selections from the plant crop of original seedlings, over five thousand seedlings—part of the batch planted in 1941 and therefore now second ratoons—were examined. These yielded 17 selections from seven of the families; the future of these selections will be watched with interest since the block had already been selected in the first ratoons.

TABLE II.

CROSSES EFFECTED DURING 1944 CROSS-POLLINATION SEASON.

Female Parent.	Male Parent.
Atlas	Comus, K.95, Q.36
B.210	C.278
B.232	K.5, Uba Marot
Badila	A.233, C.278, Q.27
Cato	C.278
Co.270	H.Q.409
E.255	Q.813
Jason	P.O.J.2940
Korpi	H.Q.409, 28N.G.251
N.G.16	J.B.1, K.5, Q.36
P.O.J.100	Uba Marot
P.O.J.2364	E.K.28, K.95
P.O.J.2725	Co.290, Comus, C.P.29/116, K.95, Q.34
P.O.J.2875	H.Q.409, K.5
P.O.J.2878	B.318, Co.290, Comus, K.95, P.O.J.2940, Q.34, Q.39, Q.41
Pompey	C.278, J.B.1
Q.10	Comus, H.Q.409, K.5, Q.30
Q.13	Badila, Comus, H.Q.409, K.5, 28N.G.251, Q.30, Uba Marot
Q.25	Comus, J.B.1, K.5, Q.34
Q.27	Badila, C.279, Comus, H.Q.409, Q.31, Q.813
Q.37	Comus, E.K.28, Q.34
Q.42	Comus, K.5, K.95
Q.44	Badila, Comus, D.166/34, H.Q.409, Q.813
S.J.4	C.278, J.B.1, Q.41
30S.N.874	Badila
Trojan	Badila, H.Q.409, Q.813
31–2484	K.95
31–2806	K.95

Note.—The varieties prefixed with the letters "A," "B," "C," "J.B." or "K" are local seedlings not yet advanced to the "Q" stage.

At Mackay, 5,796 seedlings were planted out in late October and early November, 1943. Growing conditions were not good, and the crop was light when selections were made in June, 1944. Some 35 seedlings from nine families were planted in the usual 40-sett plots.

Selections at Meringa from original seedlings planted in 40-sett plots in August, 1943, suffered from the prevailing dry weather and had to be irrigated for a strike. After the onset of the wet season satisfactory growth was made and when selections were made in June, 1944, a good crop had been produced. Twenty selections, representing 17 families, were made from these plots; they are to be planted in a yield-observation trial this (1944) spring.

Mackay first-selection seedlings did not fare very well and some of the varieties yielded barely enough setts for the yield-observation trial. Selections from the original seedlings in 1943 numbered only 20 and from these eight were selected for planting again in June, 1944.

First-selection seedlings now in 40-sett plots at Bundaberg were selected in spring, 1943, from the ratoons of original seedlings; it is interesting to record that 42 seedlings were selected in both plant and ratoon stools; 19 were selected in the plant crop only (and subsequently discarded) and 33 fresh selections made in the ratoons. The 75 seedlings have made good growth and will be selected from the ratoons next year.

The yield-observation trial planted at Meringa with "B" series seedlings in 1942 was ratooned in spring, 1943, and thereafter made only a fair to average crop. Several varieties were eliminated on account of unfavourable reactions to downy mildew and/or gumming disease, and eventually B.212, B.224, B.232, B.287, and B.302 were selected. B.232 was considered worthy of advancement to a Latin Square trial and was planted in competition with Trojan, Q.13, Q.44, and P.O.J.2878. B.232 and the other selections have also been planted on better class soils on various farms for further propagation. The present plant yield-observation trial at Meringa also contains "B" seedlings since there was an hiatus in our regular routine on account of the transition from plant, to plant and ratoon crop, selection. This batch is a rather mediocre lot, and adverse conditions gave poor strikes. Selections will be made from the ratoons next year.

The plant yield-observation trial at Mackay, containing "C" seedlings, together with the introduced canes Q.42, Q.44, Trojan, 32-3575 and 32-8560, will be selected next year; in the meantime, it is interesting to observe that neither in yield nor in c.c.s. are any new canes better than the Mackay raised Q.28. The seedling canes, B.160, B.172, B. 173, and B.174, have been selected from the ratoon yield-observation trial and are to be planted in a Latin Square trial this spring.

"B" seedlings at Bundaberg in the yield-observation trial will be ratooned and selected in 1945; B.30 is at present the most impressive of these.

The Latin Square trial planted at Meringa with the "A" seedlings 224, 233, and 278, selected from the ratoon yield-observation trial in 1943, encountered dry conditions soon after planting and subsequent growth was rather poor. The ratoons will be selected next year and, meanwhile, the "A" seedlings are being propagated on different soil types on farms near the station. The first ratoon Latin Square trial containing K.58, Q.10, Q.44, Comus and Cato, was harvested in late September, 1943. Q.44 and Comus gave significantly higher yields on this poor forest type of soil than did the remainder; there was scarcely any difference in the c.c.s. values. K.58 came away very slowly and this disability, together with its slow striking and mediocre yields, justified the earlier decision to abandon it.

The plant Latin Square trial at Mackay contains A.124, A.130, A.146, and A.147, and will be selected on the results of the ratoon crop next year. These four varieties have been planted in small plots on two farms. The ratoon Latin Square trial shows I.26 as the best of a rather mediocre lot; this variety has been planted in farm plots with the "A" canes.

The Bundaberg plant Latin Square trial contains A.16, A.24, and A.26, together with an Hawaiian cane, 32-8560, and the standard Co.290. Selections will be made from this next year.

It should be noted that results of the various seedling trials harvested during the year June 30th, 1943, to June 30th, 1944, are to be found in this report under the heading of the respective Experiment Stations.

Following are brief notes on some of the newer varieties:—

Northern Districts.

Q.44.—Plantings were greatly extended during the past year, particularly in the Mulgrave area. The quality of Q.44 reaches its peak in the latter half of the season, but in some instances satisfactory figures have been obtained from early cutting. The variety grows well on poor to medium class land, and tends to arrow fairly freely. It is an excellent ratooner under the most severe conditions, and its quick covering-in makes it a cheap cane to work.

Cato.—Has become well established in the north, and its yields of sugar on medium class land have been very satisfactory. It is a reliable germinator and ratooner, and is easy to harvest. It should not, however, be planted on first-class land, as it may lodge badly and give rank crops of low quality.

Comus.—Is a rapid germinator and produces a good plant crop, but, if cut under unfavourable conditions, the ratoons are likely to fail. It arrows fairly freely and although only of medium quality, it appears to mature reasonably early.

Trojan.—Has done well in the Herbert River District and present indications are that wet or clayey soils, rich in plant food, are necessary for its best development. It is an erect cane, and its upright foliage gives rather poor cover. It ratoons well, is a moderate to free arrower, and is a good harvesting variety.

Eros.—Has impressed in the Herbert River area, where it is recommended for the sandier soils, but plots further north are as yet too few in number for comment.

Central Districts.

Q45.—Has continued to give satisfactory results in the trial plots; the comparative lack of arrowing is a good feature of this variety. It is a late maturer of medium sugar content, strikes well, and is an excellent ratooner. It is proposed to place Q.45 on the approved lists for the Mackay mills in 1945.

Southern Districts.

C.P.29/116.—Was approved this year at each of the Bundaberg mill areas, and has been planted fairly extensively as an experimental cane in the Moreton and Isis districts.

Q.25.—Has become very popular in the southern districts, despite its susceptibility to Fiji disease. Approximately 23,000 tons of this variety were harvested in 1942, and over 60,000 tons in 1943.

Q.42.—Was approved at each of the Bundaberg mill areas this year and is maintaining its reputation for very good sugar early in the season. It has suffered somewhat severely with mosaic in some plantings on alluvial country, but it would appear that it is fairly tolerant to this disease, and, except in the worst areas, should be kept reasonably clean by the usual routine control measures.

Three seedlings from the Bundaberg Experiment Station have been raised to the status of "Q" canes during the past year, and are now in farm propagation plots. Two of them, Q.47 and Q.49, are from the cross Co.290 x P.O.J.2878, whilst Q.48 is from the P.O.J.2725 x Co.290 combination. All three have done fairly well on the Station in comparison with the standards of the district, and it will be interesting to observe their behaviour in the commercial plantings.

VARIETAL STATISTICS.

