1937.

QUEENSLAND.

THIRTY-SEVENTH 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* 1934").

PRESENTED TO PARLIAMENT BY COMMAND.

BRISBANE:
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THIRTY-SEVENTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

Director's Report.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

SIR,—I have the honour to submit the Thirty-seventh Annual Report of The Bureau of Sugar Experiment Stations, covering the period 1st July, 1936, to 30th June, 1937.

H. W. Kerr.

Director.

Brisbane, 6th September, 1937.

General.

The conditions under which the 1937 cane crop was produced were highly variable. A dry spring season in all areas was followed by beneficial early summer rains in all areas from Mackay north. Generally satisfactory growing conditions continued in these districts until March. No heavy rains, accompanied by flooding, were encountered in the far northern districts during these months, and the crops did not suffer from this cause. In view of the prolonged crushing season for the 1936 crop in these parts, the success of the 1937 ratoon crops was definitely favoured by these conditions.

Until March the prospect for abnormally heavy yields in the Central and Northern districts was distinctly indicated, but there followed a period of two months during which no highly beneficial rains were experienced, and early crop estimates were substantially lowered due to the growth check which followed. Winter rains were not heavy, though they served to maintain the mature crop in good condition. Early milling returns indicate that the sugar content of the cane will this year be rather abnormally high.

As regards the Southern cane areas, little may be said in favour of the growing season in those districts. The extreme drought conditions which set in during the summer of 1936 persisted throughout the balance of the year, and the first rains of real benefit accompanied the March cyclonic disturbance. Thereafter, drought conditions again supervened, and even allowing for a proportion of standover cane for the 1936 harvest, subnormal tonnages will be harvested uniformly in the Bundaberg and southernmost cane areas.

Report of Director—continued.

Crop Yield, 1936—Crop Estimate, 1937.

The following table shows the individual mill crushings for the 1936 season, and the estimated crops to be treated during the 1937 harvest :—

1936 Crushing.	Mill.	1937 Estimate.
Tons.		Tons.
152,199	Mossman	132,000
291,792	Hambledon	264,000
353,538	Mulgrave	280,000
249,281	Babinda	249,000
182,223	Goondi	183,770
245,506	South Johnstone	252,756
167,877	Mourilyan	180,000
263,311	Tully	269,645
273,711	Victoria	275,000
231,267	Macknade	231,000
86,840	Invicta	111,875
167,653	Pioneer	206,090
221,323	Kalamia	238,094
211,714	Inkerman	251,000
151,750	Proserpine	150,000
91,454	Cattle Creek	69,000
197,326	Racecourse	180,000
158,989	Farleigh	142,000
94,533	North Eton	73,000
193,645	Marian	140,000
188,540	Pleystowe	160,000
202,677	Plane Creek	189,775
69,163	Qunaba	53,000
130,564	Millaquin	120,000
146,627	Bingera	135,000
136,286	Fairymead	115,412
30,280	Gin Gin	19,000
145,313	Isis	100,000
29,644	Maryborough	27,000
27,717	Mount Bauple	16,000
68,303	Moreton	55,000
9,625	Rocky Point	11,000
845	Eagleby	1,000
5,171,516	Total ..	**4,880,417**

Report of Director—continued.

id the estimated

Estimate of Sugar Yield, 1937 Crop.

The preliminary estimate of the crop which will be harvested in Queensland during the 1936 season is 4,880,417 tons. Allowing 6·90 tons of cane to make 1 ton of 94 n.t. sugar, the estimated sugar yield is 707,310 tons. It is probable that the cane yield will be below the preliminary forecast, but it is also possible that the tons of cane required to make 1 ton of sugar will be even lower than 6·9. It is therefore anticipated that the actual yield will approximate 700,000 tons.

The estimated yield from the three New South Wales mill areas is 40,000 tons, giving a total Australian production of approximately 740,000 tons.

Statistics of the 1936 Crop.

The yield of raw sugar in Queensland, for the 1936 crop, was 744,261 tons. This is an all-time record, exceeding the previous record of 638,734 tons, established in 1933, by some 105,527 tons.

The following table shows the geographical distribution of the crop for the past five seasons, as between "Northern" and "Southern" areas :—

Sugar Production, 1932-36.

District.	1932.	1933.	1934.	1935.	1936.
	Tons.	Tons.	Tons.	Tons.	Tons.
North of Townsville	299,343	311,825	233,457	258,958	333,615
South of Townsville	214,741	326,909	379,113	351,368	410,646
Total	514,084	638,734	612,570	610,326	744,261

In both regions the yields greatly exceeded the previous record tonnages ; the greatest advance in yield, during recent years, lies with the areas south of Townsville.

Area Harvested and Acreage Yields.

The total area harvested in 1936 was 245,152 acres. The acreages under plant, ratoon, and standover cane were as follows :—

	Acres.
Plant cane	102,278
Ratoon cane	126,110
Standover cane	16,764
Total	245,152

The yield of cane per acre crushed was 21·10 tons, while the average sugar yield was 3·04 tons per acre. Both constitute record figures. The following were the yields of cane and sugar per acre in the respective sugar districts :—

Acreage Yields by Districts.

District.	Tons Cane per acre.	Tons 94 n.t. Sugar per acre.
Mossman–Ingham	23·81	3·30
Lower Burdekin	28·86	4·51
Proserpine	13·98	2·12
Mackay–St. Lawrence	17·43	2·65
Bundaberg–Gin Gin	20·14	2·73
Maryborough–Childers–Gympie	14·31	1·99
Nambour–Beenleigh	15·83	2·27
State Average	21·10	3·04

Report of Director—continued.

The following table gives the crop statistics for Queensland for the past ten years :—

Table showing Acres Cultivated and Harvested, Yields of Cane and Sugar, Acre-Yields, and Quality of Cane, 1927-1936.

Year.	Acres Cultivated.	Acres Harvested.	Total Yields.		Yields per Acre.		Tons Cane to 1 ton Sugar.
			Cane.	Sugar.	Cane.	Sugar.	
			Tons.	Tons.	Tons.	Tons.	Tons.
1927	274,838	203,748	3,555,827	485,745	17·45	2·38	7·32
1928	283,476	215,674	3,736,311	520,620	17·32	2·41	7·18
1929	291,660	214,880	3,581,265	518,516	16·67	2·41	6·91
1930	296,070	222,044	3,528,660	516,783	15·89	2·33	6·83
1931	309,818	233,304	4,034,300	581,276	17·29	2·49	6·94
1932	291,136	205,046	3,546,443	514,085	17·30	2·51	6·90
1933	311,910	228,154	4,667,028	638,734	20·46	2·80	7·31
1934	303,926	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	*	245,152	5,171,516	744,261	21·10	3·04	6·94
True Average for 10 Years					18·20	2·59	7 03

* Not available.

The steady increase in acreage yields during the past decade is a striking reflex of the manner in which intensive production methods have been more vigorously pursued, as raw sugar values have declined. For the first time in the history of the Queensland sugar industry, the average yield of sugar per acre was in excess of 3 tons. It is of interest to compare this figure with that which obtained at the beginning of the century, when the normal yield was about 1·5 tons of sugar per acre.

Average Area Harvested per Farm.

The following figures show the average acreage *harvested* by cane planters in Queensland for the 1936 crop :—

	Acres.
Cairns to Townsville	47
Ayr to Mackay	32
Bundaberg to Bauple	18
Nambour to Beenleigh	6
State average	30

The average harvested per planter was 30 acres, which is 2 acres more than that of the previous year.

Molasses Produced.

The following figures supplied by the Government Statistician show the manner in which the molasses produced in 1936 was disposed of :—

	Gallons.
Sold to distilleries	6,086,864
Burnt as fuel	6,354,841
Used or sold for feed	4,351,822
Sold or used for other purposes	397,080
Used as manure	3,211,423
Run to waste	560,326
Total	20,962,356

These figures provide rather a striking contrast with those of previous years. While the molasses production was a record total, substantial increases were shown in respect to all items, excepting the amount run to waste, which was reduced from 1,214,678 to 560,326 gallons. Drought conditions in the dairying districts of Southern Queensland were doubtless responsible for an increased utilization of molasses as a stockfeed, while that proportion used as manure showed an increase of nearly 700,000 gallons over 1935. Distilleries also accounted for 1,400,000 gallons in excess of the 1935 value. It must therefore be concluded that the industry is finding good use for increasing quantities of this by-product. Doubtless there remains the problem of the large quantity burnt as fuel when fibre in cane values are low.

Report of Director—continued.

MAFFRA BEET FACTORY.

The following data in respect of the Maffra Sugar Factory, Victoria, are supplied through the courtesy of the Manager :—

Crop Yields, 1937 Season.

Area harvested	3,475 acres
Beet purchased	31,079 tons
Beet sliced	29,820 tons
Average sugar content	17·58 per cent.
Sugar produced	4,180 tons
Price paid for beet	42/–
Average yield beet per acre	8·94 tons
Average yield refined sugar per acre	1·20 tons

1936 SUGAR VALUES.

The proportion of the sugar manufactured in Queensland which was required for consumption and use in the Commonwealth of Australia was declared at 56·4609 per cent., and that for export at 43·5391 per cent. These proportions are exclusive of the "excess" sugar produced by mills in excess of their allotments under the Peak Year scheme. The excess sugar produced for the 1936 season was 149,618 tons, as compared with 45,422 tons for the 1935 crop. This is by far the greatest tonnage of excess sugar produced in one year.