The varietal composition of the cane crop crushed during the 1943 season is set out in Table III. Every variety of which over 1,000 tons were harvested is listed, and tonnages given to the nearest 100 tons. The tonnages and percentages crushed are set out for each of the main cane-producing districts and for the State as a whole; North of Townsville represents the wet tropical belt; Giru and Burdekin, the dry, largely irrigated tropics; Mackay, the dry, comparatively unirrigated tropics; and Bundaberg and South, the temperate southern zone. The zones are clear cut except for a small area about Townsville, and represent distinct, discrete areas. Before proceeding to comment on the varieties, it may be of interest to note the relative importance of the various districts both in 1942 and in 1943, when shortage of manpower, materials, and fertilizer combined to bring about a reduction of over 20 per cent. on the yield for the previous year. Figures for the various districts in the two years are as follows:—

	North of Townsville.	Giru and Burdekin.	Proserpine and Mackay.	Bundaberg and South.	Total.
Average 1937-41	2,335,035	685,384	1,263,760	1,253,840	5,538,019
1942	2,007,282	607,915	979,953	755,337	4,350,487
1943	1,459,882	408,129	738,797	790,616	3,397,424
Per cent. decrease or increase on 1942 ..	−27·2	−32·8	−24·6	+4·7	−21·9

The decrease was greatest in the northern areas (where the threat of invasion discouraged planting in 1942), whilst at Bundaberg and South there was actually an increase. The season was not any more favourable there than in the north, and the explanation of the maintenance of production in the south, despite all troubles, lies in the relatively high proportion of standover crops harvested in this area. There, nearly 15,000 acres in a total of 44,327 harvested was standover cane, while only 807 acres of standover cane were harvested in the rest of the State. However, compared with the average of the last five years, production at Bundaberg and South was very much reduced in both 1942 and 1943.

Turning to the varieties in Table III, we note that Badila is still easily the leading variety, and P.O.J.2878 is a good second. Many of the variations in tonnage of individual varieties can be traced to the differential decreases in the northern areas and, on that account, strict conclusions cannot be drawn. In the north, Q.10 yielded 77,300 tons and 5.3 per cent. of the crop, compared with 38,000 and 1.9 in 1942. Eros, with a fourfold increase from 1,200 to 5,400 tons, and Trojan from 1,200 in 1942 to 17,100 tons in 1943, made very substantial increases despite the overall falling off in the district as a whole; Comus made its first appearance in this annual list with 1,500 tons. In the Burdekin and Mackay areas there has been no marked change in the varieties grown, but two of the minor entries are of particular interest: Comus appears for the first time as also does Q.28; it is expected that the latter will show a very big increase in the returns for 1944. In the Bundaberg and South district Q.25, with 60,100 tons, has moved into third place, below P.O.J.2878 and Co.290; it now forms 7.6 per cent. of the southern crop and has shown a threefold increase since 1942.

An analysis of the composition of the crop on the basis of country of origin of the varieties (Table IV.) shows that the New Guinea group still constitutes over one-third of the total and the Javan and Queensland groups are approximately equal with almost a quarter each. The remaining 19 per cent. is largely composed of single varieties from each country.

TABLE III.

QUEENSLAND CANE VARIETY CENSUS—1943 CROP.

VARIETAL COMPOSITION OF THE 1943 CANE CROP IN THE FOUR MAIN DISTRICTS AND THE STATE AS A WHOLE. TONNAGES COMPUTED FROM MILL RETURNS TO NEAREST 100 TONS.

Variety.	North of Townsville.		Giru and Burdekin.		Proserpine and Mackay.		Bundaberg and South.		Whole State.	
	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.	Tons.	Per Cent Crop.
1. Badila	818,400	56·1	260,000	63·7	50,100	6·8	..	..	1,128,400	33·2
2. P.O.J.2878	60,900	4·2	..	..	33,100	4·5	488,000	61·7	582,000	17·1
3. Co.290	..	..	..	..	103,300	14·0	195,200	24·7	298,500	8·8
4. M.1900 Sdg.	..	..	..	..	252,400	34·2	..	..	252,400	7·4
5. H.Q.426	139,400	9·5	18,300	4·5	86,000	11·6	..	..	243,700	7·2
6. E.K.28	..	..	68,000	16·7	127,300	17·2	..	..	195,200	5·7
7. S.J.2	8,500	·6	44,200	10·8	41,900	5·7	..	..	94,600	2·8
8. Q.10	77,300	5·3	..	..	..	..	..	..	77,400	2·3
9. H.Q.409	74,800	5·1	..	..	..	..	..	..	74,800	2·2
10. S.J.4	66,700	4·6	4,700	1·2	..	..	..	..	71,400	2·1
11. Q.25	..	..	100	..	100	..	60,100	7·6	60,300	1·8
12. Pompey	52,400	3·6	..	..	..	..	..	..	52,400	1·5
13. Cato	42,900	2·9	..	..	..	..	..	..	42,900	1·3
14. Q.813	6,900	·5	..	..	25,400	3·4	9,900	1·2	42,200	1·3
15. Juno	21,500	1·5	..	..	..	..	..	..	21,500	·6
16. P.O.J.213	..	..	..	..	..	..	20,400	2·6	20,400	·6
17. D.1135	18,300	1·2	..	..	900	·1	400	·1	19,700	·6
18. Trojan	17,100	1·1	..	..	..	..	..	..	17,100	·5
19. Oramboo	6,200	·4	..	..	2,700	·4	5,500	·7	14,400	·4
20. Q.2	13,100	·9	..	..	..	..	..	..	13,100	·4
21. Korpi	8,900	·6	2,400	·6	..	..	900	·1	12,200	·4
22. P.O.J.2725	1,200	·1	900	·2	5,200	·7	4,400	·6	11,700	·3
23. Q.20	..	..	4,500	1·1	5,500	·7	..	..	10,000	·3
24. B.147	8,000	·5	..	..	..	..	..	..	8,000	·2
25. Eros	5,400	·4	..	..	..	..	..	..	5,400	·15
26. Brutus	5,100	·3	..	..	..	..	..	..	5,100	·15
27. Comus	1,500	·1	100	..	1,200	·2	..	..	2,900	·08
28. S.J.16	..	..	2,500	·6	..	..	..	..	2,500	·07
29. Q.28	..	..	..	..	2,400	·3	..	..	2,400	·07
30. H.Q.285	..	..	..	..	900	·1	1,000	·1	1,900	·06
31. B.208	..	..	1,400	·3	..	..	..	..	1,400	·04
32. Saturn	1,400	·1	..	..	..	..	..	..	1,400	·04
33. P.O.J.234	..	..	..	..	..	..	1,300	·2	1,300	·04
34. Mahona	..	..	..	..	..	..	1,200	·1	1,200	·04
35. Nanemo	1,000	·1	..	..	..	..	..	..	1,000	·03
Others	2,800	·2	1,000	·2	300	..	2,200	·3	6,300	·2
Actual Tons Harvested ..	1,459,882	..	408,129	..	738,797	..	790,616	..	3,397,424	..

TABLE IV.

COMPOSITION OF THE 1943 CROP ON THE BASIS OF COUNTRY OF ORIGIN OF VARIETIES.

Country of Origin.	Tonnage Harvested.	Per cent. of Crop.
New Guinea	1,157,200	34·1
Java	810,600	23·9
Queensland	790,600	23·3
India	298,500	8·8
Mauritius	252,400	7·4
Fiji	52,400	1·5
British West Indies	29,100	·9
Unclassified	6,300	·2

REPORT OF THE DIVISION OF ENTOMOLOGY AND PATHOLOGY.

By R. W. MUNGOMERY, Entomologist.

As in the previous year, the activities of this Division were seriously curtailed by shortage of staff and duties had perforce to be confined largely to advisory work and ordinary routine matters. On the entomological side the most unusual occurrence was the plague of locusts which descended upon the central and northern canefields during the summer; matters of interest from the disease point of view were the re-introduction of the downy mildew susceptible P.O.J.2878 to the Mackay district, and the quarantining of certain parts of the Fairymead mill area near Bundaberg owing to outbreaks of Fiji disease.

The Cane Pest and Disease Control Boards in the various mill areas continue to function efficiently and have also carried out a good deal of work in testing varieties, etc., which work, although not directly involving pest and disease control, is indirectly very important and could not possibly have been done by the limited staff at present at the disposal of the Bureau. These Boards, working under the general direction of the Advisory Board and the Bureau, and made up of local sugar producers, have done some excellent work, and it would appear that a very satisfactory set-up has been evolved for the control of pests and diseases in an industry comprising, as it does, a very large number of small producing units.