The price payable for the sugar required for consumption and use in Australia was declared at £24 2s. per ton of 94 net titre. This was an increase of 2s. per ton on the home consumption price of the previous season. The net value per ton of 94 net titre sugar sold abroad was £7 19s., which is practically identical with that recorded for 1935. The average price paid to those Queensland mills which did not produce "excess" sugar was £17 1s. 4d. per ton, compared with £16 17s. for the previous season. The average value of *all* sugar was £15 4s. 8d.

The following table summarises production and consumption figures and sugar values since the year 1924, when the first large surplus was produced :—

Year.	Total Sugar Production at 94 n.t.	Tons Sugar Exported.*	Average Australian Price.	Average Export Price.	Average Price, No. 1 Pool Sugar.	Average Price, *all* Sugar.
	Tons.	Tons.	£	£	£	£
1924	409,136	74,000	26·0	21·0	26·0	26·0
1925	485,585	219,000	26·5	11·3	19·5	19·5
1926	389,272	74,777	26·5	14·9	24·5	24·5
1927	485,745	152,384	26·5	12·1	22·0	22·0
1928	520,620	186,703	26·5	10·5	20·9	20·9
1929	518,516	197,000	27·0	9·9	20·3	20·3
1930	516,783	203,605	27·0	8·3	19·7	†19·5
1931	581,276	291,802	27·0	9·4	18·3	18·0
1932	514,027	189,733	25·0	8·3	19·3	18·8
1933	638,734	305,687	24·0	8·0	17·2	16·2
1934	612,570	277,336	24·0	7·6	16·5	15·5
1935	610,326	298,202	24·0	7·9	16·9	16·2
1936	744,261	409,400	24·1	7·95	17·1	15·2

* Bagged sugar. † Peak Year Scheme first operated in 1930.

Total Value, 1936 Sugar Crop.

The total value of the 1936 crop was £11,337,580—an all-time record.

ECONOMIC REVIEW.

The outstanding event of the past year was the International Sugar Conference convened in London in April, 1937, under the auspices of the League of Nations. This Conference marked a logical attempt on the part of the sugar-producing world to impose such control on sugar production as was necessary to introduce greater stability in the industry. For many years, excess stocks of raw sugar have existed, and the prices at which it was necessary to clear these were substantially below production costs for practically every sugar-producing country.

Australia was represented at this Conference by a delegation led by the Federal Treasurer (Mr. R. G. Casey), very ably supported by the Honourable the Premier of Queensland (Mr. W. Forgan Smith) as alternative delegate to the Commonwealth appointees. In all, representatives of twenty-three countries participated in the deliberations, which occupied a period of more than three weeks.

An agreement was finally drawn up, which proved acceptable to practically all countries. This agreement aims at "maintaining the free market by preventing its restriction through a disproportionate expansion of national production or of the quantities supplied under preferential arrangements. It also aims at encouraging an extension of the free market by promoting increased consumption." It established a scheme of export quotas in accordance with the immediate requirements of the free market, while providing for any expansion which may result from increased future demands. The agreement will operate for five years, as from 1st September, 1937. The quotas as fixed were "not so restricted as to arouse any fears that supplies will be inadequate to meet demand, or that prices will be forced up unduly to the prejudice of consumers."

The agreement was signed in London on the 6th May, 1937. It is a comprehensive document which defines the operations of the plan, sets out the objectives of those countries (including Australia) not exporting to the free market, and defines the quotas of those supplying this market. An International Sugar Council was established, with headquarters in London, to administer the agreement.

So far as Australia is concerned, an export quota of 400,000 tons per annum was granted. This sugar will be marketed within the British Empire. A proviso is added that in the event of any consumption increase in those parts of the British Empire which are at present importers, the British Dominions and Colonies and the United Kingdom beet producers shall obtain a share in this increase, proportionate to that which they have at present.

From the point of view of Australian producers, the result must be regarded with satisfaction. It has been repeatedly emphasised that producers in this country have never aimed at the production of sugar for export. The present situation is one which has been brought about by a number of factors, which encouraged production to such an extent that it rapidly overtook the consumption rate. The most important consideration, from our point of view, is that we should have an assured market for our exportable surplus, and, further, that any scheme which could so regulate production that the world's sugar price might be brought to a level nearer to that of the production cost is definitely to be endorsed. The ruling price on the free market over the past few years was such that virtually no country could produce sugar profitably for this purpose.

It is pleasing to record that in recent months the market quotation is substantially in advance of that obtaining a year ago, and the net value of the Australian export sugar would have revealed a very important improvement were it not for the concomitant increase in overseas freight rates, which largely offsets any benefits hitherto acquired.

It is obvious that the success attained by the new Agreement will depend very largely on the measure of increase which is obtained in world sugar consumption. The Conference directed special attention to this factor, notably in respect of those countries in which *per capita* consumption is low, because the retail price has been inflated due to the excessive fiscal charges imposed. Statistical data of recent years have demonstrated a very encouraging increase in world consumption, which has resulted in a substantial reduction in sugar stocks. Should this be sustained, there is every probability that further advances will be made in market values ; however, one would not be so bold as to predict an early increase to a point which would stimulate a desire for increased production in this country.

Report of Director—continued.

Arising from the discussion which took place during the course of the Conference, and quite apart from the Agreement altogether, was a matter of perhaps even greater significance to Australian producers. That was the decision of the British Government to grant the Dominions a continuance for five years of the existing rebates of duty, and an undertaking that eighteen months' notice would be given of any decision to terminate the preference. Even if the International Agreement should break down, this assurance provides a measure of stability which previously did not exist.

During the 1936 season Queensland produced a sugar crop far in excess of any hitherto recorded. Practically 425,000 tons of sugar were exported, and the average net price of *all* sugar was £15 4s. 8d. per ton. It is freely suggested that this crop was highly abnormal in magnitude due in a large measure to the particularly favourable weather conditions experienced in all areas from Mackay north. Doubtless this explanation is true, insofar as it applies to the 1936 crop; but one cannot overlook the fact that improved efficiency in field and mill and the wider adoption of intensive cultivation methods in recent years have been responsible for a sharp upward trend in average production. Our records show the following five-year period averages for yields of sugar per acre :—

Period.	Sugar per Acre. Tons.
1919–1923	2·01
1924–1928	2·37
1929–1933	2·51
1934–1936 (3 years)	2·84

It would, therefore, appear probable, irrespective of season, that the Queensland average will very soon fluctuate about 3 tons of sugar per acre, and even then it will not have reached its limit. With the progressive development of irrigation resources, the writer confidently anticipates that a yield of 3·5 tons per acre will be attained in the course of a few years; and even on the present harvestable acreage, a sugar crop in excess of 800,000 tons of sugar could readily be achieved.

The industry is therefore still faced with the problem of looking to the future in order to avoid, if possible, any further complications which might arise from natural and logical causes such as those suggested.

Work of the Bureau.

The detailed reports of the officers in charge of the several Divisions will be found in the subsequent pages of this report. The following comments summarise the more important aspects of the activities of the Bureau for the year under review :—

Advisory Board.

The vacancy created by the resignation of Mr. W. D. Davies, Northern growers' representative on the Board, was filled by the appointment of Mr. N. H. Wellard, of Mossman.

During the year three meetings of the Board were held—on the 26th October, 1936, and 26th February, 1937, in Brisbane, and on the 10th June, 1937, in Bundaberg. At these meetings many matters with an important bearing on the Bureau policy were discussed. The Board is, therefore, charged with a very definite responsibility in this regard, and it must be concluded that healthy progress was made during the period.

The question of more effective control of cane diseases received close attention at all meetings of the Board, notably in relationship to the outbreak of gumming disease in the Mulgrave area. The more effective control of cane diseases, in all districts of the State, was the subject of extended deliberations at the June meeting held in Bundaberg, and plans for future action were laid.

The Board decided that the time was opportune for reinstituting Farmers' Field Days at the Experiment Stations. Functions were subsequently held at Bundaberg on the 10th June, when the Advisory Board was present, and at Mackay on the 25th June. Both gatherings passed off successfully and were attended by a good representation of growers.

The fibre-in-cane investigation which was begun during the harvesting season of 1936 was again considered by the Board, who agreed that the subject be further studied on an enlarged scale during the 1937 crushing. The work has been commenced at the Mackay and Bundaberg Experiment Stations.

The utilization of by-products is a subject which came before the notice of the Board and a preliminary survey of the molasses question has been put in hand. This arose from the proposal of one of the northern mills to experiment in the production of solid molasses for use as stockfeed.

The estimates for the 1937–38 financial year were discussed and finalised at the meeting of the Board held in Bundaberg in June, 1937. Careful attention was paid to matters of staff, and the provision of suitable officers to fill existing and projected vacancies. Matters of this nature were duly provided for in the budget which was framed.

Staff Changes.

Mr. G. E. Young resigned his position in January, 1937, to resume studies at the University. Mr. N. Smith resigned in June, 1937, to take up a position with the Australian National Power Alcohol Company, Sarina. Mr. J. Pringle was transferred from the Bundaberg Sugar Experiment Station to the Agricultural Chemist's Laboratory, Brisbane, and Mr. N. J. King was appointed his successor as Chemist in Charge of that Station. Mr. A. P. Gibson resigned his position as Instructor in Cane Culture due to ill-health.

Steps have been taken to fill the two vacancies in the Mill Technology staff and to appoint a successor to Mr. Gibson. The loss of the Assistant Mill Technologists will seriously interfere with the continuity of mill investigational work, and steps will be taken, in the future, to devise means of ensuring continuity of service in this Division.

Experiment Stations.

At the end of the 1936-37 financial year the programme which was laid down three years ago for bringing the three sugar experiment stations up to a high standard of working efficiency was almost completed. All station buildings and equipment have been modernised, and it is confidently expected that the additions of the ensuing year will find all substations adequately staffed and equipped for their work.

Work of the Bureau—continued.

Publications.

The "Cane Growers' Quarterly Bulletin" continues to find favour with cane farmers, whilst it provides the Bureau officers with a most suitable medium for transmitting the results of researches direct to those interested in our findings.

A complementary publication, which is strictly technical in character, was first issued during the past financial year. The annual series of Technical Communications, as they are called, will deal with the scientific research work in all Divisions of the Bureau. To date the following numbers have been issued and distributed both in Queensland and overseas :—

No. 1.—"Irrigation Waters of the Burdekin Delta," by N. G. Cassidy.
No. 2.—"The Determination of Fibre in Cane," by H. W. Kerr and N. G. Cassidy.
No. 3.—"1936 Seasonal Investigation on Hot and Cold Liming," by N. Smith.
No. 4.—"Circulation in Coil Vacuum Pans," by N. Smith.
No. 5.—"Boiler and Furnace Testing in a Cane Sugar Mill," by J. Eigenhuis.
No. 6.—"The Analysis and Sampling of Final Bagasse," by E. R. Behne.
No. 7.—"Milling Tests," by E. R. Behne.
No. 8.—"Furnace Investigations, 1936 Season," by J. Eigenhuis.

Queensland Society of Sugar Cane Technologists.

By direction of the Honourable the Minister a good representation of Bureau officers attended the 1937 Conference of the Society, which was opened in Cairns on the 17th March, 1937, by the Honourable F. W. Bulcock, M.L.A., Minister for Agriculture. The benefits accruing from these annual conferences cannot be denied, and it is a significant fact that a pronounced forward step in the direction of increased milling and agricultural efficiency can be traced from the inauguration of the Society in 1929.

Balance Sheet.

STATEMENT OF RECEIPTS AND DISBURSEMENTS FROM 1ST JULY, 1936, TO 30TH JUNE, 1937.

Receipts.	£	s.	d.
To Balance, 1st July, 1936	11,726	17	2
„ Assessments	21,549	1	11
„ Endowment	7,000	0	0
„ Bundaberg Station	732	2	8
„ Mackay Station	828	0	4
„ Meringa Station	266	9	5
„ Sundries	58	19	3
	£42,161	10	9

Disbursements.	£	s.	d.	£	s.	d.
By Salaries				9,237	1	0
„ Contingencies—						
Salaries and Wages	2,115	2	5			
Travelling Expenses, Hires, Fares, and Freights	2,108	12	11			
Chemicals, Apparatus, Furniture, and Books	1,576	5	6			
Cars and Maintenance	652	16	7			
Printing, Advertising, and Stationery	1,380	9	6			
General Expenses	1,220	17	0			
				9,054	3	11
„ Bundaberg Contingencies				2,341	3	2
„ Mackay Contingencies				2,235	15	10
„ Meringa Contingencies				2,188	2	10
„ Balance, 30th June, 1937				17,105	4	0
				£42,161	10	9

C.C.S. Formula.

For the benefit of overseas 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 defined as follows :—

$$\text{C.C.S. in juice} = \text{Brix in juice} - \frac{\text{Impurities in juice}}{2}$$

and C.C.S. in cane is calculated by the 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.

Staff.

During the year the field staff was weakened by the resignation of Mr. A. P. Gibson, Instructor in Cane Culture, who was stationed at Ayr. Many of the decided advances in the status of cane agriculture in the Burdekin delta, during recent years, may be traced directly to the duties performed by this officer, who was forced to resign due to ill-health. Mr. J. Pringle, who served for over twenty years as Chemist in Charge of the Bundaberg Sugar Experiment Station, was transferred, on request, to the Agricultural Chemical Laboratory in Brisbane. Mr. Pringle was associated with the Bureau during the difficult times through which the southern districts have passed, and he severed his connection with the service in the year that the Station established its record year of achievement to date.

Mr. N. J. King was appointed as Chemist in Charge at Bundaberg, while steps are being taken to appoint an Instructor in Cane Culture to restore the extension service to its previous strength.

The three junior members of the field staff have continued their course of training under the direction of senior officers, and are developing towards the stage where they may be placed in full control of the farm extension service in the major divisions of the State. Until this can be achieved the full benefits of the researches of the Bureau cannot be realised.

Extension Work.

The farm fertility trials, which have been a feature of our extension service in recent years, were continued during the period under review. The number of trials set out has been reduced substantially in order to provide for a larger number of varietal trials, particularly in the Northern and Southern districts. In these areas, a number of promising canes are available for trial, and we will attempt to study their performance in comparison with the standard varieties of the several mill districts.

In the Southern districts the gumming-resistant varieties P.O.J. 2878, Co. 290, and P.O.J. 213 are steadily replacing the older standards, and their influence is reflected in the cane yields in those parts. In the Cairns-Tully district, Q. 2 was added to the lists of canes approved by the Bureau for planting, and it appears to possess definite promise on certain of the poorer lands. It carries the virtue of resistance to borers, which may prove a valuable factor. Further "Q" varieties have been placed in yield trials to be harvested in 1938; of these, Q. 13 appears to possess greatest promise.

The spray irrigation trial at Ayr was carried on for a further year, but it has now been discontinued due to the absence of a Bureau officer who could give the project personal supervision.

The detailed results of all farm trials are published annually in the January number of the "Cane Growers' Quarterly Bulletin."

Seedling Propagation.

The Bundaberg Station was this year provided with a hothouse to facilitate the propagation of seedlings at that centre. It is planned to provide similar facilities at Mackay during the coming year. Each Station will then have the capacity for carrying on this work in an expeditious manner. It is realised that the production of new varieties is one of the most important projects which the Stations are pursuing, as it affords the best line of attack on disease and pests, in addition to offering prospects of obtaining canes of superior quality and yielding capacity.

This work is under the control of Mr. A. F. Bell, Pathologist and Assistant Director; the detailed results for the year will be found under that section of the report devoted to Seedling Raising.

Division of Soils and Agriculture—continued.

Work of the Stations.

The detailed statements of work carried out at the three Experiment Stations—located at Meringa, Mackay, and Bundaberg—appear elsewhere in this report. To date the new Meringa and Mackay Stations have been undergoing development, so that the experimental results reported at this time will be augmented in the future.

Work of the Brisbane Laboratory.

Mr. C. R. von Stieglitz, Chemist.

Routine Analyses.—The following is a summary of the routine analyses performed at the Brisbane laboratory for the period 30th June, 1936, to 30th June, 1937 :—

Soils	369
Waters	98
Water slimes	16
Canes	7
By-products	7
Limes	6
Stock feeds	3
Miscellaneous	9
Total	515

In addition a small quantity of laboratory glassware and equipment was standardized on behalf of the Mill Technology Division.

Investigational Work.—The results of investigational work are embodied in the following publications :—

Technical Communication No. 1.—" Irrigation Waters of the Burdekin Delta," by N. G. Cassidy.

Technical Communication No. 2.—" The Determination of Fibre in Cane," by H. W. Kerr and N. G. Cassidy.

" Comparison of Pol and Sucrose in First Expressed Juice," by C. R. von Stieglitz and L. C. Home.

Technical Communication No. 1 is a compilation of data obtained as a result of investigational work during the past five years, and discusses the origin and quality of the water used for irrigation and its effect on the physical and chemical properties of the Burdekin soils.

Technical Communication No. 2 records experiments devised to test the precision and reliability of the sampling technique as carried out in accordance with the method laid down by the Cane Prices Board for the determination of fibre in cane.

Publication No. 3 presents comparisons of pol and sucrose figures for first expressed juice from two different cane varieties recorded during the whole crushing season. This paper was presented at the Annual Conference of the Queensland Society of Sugar Cane Technologists held in Cairns. Further work on this question is being continued by the above authors and will be embodied in a paper to be presented at the next conference of this Society.

Intensive soil sampling for analytical purposes is in progress in collaboration with the field staff with a view to determining the reliability of present soil-sampling methods, and the number of sub-samples necessary to form a representative composite sample of any area. Potash availability studies have been continued, and these have now reached the satisfactory stage where much greater reliance can be placed on the analytical figures as a guide to fertilizer requirements than previously. Work on phosphate fixation has been temporarily suspended, but it is hoped to continue this and to further investigate nitrogen availability during the coming year.

NORTHERN SUGAR EXPERIMENT STATION, MERINGA.

Mr. R. W. Mungomery, Acting Officer in Charge.

METEOROLOGICAL.

After a wet winter in 1936, the soil dried out fairly rapidly and conditions were somewhat unfavourable for the germination of late-planted crops. This situation was relieved to some extent by the useful rains which fell during the beginning, middle, and end of September, and thereafter the young crops became well established. This, in turn, was succeeded by a prolonged period of dry weather during October and November, when the young crops made very little headway, and they remained backward until the December rains gave a fresh impetus to growth. Wet conditions then continued throughout January and February. This wet weather was not of the customary monsoonal type, but consisted chiefly of light showers which fell mostly during the night, whilst during the day very hot sunny weather supervened. During this period a good soil moisture content was maintained, and conditions remained ideal for continued rapid growth. Incidentally, these favourable weather conditions also induced the rapid development of top rot and downy mildew diseases.