The total damage in Queensland due to depredations of grubs of the greyback cane beetle (*Dermolepida albohirtum* Water.) was very much less than in the 1943 season, although in one northern district the number of grubs per stool was the highest and the distribution the widest experienced for many years. In the Innisfail district sufficient rain fell during the spring to allow the emergence of the beetles in October and November, and the fumigation campaign was undertaken during the usual January-February period. In the Cairns district some isolated flights occurred during November, but the dry conditions following caused a very heavy destruction of eggs and few grubs resulted. The dry spring and summer also kept the bulk of the beetles confined in the soil until late December and January, when the main flights occurred. Fumigation was consequently delayed until the end of March and was not completed until May. There was dry weather during and after the fumigation and some drying out of sticks occurred in the fumigated cane, particularly in sandy soils. It was difficult to make an accurate estimate of the actual area grub-infested and the loss in tonnage due to grubs in the far northern area, but certainly not less than 5,000 acres of cane were grub-infested and the loss would no doubt exceed 30,000 tons of cane. The figure for loss in tonnage is much lower than was experienced last year, but in many parts of the north the exceptionally dry spring and summer months, combined with a sparse wet season, were responsible for the cane crops making little growth, and in these generally lighter crops the loss in tonnage due to grubs was necessarily less. Actually there was considerable difficulty experienced in determining what proportion of the decreased tonnage was due to grub attack and what to dry weather. During the past two years one of the principal difficulties of fumigation has been the difficulty of transport of fumigant. However, during 1944 reasonable supplies came to hand and the difficulty then became largely one of obtaining suitable labour. This shortage of labour caused the fumigation season in the Cairns district to be prolonged into May; even with an abnormally late beetle flight, all fumigation work should be concluded in April at the latest. An attempt was made to have a number of cane-cutters and sugar workers reserved for the fumigation work when required during February, March and April, but without success; and the position was not improved by the direction of what would have been suitable labour away from this work, and by a general lack of appreciation of the necessity for first-class labour for fumigation. It is little wonder that many growers, failing to receive sufficient labour at the right time and hampered by shortages of material and equipment, are experiencing a feeling of frustration in their efforts to control pests—a feeling which often leads to a general slackness most difficult to overcome.

In spite of all difficulties, however, there were 1,183 acres fumigated in the districts from Tully northwards, but despite the efficiency of the Blundell knapsack injector, costs of labour and fumigant have so risen that the total cost is now as great as before the introduction of this equipment. Leaking drums, caused no doubt by the manufacturers' inability to obtain proper materials, led to much vexatious waste of material and manpower and added to the expense of the campaign.

In the Mackay district, as would be expected from the summer weather conditions, infestations with grubs of the greyback beetle were light. Six hundred acres were surveyed, and of this area 136 acres were successfully fumigated. Estimated losses due to grub damage were 3,500 tons; dry weather in May had accentuated the effects of the grub attacks, although there was some relief from light rains in June. As well as the fumigation of the grubs, there was some collection of both beetles and grubs and 11½ tons of the former were paid for at the rate of 1s. per pound. In all, the sum of £1,473 was spent on collections.

During the season an opportunity was taken to observe the Blundell mechanically-operated fumigant injector at work in North Queensland. In the trials witnessed, the machine was drawn by a narrow-track tractor operating between the cane rows, and it gave a highly satisfactory performance under the admittedly favourable conditions. Steering was easy, the injections were made regularly and sufficiently close to the stools and, most important, the dose appeared to be perfectly covered and the soil compacted to seal the fumigant in the ground. Three acres were fumigated per 8-hour day, utilizing two units of labour, one on the tractor and one operating the machine. No mechanical stoppages occurred during the trial and diggings made some days after fumigation revealed a high percentage kill. It is hoped that this machine will soon be in production, as it is anticipated that much of the grub-infested cane in North Queensland could be successfully fumigated with it, even if lodged cane had to be left for hand fumigation. By means of such a mechanically operated injector, a large acreage could be treated when the grubs were at a stage of development optimum for fumigation, and when their location in relationship to the cane stools was most suitable for a satisfactory kill. Thus, in wet seasons when suitable periods for fumigation occur only occasionally, and particularly at present when labour for manual fumigation is in short supply, this machine, with its high capacity, should prove invaluable.

A small quantity of the volatile liquid, methallyl chloride, was made available by the Shell Company of Australia and further tests were carried out with it. Results were similar to those obtained in 1942 and it is now apparent that under field conditions, with the same technique and the same dosage, methallyl chloride is a more effective cane grub fumigant than carbon-bi-sulphide. Before this chemical may be established as a commercial fumigant further experimentation on dosage is necessary, since a large dose administers a severe check to the cane which in dry weather may result in the death of the plant.

During March, 1944, reports from Goondi (Innisfail district) indicated that a fly parasite was destroying large numbers of grey-back grubs. In some instances the unusually high mortality caused the almost total disappearance of grubs from fields in which survey diggings a few weeks earlier had shown grub populations sufficiently large to require fumigation. This instance of efficient biological control became apparent when wet weather interrupted fumigation work; later, check diggings revealed that parasitism in most cases had been sufficiently complete to render fumigation unnecessary. When specimens of the adult fly were received for examination, they proved to belong to the family Dexiidae (genus *Prosena*). One species of *Prosena*, viz., *Prosena siberita* Fab., is well known as a parasite of white grubs in other parts of the world from Europe to Java, and was introduced into the United States of America in the hope of assisting in the control of the Japanese Beetle (*Popillia japonica* Newm.). Many species of Dexiidae are known to parasitise grubs in Queensland, but normally only a relatively small percentage of grubs become parasitised; however, this percentage has been known to rise tremendously when conditions were particularly favourable for the parasites; such a case occurred with *Rutilia inornata* Guer. parasitising grubs of *Lepidiota Frenchi* Blackb. in the Bundaberg district in 1927-28. Weather conditions in the Goondi area this year apparently so favoured the Dexiids that they were able to increase in numbers at a rapid rate and cause appreciable destruction to the cane grubs.

Damage from grubs of the Frenchi beetle (*Lepidiota Frenchi* Blkb.) was generally patchy in North Queensland although some districts were badly affected; in the Mackay area very few Frenchi infestations were reported. Frenchi damage became apparent at a time when droughty weather had checked growth and caused some loss of stools in the drier soils; consequently the grub depredations were less obvious than in better years. The actual damage, however, was probably greater in the drought-stricken crops, as the more prolific root production of better grown crops in previous years would offer more resistance to the attack. It is unfortunate that, owing to grey-back damage and other causes, many farmers have gone back to the vicious cycle of "plough out and replant," so favouring the building up of the Frenchi population.

Losses caused by the beetle borer, *Rhabdoscelus* (*Rhabdocnemis*) *obscura* Boisd. still remained at the low level of last year, despite the fact that top rot (due to infection by *Plytomonas rubrilincans* Lee *et al.*) was more prevalent in the north than usual. Beetle borers favour top-rot affected sticks and appear to breed more readily in them, and an increase in this disease is usually attended by an increase in borers; this year, however, this was not evident and it is believed that the extensive pre-harvest burning, assisted by the work of the giant toad (*Bufo marinus*) has considerably reduced the borer pest.

Records of this insect breeding on the royal palm, *Oreodoxa regia*, and on the so-called travellers' palm, *Ravenala madagascariensis*, were made in the Cairns district during the year, although the comparative scarcity of such alternative hosts indicates that they can have little or no influence on infestation in the canefields. In the royal palm, larvae and pupae were found in tunnels beneath the dying leaf sheaths of the older leaves, whilst in the travellers' palm, larvae were found in the soft decaying tissues of the spadix after the seeds had failed to develop.

In common with other parts of coastal Queensland, the cane areas of the far north were visited during the summer of 1944 by swarms of the yellow-winged locust (*Gastrimargus musicus* Fabr.). In the far north these swarms came during February and were confined to a comparatively small portion of the Cairns and Gordonvale districts lying north of the Mulgrave River. Fortunately the locusts fed mainly on grasses growing along headlands and amongst stunted blocks of cane, although a certain amount of damage to cane occurred in poorly-grown fields where the swarms of grasshoppers banded together at night and deposited their eggs. Egg pods were first located in these patches during the second week in February and in some egg-beds the number of pods deposited reached 128 per square foot of soil surface. Since each pod contained an average of 58 eggs and many of the egg-beds covered more than an acre of land, some idea may be gathered of the potential population. The locusts were observed ovipositing quite freely on heavily overcast and showery days, whilst it is believed that during fine weather most of the egg-laying occurred either in the evening or early morning. During February, for those eggs which hatched, an incubation period fo eighteen days was required, but actually only a very small proportion of the eggs produced hoppers, the remainder apparently undergoing a prolonged diapause. At the time of compiling this report, a large portion of the egg-pods in the beds are still intact and healthy. Practically no damage to cane resulted from the early emergence of young hoppers since they confined their attention almost exclusively to grasses. However, in view of the possible emergence of much greater numbers after the winter, some experiments were carried out to determine the most efficient method for the destruction of the hoppers should this be found necessary at a later date. Poison baits were found to have little practical effect until after the hoppers had moved away from the egg-bed areas and had formed up into bands. The greatest success was obtained with poison baits when the hoppers in the second stage first banded up, although in all cases it was rather hard to assess the kill obtained as so many bands were operating in close proximity to one another, and smaller bands often joined forces after the distribution of poison baits. A Paris green-bran-molasses bait in the proportion of one pound of Paris green to fifty pounds of bran and mixed with two quarts of molasses dissolved in five gallons of water, gave good results in this type of control. Destruction of the concentrated bands of small hoppers was achieved by individual growers in some instances by using flame-throwers and also by spraying the hoppers with insecticides. Both these methods were very effective but would prove too expensive if hoppers emerged on a large scale. Giant toads were observed in considerable numbers feeding on the small hoppers where the bands were moving in close proximity to the banks of a creek, and in this particular instance where the toad population was high, a considerable degree of control was undoubtedly exerted by the toads. By the end of April practically all the hoppers had reached the adult stage and had dispersed so that the bands or congregations were no longer apparent. It remains to be seen whether there will be any further emergence during the spring months or whether the combination of parasites, predators, and disease will so reduce the number of egg-pods as to prevent any future serious emergences.