Monsoonal rains were at last experienced in March, but the total rainfall received was insufficient to soak the land thoroughly as is usual during a normal wet season, and with the drier conditions prevailing during April, May, and June soil moisture soon fell and the growth rate became much reduced in consequence. Particularly was this apparent as the cooler weather conditions became more pronounced. Cane crops have approached maturity much earlier than usual, which fact is reflected in the comparatively high sugar content of the canes received by many of the Northern mills when they commenced their crushing operations in June. The total rainfall recorded during this period amounted to 49·54 inches, which is much below the average.

The following are the rainfall records taken at this Station since the year 1916 :—

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1916	100·73	1928	66·33
1917	66·81	1929	102·28
1918	69·15	1930	107·61
1919	57·53	1931	98·82
1920	94·86	1932	76·31
1921	122·84	1933	96·06
1922	64·90	1934	91·44
1923	53·29	1935	59·91
1924	95·67	1936	88·81
1925	76·98	1937 (6 months)	36·27
1926	59·12		
1927	90·16	**Average (21 years)**	**82·65**

Abstract of Meteorological Observations made at the Northern Sugar Experiment Station, Meringa, from the 1st July, 1936, to 30th June, 1937.

Month	Rainfall in Inches.	Number of Wet Days.	Highest Shade Maximum.	Lowest Shade Maximum	Mean Shade Maximum.	Highest Shade Minimum.	Lowest Shade Minimum.	Mean Shade Minimum.	Mean Diurnal Range.	Mean Temperature, 9 a.m.	Mean Relative Humidity, 9 a.m.
July, 1936	1·41	16	92·0	78·0	82·0	61·0	57·0	59·6	22·4	68·1	77
August, 1936	·17	3	93·0	80·0	87·3	62·0	59·0	60·3	27·0	67·2	68
September, 1936	3·82	13	92·0	87·0	89·3	68·0	49·0	57·7	31·6	66·8	79
October, 1936	·15	2	98·0	89·0	92·8	64·0	59·0	61·9	30·9	71·8	76
November, 1936	·08	2	99·0	92·0	95·7	68·0	61·5	65·6	30·1	82·9	75
December, 1936	7·64	19	99·0	85·0	95·5	74·0	63·0	68·4	27·1	81·1	83
January, 1937	8·38	18	105·0	88·0	92·4	76·0	67·0	72·7	19·7	85·0	77
February, 1937	4·70	15	95·8	86·5	92·6	74·0	68·0	71·6	21·0	83·7	79
March, 1937	16·36	20	94·0	82·0	88·9	74·0	59·0	69·0	19·9	81·6	87
April, 1937	4·90	6	89·5	80·0	86·3	70·0	57·0	65·7	20·6	76·9	82
May, 1937	1·84	9	89·0	78·8	85·5	64 5	49·0	59·5	26·0	74·5	81
June, 1937	·09	5	89·5	76·0	82·4	69·0	40·2	56·6	25·8	70·6	75

Work of the Northern Sugar Experiment Station, Meringa—continued.

1936 Crop.

Of the cane crop harvested during the 1936 season, approximately 4 acres comprised Badila, which had been produced from stocks introduced from the Atherton Tableland nursery. Much of this cane was sold to canegrowers during the year to enable them to build up supplies for future plantings, particularly as a means of combating chlorotic streak disease in the low-lying areas of the heavy rainfall districts. Over 70 tons were disposed of in this way, and growers in all areas from Mossman to Tully participated in the project.

The remainder of the cane consisted of seedlings from crosses which were regarded as possessing promise of yielding progeny of commercial value, whilst a smaller number originated from canes thought likely to produce future breeding varieties. Approximately 10,000 seedlings were planted in the field ; after selection 137 tons of cane were sent to the Mulgrave mill for crushing.

The following table summarises the crop data for the year :—

	Tons.
Cane sent to the mill	137
Cane used for plants, &c.	14
Sold for plants	71
Total	222

	Tons.
Badila (plant cane)	82
Badila (ratoons)	20
Seedlings	120
Total	222

	Acres.
Area under cane	7·8
Average tons per acre	**28·4**

Land-clearing.

The clearing of further forest land on the Station is carried out as a part-time job by the permanent station hands. During the year approximately 4 acres of land were cleared and prepared for planting during the spring of 1937. The clearing will be pushed ahead as rapidly as possible in order that the suitable experimental land may be brought under the plough. Meantime, the major field work of the Station will consist of seedling propagation.

Laboratory Work.

In the laboratory the routine testing of new canes undergoing field trial was carried out, together with a certain amount of soil-testing for farmers.

In addition, Mr. N. G. Cassidy was engaged for several weeks at this centre in laying the foundations for an intensive fibre investigational programme to be undertaken during the 1937 harvesting season.

CENTRAL SUGAR EXPERIMENT STATION, MACKAY.

D. L. McBryde, Chemist in Charge.

METEOROLOGICAL.

The weather conditions under which the 1937 crop was grown were not so favourable as those which obtained during the growth of the previous crop. Dry weather during the early summer caused the young plant crops to suffer, while the ratoons could not be worked satisfactorily. Severe storms in October gave little relief. The monsoonal rains set in late in the year, and crops were checked until their advent.

Favourable growing conditions during the first quarter of 1937 were followed by a further dry period, and little useful rain fell during April, May, and June. The crops which hitherto gave promise of heavy yields were thereby severely retarded and little autumn growth resulted.

The December rains enabled a rather heavy emergence of greyback beetles to take place. Grub damage was therefore widespread in character, though doubtless the apparent effects of this pest were accentuated by the unusually dry weather conditions as described from April onwards.

Though the preliminary estimates for all mills in the district indicated that crops greatly in excess of "peak tonnages" would be harvested, the combination of dry weather and pests has caused these estimates to be modified substantially. It was anticipated, in June, that not more than 10–15 per cent. of "excess" sugar would be manufactured.

Abstract of Meteorological Observations made at the Sugar Experiment Station, Mackay, from 1st July, 1936, to 30th June, 1937.

Month.	Rainfall in Inches.	Number of Wet Days.	Average Rainfall, 1936-37.	Highest Shade Maximum.	Lowest Shade Maximum.	Mean Shade Maximum.	Highest Shade Minimum.	Lowest Shade Minimum.	Mean Shade Minimum.
1936.			Average for 36 years.						
July	0·45	9	1·46	81·0	63·2	71·7	65·2	45·0	55·3
August	0·10	1	·94	85·5	69·2	77·1	62·0	47·5	55·4
September	0·94	8	1·77	86·5	72·0	77·8	64·0	53·0	59·5
October	2·47	6	1·71	91·0	77·0	85·4	72·5	55·2	61·5
November	0·35	4	3·07	92·0	79·0	84·5	73·0	52·0	65·3
December	10·55	13	7·67	87·0	81·0	83·8	76·0	63·5	70·6
1937.			Average for 37 years.						
January	5·11	7	14·40	95·0	82·0	87·4	77·2	68·0	72·0
February	22·77	16	11·03	92·0	79·5	81·4	74·0	67·2	71·5
March	18·03	19	10·40	89·0	75·0	83·2	74·5	62·0	68·5
April	1·28	6	5·09	86·0	78·5	82·1	67·3	55·0	59·1
May	0·59	6	3·27	86·0	72·2	79·3	68·0	44·0	55·6
June	1·57	8	2·64	81·0	63·0	72·8	63·0	38·0	50·3
12 months	64·21	103	..	..	..	..	..	..	..

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Lowest Shade Minimum.	Mean Shade Minimum.
45·0	55·3
47·5	55·4
53·0	59·5
55·2	61·5
52·0	65·3
63·5	70·6
68·0	72·0
67·2	71·5
62·0	68·5
55·0	59·1
44·0	55·6
38·0	50·3
..	..

Work of the Central Sugar Experiment Station, Mackay—continued.

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

Year.	Rainfall in Inches.	Year.	Rainfall in Inches.
1920	57·27	1929	64·03
1921	95·89	1930	55·81
1922	34·47	1931	30·01
1923	25·23	1932	48·48
1924	53·37	1933	71·94
1925	54·80	1934	37·57
1926	34·69	1935	45·15
1927	83·87	1936	97·37
1928	72·28	1937	*49·31

* 6 months.

Average (17 years) 56.72

Soil Moisture Observations.

Observations on the height of the soil water-table were again made during the year on the Station well. The reaction to rainfall and the rate of fall of the water-table were generally similar to those of the previous year. During March the well filled to the soil surface, but the level fell rapidly after forty-eight hours.

Twice during the wet season severe inundations of the lower fields of the Station occurred. During February, when 970 points of rain fell in five hours, the level of flood water reached a highly abnormal level; again, in March, heavy rains caused further flooding, and the effect of excessive wet favoured the breeding of wireworms in these areas.

Experimental Blocks Harvested during 1936.

1. Fertility trial—5 × 5 Latin square, quantitative.
2. Varietal trial—Mackay seedlings *v.* Standard, 4 × 4 Latin square.

Work of the Central Sugar Experiment Station, Mackay—continued.

FERTILITY TRIAL (Plant Cane).

Plan and Yields.

NP	C	NK	NPK	PK
27.2	24.0	24.9	24.7	24.7
NK	PK	NPK	C	NP
28.5	19.3	25.1	21.2	26.8
NPK	NP	C	PK	NK
29.4	23.6	21.9	23.4	25.1
PK	NPK	NP	NK	C
28.1	20.3	24.8	26.3	22.1
C	NK	PK	NP	NPK
27.9	30.2	21.9	26.4	24.2

Block.—B2.
Variety.—Q. 813.
Harvested.—November, 1936.
Age of Crop.—15 months.
Experimental Plan.—5 × 5 Latin square.
Plots.—1/15 acre.

TREATMENTS.

C — No manure.
N — 250 lb. sulphate ammonia per acre.
P — 300 lb. superphosphate per acre.
K — 150 lb. muriate of potash per acre.

All phosphate and potash was applied in the planting furrow, while the sulphate of ammonia top dressing was given in January, 1936.

GROWTH NOTES.

The crop was well cultivated during its early growth, and light irrigations were given in October and November. During February and March the plots became weedy. When weather conditions would permit of cultivation the cane was too large for implement work.

Portion of the block was accidentally burnt during October, 1936; those plots which had been damaged were harvested immediately, while the balance was removed early in November.

At no time during the growth of the crop were obvious fertilizer responses to be seen.

Analysis of Variance.

Due to—	Degrees of Freedom.	Sum of Squares.	Mean Square.	Half Log_e (Mean Square).
Rows	4	16·13	4·03	..
Columns	4	67·39	16·85	..
Treatments	4	64·13	16·03	1·3872
Errors	12	55·94	4·66	0·7695
Totals	24	203·59	..	..

Crop Yields.

——	C.	NP.	NK.	PK.	NPK.
Cane per acre, tons	23.42	25.76	27.72	23.48	24.78
Cane, percentage mean yield	93·6	102·9	110·7	93·8	99·0
C.C.S. in cane, per cent.	17·2	16·8	17·0	17·1	17·2

Standard Error = 3·86 per cent.

DISCUSSION.

The yields for this trial are erratic and give no clue as to the probable plantfood deficiencies to be encountered on this soil type. Doubtless the complication due to fire damage has added to the influence of soil variability.

The trial has been carried on to the first ratoon crop, and nitrogen deficiency is very evident, as judged both from the length and thickness of stalk, as well as on the colour of the foliage.

Work of the Central Sugar Experiment Station, Mackay—continued.

VARIETAL TRIAL (Plant Cane).

Plan and Yields.

C 83 44.4	Q 813 31.5	C 57 26.2	C 85 29.7
C 85 37.0	C 57 32.6	C 83 37.6	Q 813 32.2
C 57 32.0	C 85 36.5	Q 813 29.8	C 83 38.2
Q 813 34.6	C 83 39.7	C 85 28.1	C 57 31.4

Block.—B2.
Harvested.—October, 1936.
Age of Crop.—14 months.
Experimental Plan.—4 × 4 Latin square.
Plots.—0·102 acre.

Fertilizer applied.—All plots were uniformly fertilized at the following rates per acre :—
In drill.—300 superphosphate.
150 muriate of potash.
Top Dressing.—In December the cane was topdressed with sulphate of ammonia, 200 lb. per acre.

GROWTH NOTES.

After planting weather conditions were very dry and the trial was given a light irrigation in mid-November. The cane was top dressed with sulphate of ammonia early in December.

The major portion of the trial was burnt by an accidental fire, late in October, but was harvested without undue delay.

No signs of disease were detected in the several varieties throughout their growth period. Maturity tests, which were carried out regularly, indicated that the canes were at their peak when harvested.

Analysis of Variance.

Due to—	Degrees of Freedom.	Sum of Squares.	Mean Square.	½ $\log_e$ (Mean Square.)
Rows	3	8·18	2·73	..
Columns	3	96·42	32·14	..
Varieties	3	211·15	70·38	2·1270
Errors	6	24·73	4·12	0·7079
Total	15	340·48	..	..

Crop Yields.

	Q. 813.	C. 57.	C. 83.	C. 85.
Cane per acre, tons	32.0	30.6	40.0	32.8
Cane, percentage mean yield	94·5	90·4	118·2	96·9
C.C.S. in cane, per cent.	16·6	17·6	16·4	16·8
C.C.S. per acre, tons	5·31	5·39	6·56	5·51

Standard Error = 3·0 per cent.

DISCUSSION.

The varieties included in this trial, against the standard Q. 813, are the first three seedlings of promise propagated in Mackay since the project was initiated some six years previously.

It will be observed that two of the seedlings (C. 83 and C. 85) outyielded the standard, in cane per acre, while all three gave a superior yield of sugar per acre. C. 83 and C. 85 have as one parent P.O.J. 2878, which transmits to the progeny decided susceptibility to downy mildew and top rot diseases. For this reason the varieties cannot be distributed for commercial plantings.

The variety C. 57 was produced from Badila, and though not outstandingly vigorous, it appears to be early-maturing and also attains a high C.C.S. at maturity. Trial plantings of this cane are therefore being made on the more fertile soils of the Mackay and Proserpine districts.

Work of the Central Sugar Experiment Station, Mackay—continued.

Rotational Grazing Trial.

In the 1936 Annual Report it was stated that an area of the Station had been set aside for the purpose of demonstrating the value of long fallowing, with green manure crops or pasture, on the poorer lands of the Mackay district.

This block is now definitely established. It is 16 acres in area and has been subdivided to provide eight blocks of approximately equal dimensions. The first plot was planted with cane in the first week of October, 1936. The lateness of the planting was consequent upon the heavy infestation of the area by wireworms. The variety was C. 83, described elsewhere, and it made good headway until infected with red stripe (top rot) disease. It made a satisfactory recovery in April, and should yield a reasonable crop.

The second plot has been specially graded and drained and it will be planted in the spring of 1937, though delay in this regard may be necessary to avoid possible wireworm damage.

Further four plots have been fenced and set aside as a grazing area. A flock of twenty-five ewes, Merino and Corriedale crosses, and a Romney Marsh ram were turned into the area in November, 1936. They were not able to cope with the growth of *Panicum muticum* which the plot carried, and it was necessary to have the grass mowed and burnt on two occasions to improve the quality of the pasture.

Though the paddock was twice under water during the past wet season, the sheep did not suffer any apparent ill-effects and have made good progress. No signs of worms or foot-rot have been noted, but on one occasion the sheep were dipped because of lice.

As the blocks are brought successively under cane, the boundary fence of the grazing area will be altered. Each plot will produce a plant and a ratoon crop of cane before being green-manured and seeded to pasture grasses.

Legume Trial.

Two trials have been initiated during the autumn of 1937 to determine the value of various legume species on the alluvial soils of the Mackay area. An attempt will be made to grow lucerne under irrigation, while a plot containing twelve varieties of soy bean, as well as lespedezas and berseem clover, was also planted. To date the crops appear healthy and vigorous.

Drainage Work.

An area embracing about three-quarters of the Station is definitely low-lying and in need of drainage. This is one reason why the present area was selected for Experiment Station purposes. The farm has been carefully surveyed to provide levels, and on the basis of the contour map prepared a thorough drainage system will be laid out.

The level of the culverts beneath the Walkerston road has been lowered by the courtesy of the Main Roads Commission so that the accumulated water from the Station will have much better escape than previously. Bedding, grading of water furrows and main drains, and placing of drains where they will deal most expeditiously with surplus water have received considerable attention, and future cane plantings should possess far better prospects of yielding maximum returns than has been the case in the past.

Horse Ration.

A special horse ration based on roughage (grass or cane tops), molasses, and protein meal was introduced during the year. The animals have kept in excellent condition throughout. The belief of certain growers that the appearance of our animals is due to the free maize ration which they receive is a compliment to the feeding methods employed. These horses have received no maize or any other grain for two and a-half years at least.

In the early feeding trials linseed meal was employed as the protein meal. On the score of economy, it was decided to change to peanut meal, which is also much richer in proteins. With a gradual change-over the horses suffered no ill-effects and are eating the alternative meal with no apparent dislike.

Recently a small quantity of mineral lick, containing salt and bone flour in the main, has been added to the ration. The Station lands are deficient in lime phosphate, and this lick should make good any deficiencies in the roughage.

Work of the Central Sugar Experiment Station, Mackay—continued.

Farm Trials.

Four farm fertility trials were laid down during the year; this marks the reinstitution of trials in the area, and the number will be expanded to its level of a few years ago.

In addition, a series of varietal trials, embracing Co. 290 and P.O.J. 213, are being set out on representative blocks of the poor soil areas.

Station Building Work.

During the year eighteen concrete seedling benches, each 8 feet by 4 feet, were constructed. They have been placed in a double row served with a tram track to facilitate the transfer of seedlings. These tables will accommodate 6,000 potted seedlings.

The sample mill and fibrator were installed in the power shed to the rear of the laboratory. The diesel engine employed for irrigation pumping also serves the transmission shaft which operates the mill and fibrator.

Attention has also been given to the installation of permanent drains in the precincts of station buildings.

Portable Line Assembly.

A very satisfactory and rapid method for assembling portable track was experimented with. This method has been described fully in the "Cane Growers' Quarterly Bulletin." The adoption of the proposed plan will result in a considerable saving of time for those who have much of this work to do. Racecourse Mill has made and used such an anvil for repairing the old line, and reports very good results.

Field Day.

A successful Field Day, to which all canegrowers in the district were invited, was held at the Mackay Station on the 25th June, 1937.

Addresses were delivered by Messrs. B. Courtice (representing the Advisory Board), the Director, and the Assistant Director. Expressions of appreciation of the Station work were given by Messrs. G. Johnston and C. McKinley.

An inspection of the Station was followed by implement demonstrations.

Laboratory Analytical Work.