In the Mackay district flier swarms of the locust appeared in the canefields late in November and from then until early March flier and/or hopper swarms were present in most localities. Although large parts of the Plane Creek and Farleigh mill areas did not receive visitations it would appear that this plague was the heaviest and most extensive since 1896 and, to make matters worse, it occurred when growing conditions for the cane were very poor. Canefields and environs were but a small part of the large area heavily and continuously infested by these pests. Reports and estimates of economic losses in cane crops varied from time to time and place to place, but the heaviest damage claimed at an early stage came from those areas—mostly west of Mirani—which missed appreciable early summer rains and where backward cane was subjected to more than one attack by hoppers and/or fliers. The wet season

commenced in February, later than usual, and the sugar cane showed once more its ability to recover from severe attacks by foliage pests. In most instances it is now difficult to separate the loss in crop caused by the defoliation from that due to the poor summer growing conditions. The stripping of the leaves, however, did cause some trouble indirectly by allowing many weeds to grow at a time when the farmers could not deal with them. No official control measures were instituted in the Mackay district but materials were conserved for plague abatement which, from past records, should correspond with the protection of the young plant cane. From December onwards selected areas where eggs had been deposited were kept under observation, and some eggs transferred to the laboratory. There, in early March, parasites (*Scelio leipartitus* Kief.) emerged, and at the same time it was observed they were plentiful in the field. They could be found in appreciable numbers until June.

Some severe infestations of wireworms were experienced in the central district during the spring of 1943. A few light attacks of little economic importance were reported from several localities during the early 1944 plantings. At Bundaberg on red volcanic soil considerable damage to one small planting in 1943 was probably due to wireworms, although confirmation is lacking.

Infections by mites of the family *Eriophyidae* were recorded during summer in several fields of P.O.J.2878 on alluvial soil near Bundaberg. In some instances about two per cent. of the stools were infected and judging by the unthriftiness of the diseased stalks some losses would have occurred. Affected shoots were markedly stunted, with brown tips to the leaves and mottling on all unfurled blades. Sometimes the mottling took on a striped form and at first glance could be mistaken for downy mildew. Total damage was slight and it is chiefly as a record that the infection is noted here.

During the past year rat damage to cane in the central district was negligible. However, there was an appreciable increase in the incidence of these pests in northern mill areas although most of the economic losses were connected with neglected fields of poor cane. Two parts of a report on an investigation of the rat pest problem by Mr. W. A. McDougall were published during the year and a third part has been prepared for publication.

Whilst most of the activities of the northern Cane Pest and Disease Control Boards are confined to the control of pests, the chief concern of those in the south is disease, as can be seen from notes on the individual diseases detailed below. Gumming, once a major disease, has ceased to be of direct importance, but Fiji and downy mildew continue to need vigilant attention and are still serious problems in South Queensland.

During the year under review, gumming disease (*Bacterium vasculorum* (Cobb) Greig Smith) was not seen anywhere in the State except in the Hambledon area in North Queensland. There some nine farms were found to be infected by harvest time in 1943, but by June, 1944, only two farms were known to be diseased and the affected area was relatively small. In the Mulgrave area, which adjoins Hambledon, no disease was seen, although some suspicion still attaches to a field where odd volunteer stools of the susceptible variety S.J.4 are still being found. Although it is apparent that the direct loss from gumming is now negligible the indirect loss is still very considerable and will have to remain so until it is absolutely certain that the disease has been eradicated from the particular districts concerned. Gumming is a disease that can only be controlled by growing resistant varieties and its complete absence is required before susceptible varieties can be grown with assurance.

The usual gumming disease resistance trial was conducted in the Pathology plot at Brisbane. It consisted chiefly of new seedlings from the Experiment Stations, and the only named varieties were Q.10, Q.13, Q.42 and Q.45—Q.13 and Q.42 showed a few streaks but no other symptoms, the others are apparently highly resistant.

Downy mildew (*Sclerospora sacchari* T. Miy.) disease is under control in the northern mill areas. At Mossman only one farm is known to be infected; at Hambledon, twenty stools were rogued from one field before ploughing out and no other outbreak has occurred; at Mulgrave and in the Herbert River district no diseased stools have been seen this year. In the Mackay district a field of P.O.J.2878 was known to be infected in 1943, and following the harvesting, two diseased stools appeared in the poor second ratoons; a short-term plough-out order was then issued and the crop was promptly destroyed. The district is now, as far as is known, free from the disease for the first time in many years. Inspections have been thorough and the Mackay Cane Pest and Disease Control Board has systematically inspected 9,000 acres, on some 600 farms during the year. Coincidental with the decline of downy mildew disease, arrangements were made to return the susceptible variety, P.O.J.2878, to the approved variety lists for all Mackay mills, and also to propagate the Bureau seedling, Q.45, which had been held in abeyance pending the control of downy mildew. Since it could not be absolutely certain that the disease had been eliminated, some control over the distribution of P.O.J.2878 was necessary, and the whole district has been proclaimed a quarantine area, within which permits are necessary for the transfer of P.O.J.2878 plants. Several hundred permits have already been issued for 1944 plantings.

In the Bundaberg district there has been a very marked increase in downy mildew disease after a progressive decline over the past two years. Some 4,013 stools were found in 18,153 acres inspected by the Cane Pest and Disease Control Board, and all occurred on the red volcanic soil of the Woongarra district, the scene of previous severe outbreaks. Some of the increase can probably be put down to inability of farmers to harvest and/or plough out diseased blocks in the previous year and, to prevent a recurrence of that, a special effort has been made this year to prevent the standing-over of diseased cane.

Two downy mildew resistance trials were conducted during the year, one in the far north, between the Mossman and Hambledon mill areas, and the other at an isolated spot near Bundaberg. The northern trial was reasonably successful, judging by the amount of disease transmitted to the standard varieties; most of the trial consisted of new seedlings under test at Meringa, and the following percentages of diseased stalks were recorded—

No infection	B.306, B.235, C.277, Badila, B.294, B.307, B.233, Hind's Special, B.254, S.J.2, S.J.4, B.230, N.G.16
0–5 per cent.	B.301, B.147, 33M.Q.819, B.229, D.1135, B.298, C.279, Q.813
5–10 per cent.	31–2806, P.O.J.100, B.208, C.278
10–15 per cent.	P.O.J.2878, Uba Marot, Co.290, Trojan
15–20 per cent.	Q.1098, Loethers
Greater than 20 per cent.	Neptune (24), Eros (26), 32G.1374 (33), 30M.Q.461 (41)

The Bundaberg trial with locally raised seedlings gave the following results—

No infection	B.5, B.30, I.11, I.15, Q.13, Q.27, Q.42, Q.47, 32–8560, C.P.29/116
0–5 per cent.	A.16, A.24, A.26, B.12, B.24, B.35, B.61. B.62, B.66, B.82, I.6, I.12, Akbar, Eros, 32G.706, Q.25, Q.28, Q.44, Q.45, Q.48, Q.49, Co.290, P.O.J.234
5–10 per cent.	B.37, B.50, Trojan
10–15 per cent.	Vesta, P.O.J.2878
15–20 per cent.	B.56, B.88
Greater than 20 per cent. ..	B.2 (27), B.8 (23), B.68 (44)

This trial is to be ratooned and infection recorded again next year.

Fiji disease infection increased by a relatively considerable degree during the past year in the Bundaberg district, and six thousand affected stools were found in the 18,153 acres inspected. Some part of this increase is a legacy from last year when shortage of labour and other factors prevented the harvesting and/or ploughing out of diseased cane. This year in an effort to regain control a greater number of plough-out and harvest orders have been issued, and the two most affected districts have been declared quarantine areas. These are at Avondale and Tantitha, both of which are in the Fairymead mill area; fifty-four per cent. of the Fiji diseased stools found in the whole district occurred at Avondale, and 15 per cent. at Tantitha. The quarantine proclamation (No. 16 under "The Sugar Experiment Stations Acts, 1900 to 1941") prohibits the planting of P.O.J.2878, P.O.J.2725, and Q.25, thus cutting down the list of approved varieties very seriously, and in order to help the growers so affected the Bureau is endeavouring to expedite the testing of varieties for these lands. Plough-out orders issued prior to the 1944 crushing season total 275 acres compared with 189 in 1943; similar figures for compulsory harvest orders are 245 and 143, and there will be very few diseased fields stood over into 1945. Another factor which should also help the Cane Pest and Disease Control Board in its fight with disease is the increased planting of the variety C.P.29/116. Although it has some undesirable features, such as liability to arrow, and rather low sugar early in the season, its extreme vigour and commercial resistance to both Fiji and downy mildew diseases make it a valuable addition to the approved variety list. C.P.29/116, together with some Q.42, is being planted largely at the expense of the Fiji-susceptible Q.25.

In the Isis area Fiji disease showed a marked decrease and only eight diseased stools on four farms were found. This compares with 200 stools on 27 farms in 1942-43, and is a general indication of the excellent position in the Isis district. All farms were inspected during the year, so that there is scarcely any chance of an undetected patch of disease remaining.

In the Maryborough area for the first time since systematic inspections have been made, no Fiji disease was found in the locality known as Island Plantation, once one of the worst infested places in Queensland. Other localities adjoining have largely been cleared of Fiji, but there still remain odd diseased stools in other parts of the Maryborough area and, in order to prevent spread from these, a quarantine area was proclaimed and the removal of any cane from any plantation, which has had Fiji during the previous three years, is prohibited. A total of 105 diseased stools were located and destroyed during the year, but, as already stated, there were no concentrations of the disease, and the coming year should see a further decrease.

Control of Fiji disease in the Moreton mill area is still very much of a problem and it is only by sustained inspections and roguings, combined with a close watch on the sources of plants, that the disease is prevented from getting out of hand and probably causing the abandoning of the very valuable P.O.J.2878. A number of factors were responsible for the increase in the number of Fiji stools rogued during the year (some 8,033 were found); the severe frosts in 1943, and the reduction in cane production in certain disease-free areas, both combined to cause a great increase in the use of plants from diseased or doubtful sources—with consequent primary infection in the young fields.

The Fiji disease resistance trial concluded during the year was carried through to the second ratoons and even then the degree of infection in the standard varieties was rather low. Virtually the only conclusion to be drawn from the trial was the extremely high susceptibility of the Hawaiian canes, 32-1063, and 32-3575. The whole six canes imported from Hawaii into this country in 1939 have now passed through Fiji disease resistance trials, and it is a matter of general interest that all have proved too susceptible to the disease to be grown in South Queensland; at the same time they do not appear to be suited to the north, where Fiji does not exist. The varieties Hind's Special and Uba Marot, did not show any symptoms and are probably resistant. The current Fiji trial is only a small one; it includes some six Bundaberg seedlings and the same number of named canes. Present indications are that Q.45, the P.O.J.2878 x S.C.12/4 seedling from Mackay, is fairly susceptible.

A small amount of leaf-scald (*Bacterium albilineans* Ashby) still occurs in the northern mill areas, but it is of relatively little direct economic importance. The usual resistance trial conducted on heavy wet soil in an area where leaf-scald imposes some limitations on the varieties grown, encountered unusual conditions, and the amount of infection occurring in the standard varieties was very low.

Top rot (*Phytomonas rubrilineans* Lee *et al.*) as usual, occurred in fields throughout Queensland, but except in the far north, where it was somewhat more severe than usual, it was not very much in evidence.

Mosaic disease is still fairly widespread, although nowhere is it concentrated; in the Mackay district it has increased somewhat in the variety Comus. At Bundaberg, two of the new varieties, Q.25 and Q.42, are rather susceptible to mosaic and will have to be watched closely; in the Maryborough area these two varieties have become infected and it would appear that future plantings of these will have to be confined to the drier, non-alluvial soils.

Following the dry autumn in the north and at Mackay, red-rot was more common than usual. It also occurred in the variety Co.290 in the south.

There are still odd stools of non-approved varieties in the Cairns area, but they are being dug out as they are found. The chief non-approved variety concerned is S.J.4, whose extreme susceptibility to gumming disease caused its discard, and the task is not made any easier by that variety's fairly close resemblance to the widespread Badila.

At Mackay there has been a further substantial decrease in the number of farms with non-approved varieties.

The varietal garden at Redland Bay has been maintained and 75 varieties are now growing there. Several more from the quarantine house will be planted in the plot this spring.

The quarantine house was in use chiefly for the inter-district transfer of varieties. There was, however, one cane from overseas planted and grown in the house during the year. It had been forwarded home by a serviceman in New Guinea and was seized by the Bureau on arrival at a Queensland port. It was seen to be either *Saccharum robustum* cane, or else a hybrid between this species and *S. officinarum* and did not appear to be a commercial type. The serviceman's action, besides laying him open to prosecution, was foolish in the extreme, as several cane diseases and pests occur in New Guinea and the introduction could very easily have caused considerable losses in Queensland.

Bacterial cultures for the inoculation of legume seeds were again supplied to cane farmers at a nominal charge and many took advantage of the offer. Over 140 farmers sowed 2,607 acres with treated legumes. Cowpeas of various types, sown on 2,390 acres on 117 farms, were easily the most popular green manure; Gambia pea (*Crotolaria goreensis*) was sown on 184 acres and lupins, Mauritius bean, velvet bean, lucerne and soy bean, to a smaller extent.

During the year, some weeks were spent by the Assistant Pathologist on bacteriological work with canned foods for the Commonwealth Department of Agriculture and Commerce.

DIVISION OF MILL TECHNOLOGY.

Mr. E. R. Behne, Mill Technologist.

Staff.

In the year under review, there were no changes in staff; thus, the Mill Technologist and the Laboratory Assistant again were the only two members engaged in technological work. Further, with the continued absence of the Director, and the diversion of the Acting Director to other duties, the directorial work of the Bureau became the duty of the Mill Technologist. Under these conditions, little mill work could be undertaken.

The staff position of this Division was critically reviewed by the Advisory Board which was very disturbed, not only with the present depletion, but with the lack of prospects of rebuilding it to the required strength for efficient operation after the war. In accordance with the recommendations of the Board, an approach has been made to the Commonwealth Government for the return of the two Assistant Technologists, Messrs. Praeger and Clayton, who for over two years have been seconded to the Flax Production Committee. To date no intimation has been received that these two officers will be returned.

To guarantee future staff, the Advisory Board recommended that suitable scholarships be established at the University for students in Applied Science. The recipients of these Scholarships would be required to give service to the Bureau for a stipulated period on graduation. A scheme for two such scholarships has been drawn up and is now being implemented.

Mutual Control.

As for the 1942 season, the Synopsis only was prepared for the 1943 season. This has now been printed and distributed. The same twenty-four mills contributed, as previously.

Standardisation of Apparatus.

Again only essential units of apparatus could be tested in the laboratory. The results of testing are—

Brix Spindles.—Two hundred and thirty-four were tested—all except eighteen receiving official certificates. Of the eighteen, one had the standard range, but had errors outside the legal tolerance, whilst the other seventeen were of unofficial ranges.

Polariscope Tubes.—Ten were tested and all were satisfactory.

In regard to brix spindles, it is interesting to note that in the past twelve years, over 3,000 have been tested. Of these 90 per cent. have received official certificates, and 10 per cent. unofficial. The latter comprises 5 per cent. with errors beyond the legal tolerance, and 5 per cent. with unofficial ranges.

Mill Research.

It is now three years since any researches were conducted in mill problems. Whilst the reasons are clearly understood for the abandonment of this work, the time is approaching when it will have to be taken up again. This type of work requires considerable preliminary training on the part of those doing the work. Consequently, it is desirable to rebuild the Technology staff at once in order that new members may serve their apprenticeship now and so be in a position to give useful service when research work is resumed.

During the past season, the Mill Technologist visited all mills at least once.

The Education of Sugar Technologists.