During the year 1936–37 the following samples have been analysed :—

	No. of Samples.
Cane maturity tests—farmers and station	79
Other samples and show canes	80
Canes for station trials	155
Station seedlings	168
Total	482

It is regretted that more farmers do not take advantage of the maturity testing service which the Station offers. They should definitely find this of distinct value in the harvesting of their crops at or near the peak of maturity.

1936 Crop Figures.

Block	Variety.	Class of Cane.	Tonnage Harvested.	Tons Cane per Acre.
B. 3	Q. 813	Autumn plant	124	32·8
B. 3	Q. 813	Spring plant	120	28·3
B. 2	Varieties	Spring plant	12	34·0
B. 2	Varietal trial	Spring plant	55	34·4
B. 2	Q. 813	Spring plant	42	24·7
A. 1	Seedlings	Spring plant	30	20·0
D.	Q. 813	2nd ratoon	172	12·5
		Total and average	564	20.8

Area harvested = 27·1 acres.

SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG.

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

METEOROLOGICAL.

Very adverse weather conditions were the outstanding feature of the past growing season. An extremely dry spring was followed by poor December and January rains. Reasonable precipitations in mid-February provided the first favourable conditions for growth since the previous winter, and these were followed a month later by a cyclonic disturbance which yielded nearly 12 inches of rain in three days.

This favourable, though brief, period was one of rapid recovery, but the growing conditions were not sufficiently prolonged to advance ratoon and young plant cane to a stage where it could be harvested profitably. A sharp cold spell in early June resulted in frosts which did considerable damage to young plant cane and short ratoons.

The total rainfall for the twelve months was not only considerably below average, but the distribution of useful falls was much less regular than in normal years.

RAINFALL AT THE SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG, FOR THE YEAR ENDED 30TH JUNE, 1937.

Month.	Rainfall. Inches.	No. of Wet Days.
July, 1936	0·50	4
August, 1936	0·35	1
September, 1936	0·15	3
October, 1936	0·69	4
November, 1936	3·00	5
December, 1936	2·76	9
January, 1937	2·10	5
February, 1937	7·82	14
March, 1937	12·08	9
April, 1937	0·82	5
May, 1937	0·48	3
June, 1937	0·90	3
Total	31·65	65

New Experiments Initiated during the Year.

(1) **Observational Yield Trial**—
New seedling canes *v.* Co. 290 and P.O.J. 213.

(2) **Varietal Trial**—
Co. 290 *v.* P.O.J. 213 on red volcanic soil.

(3) **Fertilizer Trial**—
Employing the factorial arrangement of plots—0N, 1N, 2N with 0P, 1P, 2P with 0K, 1K, 2K.

Experiments Harvested, 1936 Season.

On the succeeding pages will be found the detailed yield results from the following experimental blocks :—

(1) **Irrigation Trials**—
(*a*) P.O.J. 2878, second ratoon crop.
(*b*) P.O.J. 2725 *v.* P.O.J. 2878, varying applications of nitrogen, plant crop.

(2) **Varietal Trials**—
(*a*) Gumming-resistant varieties, third ratoon crop.
(*b*) Gumming-resistant varieties, plant crop.
(*c*) P.O.J. 2878 *v.* Co. 290, single and double planting, plant crop.

(3) **Cultivation Trial**—
Cultural operations, with varying interspace distance, first ratoon crop.

(4) **Fertilizer Trial**—
Inorganic *v.* "organic" phosphate, first ratoon crop.

Work of the Southern Sugar Experiment Station—continued.

IRRIGATION TRIAL (Second Ratoon Crop).

Block.—Nursery. *Harvested.*—August, 1936.
Variety.—P.O.J. 2878. *Age of Crop.*—10 months.

TREATMENTS.

The first ratoon crop was harvested in October, 1935, and the ratooning carried out in the usual manner with the subsoiler. Watering and fertilizing followed immediately, and were carried on throughout the growing period. The fertilizer and irrigation treatments were similar to those for the plant and first ratoon crops, namely :—

Irrigation—

Spring months	3 inches per week.
Summer months	4–5 inches per week.
Autumn months	2 inches per week.
Winter months	1 inch per week.

Fertilizer—

At ratooning the following mixture was applied :—

Sulphate of ammonia	300 lb. per acre.
Superphosphate	200 lb. per acre.
Muriate of potash	400 lb. per acre.
Total	900 lb. per acre.

Monthly dressings of the following composition were applied throughout the growing period :—

Sulphate of ammonia	100 lb. per acre.
Superphosphate	20 lb. per acre.
Muriate of potash	50 lb. per acre.
Total	170 lb. per acre.

GROWTH NOTES.

The cane made rapid progress during the hot months of the year, but wintry weather late in April caused a check in growth, though the crop continued to make a little progress. Strong winds in late summer caused the crop to lodge considerably.

Crop Yields—Plant, First and Second Ratoon Crops.

	Plant Crop.	First Ratoon Crop.	Second Ratoon Crop.
Cane, tons per acre	82.4	72.8	66.8
C.C.S. in cane, per cent.	12·1	13·9	11·3
C.C.S., tons per acre	11.3	9.5	7.5

DISCUSSION.

This small experimental plot was established in 1933 to determine the rate of crop growth under the local environmental conditions, when soil moisture and plant food were eliminated as limiting factors. The prolific crops which become possible under these conditions are demonstrated by the above summarised yields. For plant and two ratoon crops, 233 tons of cane were harvested, per acre, yielding 28·3 tons of sugar. These figures clearly demonstrate what could be achieved on the fertile red volcanic lands of the Woongarra, given an adequate supply of irrigation water.

Work of the Southern Sugar Experiment Station—continued.

IRRIGATION TRIAL (Plant Crop).

Plan and Yields.

POJ 2725.			POJ 2878.	
2N	0N	4N	3N	1N
74.1	76.6	68.9	60.9	61.1
4N	3N	2N	1N	0N
57.0	86.6	74.5	54.3	53.2
1N	2N	0N	4N	3N
57.0	60.9	60.2	51.8	48.6
0N	1N	3N	2N	4N
55.0	53.6	57.0	48.0	43.6
3N	4N	1N	0N	2N
55.0	53.9	55.0	43.6	40.2

Block.—A1.

Varieties.—P.O.J. 2725 and P.O.J. 2878.

Harvested.—July, 1936.

Age of Crops.—16 months.

System of Replication—

5 × 5 Latin square (for nitrogen).

1 block (15 plots)—P.O.J. 2725.

1 block (10 plots)—P.O.J. 2878.

Plots.—0·055 acre.

TREATMENTS.

All plots uniformly fertilized in the drill with a mixture of superphosphate and potash.

In addition—

0N—No nitrogen.
1N—120 lb. sulphate of ammonia per acre.
2N—240 lb. sulphate of ammonia per acre.
3N—360 lb. sulphate of ammonia per acre.
4N—480 lb. sulphate of ammonia per acre.

GROWTH NOTES.

The block was planted during March, 1935, after a poor crop of Poona pea had been ploughed under and rotted. The soil was so dry at planting that it was watered immediately, to ensure a strike. Early waterings were applied in the planting furrow, and later a water furrow was run on either side of each row of cane. The lower end of the block, about two-fifths of the total length, was frosted badly during the last week of June. The stools shot away again, and a month later were frosted badly again. The second time they came away, a few gaps were apparent where certain stools had been killed completely. The upper portion of the block was not affected by frost.

The block was irrigated frequently until March, 1936, when a three-days gale blew the more advanced P.O.J. 2725 flat. The adjoining P.O.J. 2878 remained upright. After this it was not possible to irrigate, as the fallen cane blocked the water furrows. In all, nine waterings were given. Each application was equivalent to 4-5 acre inches. When the experiment was started it was decided to carry out fortnightly irrigations when suitable falls of rain did not intervene.

Analysis of Variance.

Due to—	Degrees of Freedom.	Sum of Squares.	Mean Square.	Half $\log_e$ (Mean Square).
Rows	4	1,393·40	348·35	..
Columns	4	1,052·56	263·14	..
Treatment	4	140·01	35·00	0·6264
Errors	12	326·39	27·20	0·5004
Total	24	2,912·36	..	..

Crop Yields.

	0N	1N	2N	3N	4N
Cane, tons per acre	**57.7**	**56.1**	**59.5**	**61.6**	**55.0**
Cane, percentage of mean yield	99·5	96·8	102·6	106·2	94·9
C.C.S. in cane, per cent.	12·6	12·6	13·2	12·9	13·1
C.C.S., tons per acre	**7.22**	**7.07**	**7.85**	**7.95**	**7.21**

Average yield—P.O.J. 2725 plots = 63·0 tons per acre.
C.C.S. in cane = 12·3 per cent.

Average yield—P.O.J. 2878 plots = 50·5 tons per acre.
C.C.S. in cane = 13·8 per cent.

Work of the Southern Sugar Experiment Station—continued.

DISCUSSION.

No significant results are apparent for the sulphate of ammonia applications, the yields being no doubt influenced by—(1) frosting of some plots, (2) the difficulty of an even application of water, and (3) the lodging of certain plots of the trial.

Though little significance may be attached to the yield differences between single blocks of the two varieties, it did appear that the P.O.J. 2725 was ahead of the P.O.J. 2878 at all times. This is in conformity with the results of other trials, in which P.O.J. 2725 has been found superior to its sister cane; but P.O.J. 2878, which had not lodged, showed a better C.C.S. in cane.

The general results for the trial demonstrate clearly the value of irrigation on the red volcanic soils of the Woongarra area.