For some years past the Central Technical College at Brisbane has provided a diploma course in Sugar Technology —the advanced sugar technology subjects being taught by members of this Division. Each year it became more apparent that this course was far too ambitious for the type of student taking it. This is no reflection on the mental ability of the students themselves, but simply an indication that their preliminary education was not usually adequate. After much consideration, it was concluded that the only really satisfactory solution was to develop a post-graduate course in Sugar Technology at the University, and to let the College course revert to the original Diploma in Sugar Chemistry course. This proposal was discussed with, and endorsed by, the representatives of the sugar industry. Accordingly, negotiations were entered into with the two educational bodies, and at present these have reached the following stage—

1. The University Senate has recommended that the Post Graduate Course in Sugar Technology be instituted;

2. The Director of Technical Education has agreed that the College revert to the old Diploma in Sugar Chemistry.

Much still remains to be done before these two courses can operate fully, but it is sanguinely hoped that a start will be made at the commencement of the 1945 academic year. When these two courses finally settle down, it is felt that the supply of (*a*) well trained sugar technologists, and (*b*) proficient sugar chemists will do much to improve the technical efficiency of the industry.

Mill Work, 1943 Season.

For the fourth consecutive year there was a marked drop in production. The 1943 crop, 3,397,424 tons, was nearly a million tons less than that of 1942. This resulted in the lowest sugar production for seventeen years, the quantity of 94 n.t. sugar produced—486,447 tons—being but 702 tons greater than that of 1927.

The ratio of cane to sugar, 6.98, though lower than that for the 1942 season, is higher than average, and this may be attributed mainly to increased factory losses.

The causes of the low tonnage were simply a continuation of those recorded last year, viz., inadequate fertilization and cultivation, restricted planting and prolonged and disorganised crushing.

The average quality of the cane, though appreciably better than that of last year, was still somewhat below standard. In the southern district the sugar content was particularly low; doubtless the excessive frost damage in portions of this area contributed in no small measure to this. The fibre value for the first time since 1935 exceeded 12 per cent.—due mainly to the high value of 10.62 recorded in the northern district. This increase in fibre content was welcome to the engineer in that it provided him with a large proportion of the extra fuel he was compelled to burn.

Of the factories north of Brisbane fifteen operated on two shifts only. The remainder worked three shifts, but at greatly reduced hourly crushing rates, for the greater part of the season. In some cases several of the latter group were compelled to operate part of the time on two shifts only. Shortage of labour in both the field and mill was the cause of this disorganised operation. This was most pronounced in the north, where, with the exception of one mill all mills north of Mackay (and one mill in Mackay) operated on two shifts.

Under these conditions, the analysis of lost time becomes a little complicated since most mills were forced to cease operation at times to avoid exceeding the weekly tonnages stipulated by Government Regulations, as recommended by the Royal Commission of 1942-43. Accordingly, in the accompanying table, the gross total time has been distributed in the following categories: actual crushing time; time lost through manufacturing troubles; time lost through inadequate cane supply—these three comprise the total time available for crushing—time lost through restriction of the maximum rate; and time for the week end shut downs; the last two represent time not available for crushing. Of the gross total time the available time was 64.45 per cent. and of this manufacturing and cane supply losses were 9.41 per cent. This value (9.41) per cent.) is the one that must be compared with the lost time values of previous years, and it will be seen that there has been a marked increase. Incidentally, the increase was more marked in the case of the three-shift mills.

The time lost through restriction of maximum rate was 13.80 per cent. of the gross available time and represents time which, under normal conditions, is available for crushing.

The average crushing rate was 55.45 tons of cane per hour, the lowest average value since 1936. In this regard the two-shift mills did not show very great reductions in rate, whereas obviously the three-shift mills did.

The possible influence of the disturbed conditions of 1943 on the efficiency of mill work is a matter of considerable interest, concerning which many conjectures have been made. That there was a deterioration in the quality of mill work in the years 1942 and 1943 compared with the standard of the immediately preceding years is evident from the figures in the tables of this report, and that these two years were occasions of disturbance within the sugar industry is well known. It is therefore reasonable to assume that the falling off in the standard was the result of the abnormally bad conditions. Such a generalisation as this is quite safe—it is when attempts are made to draw finer conclusions that danger arises. In order therefore to obtain an indication of the tolerances which must be allowed before conclusions may be justifiably drawn, a statistical analysis has been made of the coefficient of work of the mills for which data are available, for the years 1937 to 1943 inclusive. This covers all Queensland mills except those operated by the Colonial Sugar Refining Company and Pioneer Sugar Mills Pty. Ltd., and the two small factories in the Beenleigh area—*i.e.*, 25 factories in all.

For the purpose of this mathematical analysis the coefficient of work reported each year in the Annual Report may not be used. This value is obtained as the ratio of the total sugar (94 n.t.) produced by the mills to the total C.C.S. in the cane crushed by these mills, and so is weighted by the magnitudes of the individual mill crops. The true indication of the average mill coefficient of work is simply the arithmetic mean of the individual mill values. These values, for the seven years under consideration, are—

——	1937.	1938.	1939.	1940.	1941.	1942.	1943.
Average Mill Coefficient of Work	97·802	97·770	97·997	97·645	98·324	96·528	96·798

Using the entire data from the 25 mills over the seven years, an analysis of variance shows that there is no significant difference between the average annual coefficients of work for the five years 1937 to 1941, and that all are significantly higher than the values for 1942 and 1943. In the case of the 1942 value the difference is highly significant. The difference between 1942 and 1943 is not significant.

This result shows clearly that 1942 and 1943 were abnormally low years when compared with the previous five years, but does not in any way explain why they were low. The explanation that the general disorganisation of the industry was responsible is purely an assumption, but from general knowledge it is felt that the assumption is a sound one.

During 1942 nine of the twenty-five mills operated on two shifts only, and an inspection of their results suggests that these mills suffered to a greater extent than did the remainder. Accordingly a further analysis was made to see whether any significant difference could be found in the case of these. Since the general analysis showed that the five years 1937 to 1941 were not significantly different it was decided to use the average value of these years as the basis for comparison. The results of this analysis—covering the twenty-five mills, and the 16 mills operating on three shifts in 1943, as well as the group that operated with two shifts in that year, are shown in the accompanying table. The latter group has been further analysed by eliminating two mills which operated on two shifts in 1942, as well as in 1943.

From this analysis several interesting points are suggested:

(1) In every case 1942 was significantly lower than the average.

(2) 1943 was significantly lower than the average in all cases except the 16 mills operating on three shifts.

(3) Only in the case of the seven mills which operated on two shifts in 1943 only was there a significant difference between the years 1942 and 1943 and even then the difference barely exceeded the criterion for the 5 per cent. level of significance.

In discussing these points there are several factors which must not be overlooked, the most important being the geographical factor. All the two-shift mills, with the exception of one in Mackay, were situated in the northern district, and all three-shift mills, with the exception of one in the far north, were in Mackay and further south. Thus the different behaviour of these two groups may be due to differential climatic conditions rather than to the influence of two-shift operation. Had the two groups been uniformly distributed throughout the sugar areas, this factor would have been eliminated and the influence of two shifts could have been determined with reasonable certainty.

As it is the most that can be said is that operation on two shifts was probably responsible for the drop in coefficient of work experienced by that group of mills.

Finally, it must be pointed out that this discussion deals only with the efficiency of operations as indicated by the coefficient of work, and does not include such matters as loss due to prolongation of the season, extra labour costs, etc.

The quantity of fuel used per ton of cane showed an increase over that of the previous year which in turn was higher than that of the preceding year and was the first backward step from the previous downward trend. There can be little doubt that the extra lost time and general disorganisation was mainly responsible for this.

The length of the season, as indicated by the total crop days was the smallest since 1932, when it will be recalled a serious drought in the southern areas greatly reduced the crop.

TABLE SHOWING THE RELATIONSHIP BETWEEN AVERAGE MILL COEFFICIENT OF WORK FOR THE YEARS 1942 AND 1943, AND THE AVERAGE VALUE FOR THE PERIOD 1937–1941 INCLUSIVE.

Number of factories	25	16	9	7*
Shifts operated per day in 1943	16 @ 3 / 9 @ 2	3	2	2
Average coefficient of work—1937–1941 inclusive	97·908	97·297	98·969	98·679
Average coefficient of work—1942	96·528	95·929	97·594	97·710
Difference in coefficient of work, 1942 from average	1·380	1·368	1·375	0·989
Necessary difference for significance—				
(*a*) 1 per cent. level	·855	1·137	1·131	1·269
(*b*) 5 per cent. level	·647	·858	·848	·947
Comment *re* difference	Highly significant	Highly significant	Highly significant	Significant
Average coefficient of work—1937–1941 inclusive	97·908	97·297	98·969	98·679
Average coefficient of work—1943	96·798	96·889	96·637	96·456
Difference in coefficient of work, 1943 from average	1·110	·408	2·362	2·233
Necessary difference for significance—				
(*a*) 1 per cent. level	·855	1·137	1·131	1·269
(*b*) 5 per cent. level	·647	·858	·848	·947
Comment *re* difference	Highly significant	Not significant	Highly significant	Highly significant
Average coefficient of work—1942	96·528	95·929	97·594	97·710
Average coefficient of work—1943	96·798	96·889	96·637	96·456
Difference in coefficient of work—1942-1943	·270	·960	·957	1·254
Necessary difference for significance—				
(*a*) 1 per cent. level	1·102	..	1·460	1·639
(*b*) 5 per cent. level	·834	1·105	1·094	1·222
Comment *re* difference	Not significant	Not significant	Not significant	Significant

* Excludes the two mills which operated with two shifts in 1942 also.

FIGURES FOR 1943 SEASON.

	Northern.	Central.	Southern.	Totals and Averages.
Tons cane crushed	1,430,006*	1,176,802*	790,616*	3,397,424*
Tons sugar made (94 n.t.)	206,634*	177,527*	102,286*	486,447*
Net titre	97·14	97·55	97·56	97·41
Tons of cane per ton 94 n.t. sugar	6·92*	6·63*	7·73*	6·98*
C.C.S. in cane	14·99	15·41	13·26	14·62
Coefficient of work	96·91	97·03	97·61	97·14
Coefficient of work E.S.G.	92·04	92·05	92·69	92·23
Crushing rate	76·15	58·72	39·76	55·45
Lost time per cent.	3·35	8·18	13·98	9·41
Fibre per cent. cane	10·62	12·15	13·64	12·08
Pol, per cent. cane	16·10	16·43	14·42	15·71
First expressed juice—				
Brix	21·21	21·76	20·10	21·07
Purity	89·95	91·07	88·18	89·82
Clarified juice—				
Brix	16·64	15·38	14·71	15·61
Purity	89·66	90·19	87·58	89·22
Syrup—				
Brix	69·54	69·95	66·70	68·83
Purity	89·47	90·25	87·68	89·21
Last expressed Juice—				
Purity	79·59	79·51	74·99	78·12
Clarified juice per 100 cane	103·03	112·52	106·77	107·42
Dilution per cent. first expressed juice	27·44	41·50	36·69	35·03
Final Bagasse—				
Pol	2·83	2·86	2·03	2·60
Dry substance	51·77	49·71	50·51	50·65
Pol extraction	96·14	95·41	95·98	95·78
Reduced extraction	95·35	95·26	96·37	95·61
Lost cane juice per cent. fibre	34·73	35·86	28·16	33·36
Final molasses—				
Gallons per ton cane	4·19	4·23	4·48	4·29
Brix	84·91	88·22	88·82	87·25
Apparent purity	35·01	37·58	39·71	37·35
True purity	47·73	46·10	47·38	47·22
Reducing sugars	16·35	14·80	10·06	13·97
Final mud—				
Tons per 100 tons cane	2·58	4·15	4·17	3·58
Pol	4·08	1·89	2·19	2·57
Sugar—				
Pol	98·582	98·815	98·900	98·765
Reducing sugars	·421	·374	·173	·335
Ash	·205	·178	·234	·203
Moisture	·346	·268	·248	·289
Dilution indicator	32·31	29·22	29·11	30·29
Pol balance—				
Sugar (recovery)	86·06	86·69	85·49	86·12
Bagasse	3·86	4·59	4·02	4·22
Molasses	4·99	5·57	7·20	5·80
Mud	·65	·48	·63	·59
Undetermined	4·44	2·67	2·66	3·27
Boiling house efficiency	93·70	94·56	94·12	94·18
Boiling house efficiency E.S.G.	93·29	94·21	93·80	93·82
Fuel—				
B.T.U.'s 1,000s per ton cane—				
Wood	115·19	154·13	269·70	175·68
Coal	..	15·98	36·86	16·83
Molasses	157·42	10·56	..	57·38
Bagasse	2,093·42	2,406·40	2,648·20	2,574·64
Total	2,366·03	2,587·07	2,954·76	2,624·53
Crop days	1,638*	1,355*	1,285*	4,270*

* All mills. Remainder, except C.S.R., Pioneer, Inkerman, and Eagleby Mills.

CANE MILLED AND SUGAR YIELD, SEASON 1943.

Mill.	Tons Cane Crushed.	Tons 94 n.t. Sugar Made.	Tons Cane per Ton 94 n.t. Sugar. 1943.	1942.
Mossman	99,356	14,304	6·946	6·855
Hambledon	155,534	21,907	7·100	7·512
Mulgrave	179,098	25,789	6·945	7·318
Babinda	149,729	21,226	7·054	7·438
Goondi	149,385	21,154	7·062	7·626
South Johnstone	177,107	26,112	6·782	7·245
Mourilyan	123,876	18,093	6·847	7·367
Tully	162,990	24,028	6·783	7·279
Victoria	151,079	22,034	6·857	7·686
Macknade	81,852	11,947	6·851	7·599
Sugar—Local sales	..	40	..	..
Total for Northern District	1,430,006	206,634	6·920	7·439
Invicta	60,810	9,151	6·645	6·744
Pioneer	98,112	15,894	6·173	6·443
Kalamia	139,512	21,984	6·346	6·411
Inkerman	139,571	21,216	6·579	6·780
Proserpine	105,604	16,107	6·556	6·642
Cattle Creek	49,670	7,202	6·897	6·912
Racecourse	108,429	15,809	6·859	7·046
Farleigh	114,280	16,373	6·978	7·078
North Eton	65,480	9,451	6·928	7·250
Marian	83,407	12,621	6·608	6·784
Pleystowe	110,675	16,897	6·550	6·876
Plane Creek	101,252	14,773	6·854	7·080
Sugar—Local sales	..	44	..	..
Total for Central District	1,176,802	177,527	6·629	6·787
Qunaba	64,402	8,259	7·798	7·734
Millaquin	114,112	14,794	7·713	7·444
Bingera	146,356	19,669	7·441	7·017
Fairymead	111,063	14,026	7·918	7·858
Gin Gin	45,292	5,263	8·606	7·894
Isis	150,611	20,648	7·294	7·146
Maryborough	41,903	5,428	7·720	7·523
Mount Bauple	30,794	3,771	8·166	7·830
Moreton	74,134	9,179	8·076	7·611
Rocky Point	10,646	1,118	9·522	8·452
Eagleby	1,303	122	10·680	..
Sugar—Local sales	..	9	..	..
Total for Southern District	790,616	102,286	7·729	7·457

ADJUSTED TONNAGES OF SUGAR DEEMED TO BE MANUFACTURED FROM MILLS' OWN CANE.

Mossman	14,304	Pleystowe	16,843
Hambledon	21,907	Marian	12,565
Mulgrave	25,789	Cattle Creek	7,202
Babinda	21,226	North Eton	9,451
Goondi	21,154	Plane Creek	14,773
Mourilyan	18,093	Bingera	19,550
South Johnstone	26,112	Fairymead	14,879
Tully	24,028	Millaquin	14,910
Victoria	20,004	Qunaba	8,259
Macknade	13,977	Gin Gin	5,380
Invicta	9,151	Isis	19,712
Kalamia	21,984	Maryborough	5,318
Pioneer	15,894	Mount Bauple	3,852
Inkerman	21,216	Moreton	9,177
Proserpine	16,098	Rocky Point	1,118
Farleigh	16,297	Eagleby	122
Racecourse	16,009	Local Sales	93
			486,447

——	Season.	Pol in Cane.	Fibre in Cane.	Purity 1st Exp'd. Juice.
Southern District	1934	14·67	14·59	89·74
	1935	14·56	14·47	88·60
	1936	15·31	14·32	88·83
	1937	15·05	14·04	88·14
	1938	14·62	13·66	88·87
	1939	14·88	13·70	88·46
	1940	15·42	13·40	87·69
	1941	14·76	12·93	87·94
	1942	14·96	13·85	88·01
	1943	14·42	13·64	88·18
Central District	1934	16·45	12·20	90·82
	1935	16·54	12·36	90·78
	1936	16·43	11·84	90·91
	1937	16·62	10·96	90·06
	1938	16·70	11·55	91·58
	1939	16·33	11·39	90·43
	1940	16·34	11·52	90·54
	1941	15·86	11·54	90·11
	1942	16·09	12·24	91·52
	1943	16·43	12·15	91·07
Northern District	1934	15·16	10·30	89·08
	1935	15·91	11·35	89·63
	1936	15·01	9·92	87·92
	1937	16·14	10·12	89·79
	1938	15·74	10·17	89·95
	1939	16·18	9·84	90·30
	1940	16·26	9·89	90·45
	1941	16·27	9·71	90·01
	1942	15·06	9·89	89·00
	1943	16·10	10·62	89·95
All Districts	1934	15·57	12·23	89·95
	1935	15·84	12·39	89·83
	1936	15·66	11·63	89·36
	1937	16·15	11·17	89·61
	1938	15·84	11·63	90·32
	1939	15·88	11·56	89·85
	1940	16·04	11·58	89·65
	1941	15·70	11·29	89·47
	1942	15·44	11·76	89·76
	1943	15·71	12·08	89·82

TONS OF CANE PER TON 94 N.T. SUGAR.