VARIETAL TRIAL (Third Ratoon Crop).

Plans and Yields.

POJ 2725 27.9	Q 813 11.1	POJ 234 19.5	Q 813 11.4	Co 290 25.5
Q 813 11.1	Co 290 20.7	Co 281 15.0	Manoa 304 8.1	Q 813 10.2
POJ 234 18.0	POJ 2725 14.4	Q 813 9.0	Co 290 21.0	POJ 2725 18.2
Co 290 22.5	Q 813 7.5	Manoa 304 5.4	Q 813 9.0	POJ 234 28.2
Q 813 9.6	POJ 234 17.1	Co 290 18.9	26C 188 14.1	Q 813 8.1
26C 188 12.0	Manoa 304 3.6	Q 813 3.9	POJ 234 13.2	Co 290 21 0
Co 290 20.7	Q 813 6.6	POJ 2725 17.4	Q 813 8.1	Co 281 15.6

Block.—B1.
Harvested.—August, 1936.
Age of Crop.—10 months.
Plots.—1/30 acre.

CULTIVATION.

On the removal of the second ratoon crop in October, 1935, the ratooning was carried out in the usual manner. Mixed fertilizer was applied at the following rate per acre:—

150 lb. superphosphate.
250 lb. muriate of potash.

This was followed by two top dressings of sulphate of ammonia, each of 150 lb. per acre.

GROWTH NOTES.

The ratoons of all plots germinated well, with the exception of Manoa 304. The cane made steady progress until checked by dry weather during November; after the December rains, growth proceeded until checked by further dry conditions from mid-January to the end of February. Good rains early in March produced further vigorous growth, but this was again checked by cool dry weather in April. There was no frost damage, but P.O.J. 2725 arrowed profusely.

Crop Yields—Plant, First, Second, and Third Ratoon Crops.

Variety.	Plant Crop.	First Ratoon Crop.		Second Ratoon Crop		Third Ratoon Crop.	
	Cane per Acre.	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.	Tons.	Per Cent.	Tons.	Per Cent.	Tons.	Per Cent.
Co. 290	22.8	49.4	15·1	36.2	14·5	21.5	12·3
P.O.J. 2725	16.8	48.1	17·2	24.0	16·2	18.2	14·2
Co. 281	15.1	34.0	14·4	20.9	14·8	15.3	13·4
P.O.J. 234	13.8	31.6	15·9	21.0	15·6	19.2	14·7
26 C. 188	12.2	25.2	14·6	22.5	14·9	13.1	13·4
Q. 813	9.3	20.4	16·2	14.0	16·0	8.3	14·0
Manoa 304	9.2	17.8	14·4	11.5	13·0	5.7	11·7

DISCUSSION AND CONCLUSIONS.

The variety Co. 290 has displayed its general superiority over all other canes throughout the four successive crops. P.O.J. 2725 occupied second place, and gave satisfactory yields in all four years. P.O.J. 234 is the only cane of the remaining five worthy of consideration.

It is rather significant that these three varieties are assuming an increasingly important place in the planting programme for Southern Queensland, and, with P.O.J. 2878, seem likely to oust all of the older varieties in the course of a few years. They are uniformly highly resistant to gumming disease, vigorous in growth, and of definite drought resistance.

VARIETAL TRIAL (Plant Crop).

Plan and Yields.

Inter-space.			
4′		Co 290 27.5	POJ 2878 19.8
5′	I.	POJ 234 25.9	POJ 2725 33.0
5′		POJ 2878 16.4	Co 290 29.7
4′		POJ 2725 35.1	POJ 234 21.9
4′		Co 290 28.1	POJ 2725 29.3
5′	II.	POJ 2878 17.7	POJ 234 20.7
4′		POJ 234 22.1	POJ 2878 17.7
5′		POJ 2725 32.5	Co 290 27.0
5′	III.	POJ 2878 12.8	POJ 2725 24.6
4′		POJ 234 22.0	Co 290 30.4
5′		Co 290 27.8	POJ 234 30.7
4′		POJ 2725 34.1	POJ 2878 17.1

IV.	*Block.*—B6.
	Harvested.—September, 1936.
	Age of Crop.—19 months.
	System of Replication.—6 randomised blocks.
	Plots.—0·091 acre.

CULTIVATION.

The stubble from the previous crop was ploughed out in August, 1934, and the block sown to Poona pea. Early in December, a good crop of green matter was turned under; this was followed by a cross-ploughing in January, and after being harrowed just prior to planting, the plots were planted in February. Mixed fertilizer was applied to all plots uniformly at the rate of 200 lb. superphosphate and 200 lb. muriate of potash per acre in the drill, followed by a top dressing of sulphate of ammonia at the rate of 200 lb. per acre in late spring.

GROWTH NOTES.

All varieties germinated well. P.O.J. 234 was the first to come through the ground, followed by Co. 290 and P.O.J. 2725, while the P.O.J. 2878 was slow. The cane made steady growth during March and April, but was checked by cool weather in May. Late in June, P.O.J. 2725 and P.O.J. 2878 were damaged by frost. All varieties made good growth in the spring months, but were checked by the early summer drought. Co. 290 showed the effects of dry weather very definitely. Further periods of satisfactory growth followed until the cool and dry weather of April and May.

Work of the Southern Sugar Experiment Station—continued.

Analysis of Variance.

Due to—	Degrees of Freedom.	Sum of Squares.	Mean Square.	Half Log_e (Mean Square).
Blocks	5	21·96	4·39	..
Varieties	3	733·93	244·64	2·7499
Interspace	1	1·65	1·65	..
Errors	14	84·15	6·01	0·8967
Total	23	841·69	..	..

Crop Yields.

Variety.	Cane per Acre.	C.C.S. in Cane.	C.C.S. per Acre.
	Tons.	Per Cent.	Tons.
P.O.J. 2725	**31.4**	14·9	4·68
Co. 290	**28.4**	14·1	4·00
P.O.J. 234	**23.9**	15·2	3·63
P.O.J. 2878	**16.9**	13·9	2·35

Standard Error = ± 1·00 tons.

DISCUSSION.

The results for the plant crop of this trial indicate the superiority of P.O.J. 2725 over the other varieties under test. This is at variance with the results of the trial previously carried out on the Station with these varieties. The frosting of the block in its early growth stages has doubtless interfered with normal growth and yield. Comment on these returns will therefore be deferred until the ratoon yields are available.

The interspacing trial, which was combined with varieties, showed the following results :—

4 feet interspace	25·4 tons
5 feet interspace	24·9 tons
Increase due to narrower interspace	0·5 ton

The influence of this factor on the yield has therefore been slight.

Work of the Southern Sugar Experiment Station—continued.

VARIETAL TRIAL—SINGLE V. DOUBLE PLANTING (Plant Cane).

Plan and Yields.

POJ 2878 Single 22.0	Co 290 Double 34.0	POJ 2878 Single 20.9	Co 290 Double 35.2	Co 290 Single 33.9
POJ 2878 Double 29.0	Co 290 Single 35.9	POJ 2878 Double 24.6	Co 290 Single 32.3	Co 290 Double 34.4
Co 290 Double 29.3	POJ 2878 Single 24.6	Co 290 Double 32.6	POJ 2878 Single 21.0	POJ 2878 Double 22.8
Co 290 Single 28.3	POJ 2878 Double 31.6	Co 290 Single 33.1	POJ 2878 Double 28.7	POJ 2878 Single 27.4

Block.—A2.
Harvested.—October, 1936.
Age of Crop.—18 months.
System of Replication.—5 randomised blocks.
Plots.—0·0694 acre.

TREATMENTS.

Planting—
Single.—Three-eye plants dropped singly with 6 inches between ends of setts.
Double.—As for single, but 2 setts placed side by side.
Fertilizer Application—
(1) In drill—
200 lb. muriate of potash. } per
200 lb. superphosphate } acre.
(2) Top dressing—
200 lb. sulphate of ammonia per acre, in August.

CULTIVATION.

After harvesting the previous trial in October, 1934, the trash was ploughed under and Poona pea broadcast. A poor crop of green manure was turned under in January, and after a further ploughing and harrowing, cane was planted in March. Conditions were so dry that the land was given an irrigation to ensure a strike.

GROWTH NOTES.

The germination was satisfactory in all plots, the double planting definitely having the most shoots. The few misses required were supplied in April with good results. The cane made steady progress till checked by cool conditions early in May. Late in June the P.O.J. 2878 plots at the lower end of the block were badly damaged by frost, the Co. 290 being unaffected. The stools commenced to shoot, but suffered further frost damage at the end of July, a few of the stools being killed completely. The top three-fifths of the block was not affected by frost. The cane made steady growth during the early spring months, but was checked by dry conditions from early November to mid-December. During this period the Co. 290 suffered severely, the leaves being quite dead almost to the stalk, which was withered in the top portion. After a fall of 5 inches at the latter date the cane made rapid recovery, the Co. 290 quickly taking the lead, which it maintained during the entire growing period. Vigorous growth was made for the next four weeks, but was retarded again by adverse weather from mid-January to the end of February. Further good progress was made after the rain at the beginning of March, but was checked by cool, dry conditions late in April.

Analysis of Variance.

Due to—	Degrees of Freedom.	Sum of Squares.	Mean Square.	Half $\log_e$ (Mean Square).
Blocks	4	43·09	10·77	..
Single v. Double	1	25·99	25·99	1·6289
Varieties	1	299·54	299·54	2·8511
Errors	13	101·78	7·83	1·0590
Total	19	470·40	..	..