1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.
6·94	6·90	7·31	6·97	6·92	6·94	6·73	6·87	6·77	6·82	6·87	7·18	6·98

AVERAGE CRUSHING RATES (TONS CANE PER HOUR).

1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.
54·83	55·73	60·80	61·53	61·67	63·32	55·93	55·45

ANALYSIS OF GROSS TOTAL TIME FOR 1943 SEASON.

—	—	Total Hours.	Per cent. of Gross Total Hours.	Per cent. of Available Crushing Hours.
Available for Crushing	Crushing ..	45,747·44	58·52	90·59
	Lost Time—			
	Manufacture	1,167·85	1·49	2·31
	Cane Supply	3,585·86	4·59	7·10
	Total ..	50,501·15	64·60	100·00
Unavailable for Crushing	Restrictions* ..	10,813·95	13·83	..
	Week-ends ..	16,855·45	21·57	..
	Total ..	27,669·40	35·40	..
	Gross Total	78,170·55	100·00	..

*Restrictions to maximum rate.

SOUTHERN DISTRICT.

——	1937.	1938.	1939.	1940.	1941.	1942.	1943.
Tons of cane	647,220	1,035,992	1,262,554	1,217,278	1,006,149	755,491	790,616
Tons of 94 n.t. sugar	85,131	135,261	168,896	169,232	134,603	101,314	102,286
Tons of cane per ton 94 n.t. sugar	7·60	7·66	7·48	7·19	7·48	7·46	7·73
Pol in cane	15·05	14·62	14·88	15·42	14·76	14·96	14·42
Fibre in cane	14·04	13·66	13·70	13·40	12·93	13·85	13·64
Purity—							
First expressed juice	88·14	88·87	88·46	87·69	87·94	88·01	88·18
Clarified juice	87·23	88·07	87·80	86·91	87·05	87·36	87·58
Syrup	87·42	88·33	88·22	87·28	87·30	87·29	87·68
Gallons molasses per ton cane	4·91	4·13	4·13	4·56	4·54	4·82	4·48
Apparent purity final molasses	41·23	39·05	38·79	37·42	36·77	38·39	39·71
Overall recovery	83·83	85·46	86·17	86·44	86·86	85·50	85·49
Overall recovery E.S.G.	83·45	85·07	85·80	86·04	86·52	85·20	85·20
Recovery on mixed juice	87·81	89·82	90·08	90·27	90·31	89·28	89·07
Recovery on mixed juice E.S.G.	87·41	89·41	89·69	89·86	89·96	88·97	88·76
Boiling-house efficiency	92·82	94·55	95·02	95·03	95·57	94·38	94·12
Boiling-house efficiency E.S.G.	92·39	94·12	94·61	95·19	95·20	94·05	93·80

CENTRAL DISTRICT.

——	1937.	1938.	1939.	1940.	1941.	1942.	1943.
Tons of cane	1,961,413	2,030,166	2,397,268	1,891,399	1,724,922	1,631,976	1,176,802
Tons of 94 n.t. sugar	304,502	314,574	371,259	280,777	256,023	240,458	177,527
Tons of cane per ton 94 n.t. sugar	6·44	6·45	6·46	6·74	6·71	6·79	6·63
Pol in cane	16·62	16·70	16·33	16·34	15·86	16·09	16·43
Fibre in cane	10·96	11·55	11·39	11·52	11·54	12·24	12·15
Purity—							
First expressed juice	90·06	91·58	90·43	90·54	90·11	91·52	91·07
Clarified juice	89·55	90·77	89·97	90·04	89·54	90·51	90·19
Syrup	89·84	91·04	90·33	90·14	88·87	90·69	90·25
Gallons molasses per ton cane	4·13	3·72	3·96	4·03	4·12	3·96	4·23
Apparent purity final molasses	35·93	37·85	35·33	35·40	35·53	38·89	37·58
Overall recovery	89·00	88·72	86·98	87·80	88·25	86·85	86·69
Overall recovery E.S.G.	88·64	88·37	86·57	87·38	87·90	86·51	86·37
Recovery on mixed juice	93·25	92·70	91·20	92·19	92·23	90·84	90·86
Recovery on mixed juice E.S.G.	92·87	92·33	90·77	91·75	91·87	90·49	90·52
Boiling-house efficiency	97·54	96·26	95·20	96·23	96·47	94·33	94·56
Boiling-house efficiency E.S.G.	97·14	95·88	94·75	95·77	96·09	93·96	94·21

NORTHERN DISTRICT.

——	1937.	1938.	1939.	1940.	1941.	1942.	1943.
Tons of cane	2,524,301	2,275,927	2,378,999	2,072,079	2,062,518	1,963,175	1,430,006
Tons of 94 n.t. sugar	373,692	328,301	351,267	309,437	305,819	263,908	206,634
Tons of cane per ton 94 n.t. sugar	6·76	6·93	6·77	6·70	6·74	7·44	6·92
Pol in cane	16·14	15·74	16·18	16·26	16·27	15·06	16·10
Fibre in cane	10·12	10·17	9·84	9·89	9·71	9·89	10·62
Purity—							
First expressed juice	89·79	89·95	90·30	90·45	90·01	89·00	89·95
Clarified juice	90·29	90·07	90·34	90·63	90·18	88·91	89·66
Syrup	89·85	90·89	90·40	90·73	89·90	88·92	89·47
Gallons molasses per ton cane	3·51	3·39	3·56	3·62	3·89	4·16	4·19
Apparent purity final molasses	34·62	34·38	35·81	36·20	35·32	32·85	35·01
Overall recovery	88·01	87·50	86·88	87·67	87·40	86·60	86·06
Overall recovery E.S.G.	87·67	87·12	86·49	87·25	86·99	86·38	85·69
Recovery on mixed juice	92·44	92·53	91·15	91·69	91·28	89·89	89·52
Recovery on mixed juice E.S.G.	92·08	92·12	90·74	91·25	90·86	89·67	89·13
Boiling-house efficiency	96·80	96·89	95·25	95·71	95·48	94·52	93·70
Boiling-house efficiency E.S.G.	96·42	96·46	94·82	95·25	95·04	94·28	93·29

ALL QUEENSLAND DISTRICTS.

——	1937.	1938.	1939.	1940.	1941.	1942.	1943.
Tons of cane	5,132,934	5,342,085	6,038,821	5,180,756	4,793,589	4,350,642	3,397,424
Tons of 94 n.t. sugar	763,325	778,136	891,422	759,446	697,345	605,680	486,447
Tons of cane per ton 94 n.t. sugar	6·73	6·87	6·77	6·82	6·87	7·18	6·98
Pol in cane	16·15	15·84	15·88	16·04	15·70	15·44	15·71
Fibre in cane	11·17	11·63	11·56	11·58	11·29	11·76	12·08
Purity—							
First expressed juice	89·61	90·32	89·85	89·65	89·47	89·76	89·82
Clarified juice	89·44	89·83	89·48	89·28	89·08	89·18	89·22
Syrup	89·41	90·20	89·77	89·46	88·80	89·23	89·21
Gallons molasses per ton cane	4·02	3·54	3·88	4·06	4·16	4·24	4·29
Apparent purity final molasses	36·02	37·08	36·51	36·39	35·83	36·42	37·35
Overall recovery	87·80	87·55	88·24	87·36	87·45	86·46	86·12
Overall recovery E.S.G.	87·45	87·17	87·83	86·95	87·11	86·10	85·70
Recovery on mixed juice	92·20	92·01	92·56	91·49	91·54	90·18	89·92
Recovery on mixed juice E.S.G.	91·83	91·61	92·13	91·06	91·16	89·81	89·57
Boiling-house efficiency	96·65	96·14	96·94	95·90	96·06	94·53	94·18
Boiling-house efficiency E.S.G.	96·26	95·73	96·50	95·45	95·66	94·14	93·82
Pol extraction	95·22	95·12	95·34	95·46	95·76	95·88	95·78
Reduced extraction	94·57	94·70	94·91	95·05	95·24	95·58	95·61
C.C.S. in cane	15·00	14·79	14·77	14·90	14·58	14·36	14·62
Coefficient of work	98·98	98·17	99·16	98·24	98·60	97·29	97·14
Coefficient of work E.S.G.	94·17	93·38	94·45	93·70	93·77	92·40	92·23

—	1935.	1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.
Crop days	4,296	4,809	4,497	4,822	5,163	4,558	4,034	4,432	4,270

By Authority: A. H. TUCKER, Government Printer, Brisbane