Work of the Southern Sugar Experiment Station—continued.

Crop Yields.

	Planting.		Varieties.	
	Single.	Double.	Co. 290.	P.O.J. 2878.
Cane per acre, tons	28.0	30.3	33.0	25.3
C.C.S., percentage of mean yield	96·0	104·0	113·2	86·8
C.C.S. in cane, per cent.	15·5	15·4	15·2	15·7
C.C.S., tons per acre	4·33	4·66	5·02	3·97

Standard Error (10 plots) = 3·04 per cent.

DISCUSSION.

In this trial, Co. 290 displayed definite superiority over P.O.J. 2878 as a plant crop. The C.C.S. of the latter cane was only one-half unit better than that for Co. 290. This is in conformity with our general experience, though there is no doubting the superiority of P.O.J. 2878 as a stand-over crop. It is interesting, also, to note the improved yield recorded for the double over the single planting. This is a reflection of the much better stand obtained where the plants were placed thickly, and in the aggregate it resulted in a crop increase of 2·3 tons of cane per acre. There was practically no reduction in C.C.S., due to the thicker stand of canes thus obtained.

CULTURAL AND INTERSPACING TRIAL (First Ratoon Crop).

Plan and Yields.

Inter-space.	Non-Subsoiled.	Subsoiled.	Subsoiled.	Non-Subsoiled.		
4′ 6″	24.2	25.2	26.8	24.0	C	Autumn Plant.
	20.9	20.3	22.8	25.4	NC	
4′ 0″	21.2	19.8	23.3	23.4	C	
	23.9	23.2	23.4	26.0	NC	
4′ 6″	22.1	23.4	23.0	26.3	NC	
	23.4	26.0	19.1	22.4	C	
4′ 6″	19.7	23.9	18.2	24.6	C	
	21.2	22.6	27.6	17.8	NC	
4′ 0″	16.0	15.2	17.3	14.8	C	Spring Plant.
	17.9	18.4	19.0	17.0	NC	
4′ 6″	16.4	17.4	20.8	16.4	NC	
	17.0	16.7	18.4	23.4	C	

Blocks.—B4 and 5.
Variety.—P.O.J. 2878.
Harvested.—August, 1936.
Age of Crop.—11 months.
System of Replication.—3 randomised blocks.
Plots.—0·084 acre.

TREATMENTS.

(a) **Cultivation**—
C. Cultivated in usual manner.
NC. Subsequent cultivation with hoe only, to remove weeds.

(b) **Interspace Distance**—
1.—4′ 6″
2.—4′ 0″

(c) **Subsoiling v. Non-subsoiling**—
Prior to planting.

CULTIVATION.

On the removal of the plant crop in September, 1935, the cultivated plots were ratooned with the subsoiler three times per row. Mixed fertilizer was applied to all plots uniformly, at the rate of 300 lb. muriate of potash and 150 lb. superphosphate per acre, at the time of ratooning, followed by a top dressing of 300 lb. sulphate of ammonia per acre one month later.

GROWTH NOTES.

The ratoons came away well in all plots, there being no apparent difference in the cultivated and non-cultivated plots. Steady progress was checked by dry weather in November. Vigorous growth followed the good rains of mid-December, but in February dry conditions again supervened. Further progress was made in March and April, after which cool, dry conditions caused a cessation of crop production.

Analysis of Variance.

Due to—	Degrees of Freedom.	Sum of Squares.	Mean Square.	Half Log$_e$ (Mean Square).
Blocks	2	309·12	154·56	..
Subsoiling	1	0·90	0·90	1·0986
Interspace distance	1	0·90	0·90	1·0986
Cultivation	1	1·76	1·76	1·4340
Errors	42	247·86	5·90	2·0387
Total	47	560·54	..	..

Crop Yields.

	Subsoiled.	Non-subsoiled.	Interspace.		Cultivated.	Non-cultivated.
			4′ 6″	4′ 0″		
Cane, tons per acre	21.3	21.1	21.3	21.1	21.0	21.4
Cane, percentage of mean yield	100·5	99·5	100·5	99·5	99·0	101·0

C.C.S. in Cane (average) = **13.4** per cent.

DISCUSSION.

In this experiment it was attempted to show the influence of certain culture factors on the yield of P.O.J. 2878. With the plant crop a small gain was determined, indicating the benefits of subsoiling and surface cultivation, while variation in the interspace distance was without effect.

For the first ratoon crop, no differences in yield, beyond those expected for experimental variation, were recorded. Again it would appear that the value of cultural treatment on the red soil is nil—and this applies equally to deep cultivation as well as to surface tillage.

The only point of interest in the entire experiment is the consistent superiority of autumn over spring planting. This benefit is reflected also in the first ratoon crop, as the following figures show:—

	Plant Cane.	First Ratoons.
	Tons.	Tons.
Autumn plant	27·9	23·0
Spring plant	19·0	17·6
Gain for autumn plant	8.9	5.4

Work of the Southern Sugar Experiment Station—continued.

FERTILIZER TRIAL—FORMS OF NITROGEN AND PHOSPHATE (First Ratoon Crop).

Plan and Yields.

P_MK 16.0	K 20.8	N_AP_SK 16.8	P_SK 17.4	N_BP_MK 19.2
N_AP_SK 21.1	P_SK 17.6	K 12.8	N_BP_MK 20.7	P_MK 19.7
N_BP_MK 22.4	P_MK 14.4	P_SK 13.4	N_AP_SK 14.9	K 20.0
P_SK 16.5	N_BP_MK 14.0	P_MK 12.3	K 18.2	N_AP_SK 18.9
K 16.8	N_AP_SK 13.6	N_BP_MK 10.6	P_MK 14.3	P_SK 19.9

Block.—E. 3 (b).
Variety.—P.O.J. 2878.
Harvested.—August, 1936.
Age of Crop.—12 months.
System of Replication.—5 × 5 Latin square.
Plots.—0·062 acre.

TREATMENTS.

(a) *Drill Application*—

K—200 lb. muriate of potash per acre.

P_M—200 lb. meatworks manure per acre.

P_S—50 lb. sulphate of ammonia } per
127 lb. superphosphate } acre.

N_B—225 lb. dried blood per acre in drill.

N_A—150 lb. sulphate of ammonia per acre as top dressing.

CULTIVATION.

After harvesting the plant crop in the leaf, in August, 1935, the trash was rolled into alternate interspaces with the side-delivery rake, and the bare interspaces were cultivated in the usual manner. Fertilizers were applied as above, the topdressing to "N_A" plots being given in mid-October.

GROWTH NOTES.

The ratoons commenced well in all plots and made steady growth during the spring. Dry conditions, which checked growth, were relieved by mid-December rains (5 inches) and the crop made rapid growth until mid-January. Early March rains promoted further growth, which continued until the cool conditions of May. No frost damage occurred in this crop.

Analysis of Variance.

Due to—	Degrees of Freedom.	Sum of Squares.	Mean Square.	Half Log_e (Mean Square).
Rows	4	39·05	9·76	..
Columns	4	121·38	30·35	..
Treatments	4	16·83	4·21	0·7187
Errors	12	65·86	5·49	0·8515
Total	24	243·12	..	..

Cane Yields.

—	K	P_MK	P_SK	N_BP_MK	N_AP_SK
Cane, tons per acre	17.7	15.3	17.0	17.4	17.1
C.C.S. in cane, per cent.	14·4	14·3	14·2	14·2	14·3

DISCUSSION.

It is generally recognised that red volcanic soils are well supplied with available phosphates, though it is sometimes claimed that "fixation" of soluble phosphates by the iron of the soil is responsible for the lack of response shown with superphosphate. This experiment was designed to investigate this point, by comparing the values of equivalent quantities of superphosphate and bone. In addition, the value of dried blood *v.* sulphate of ammonia was also included.

For both plant and first ratoon crops, erratic yields have been recorded, and the trial is indefinite. However, there has been no suggestion that either form of phosphate or nitrogen has had any influence whatsoever on crop yield or C.C.S.

Station Improvements.

During the year considerable improvements and additions were made to the Experiment Station property. The old buildings which were used as stables, barn, and fertilizer room were completely demolished, and in their place was erected a modern single-unit building. This carries under one roof stables for six horses, fertilizer store and mixing room, workshop and tool room, storage barn and chaffcutter assembly, and a capacious implement shed. The building has been planned to give maximum convenience and efficiency. A new building was also erected close to the laboratory for the purpose of housing the crushing mill and fibrator units, as well as providing garages for Station vehicles. All Station buildings and roofs were painted.

The erection of a new, modern hothouse for the propagation of cane seedlings was started prior to the end of the year and will be complete for the raising of seedlings this season. It replaces the hot-box previously used. The house, heated by a hot water pipe system, and sufficiently commodious for convenient working, fills a long-felt need and completes a long-standing plan for a well-equipped seedling raising unit. Concrete tables outside the hothouse provide space for over 6,000 potted seedlings.

Horse-feeding.

With a view to supplying Station horses with a more balanced ration than previously, a small block has been sown with oats and wheat to be grown for hay production. A good germination has resulted, and records of yields obtained will later be of interest to canegrowers who desire them.

Through the courtesy of Mr. C. J. McKeon, Director of Tropical Agriculture, a plot of grasses has been established in an endeavour to select a hardy, drought-resistant grass with ability to stand up to heavy grazing.

Field Day.

The decision to reintroduce the Farmers' Field Day at the Experiment Station met with enthusiastic approval on the part of the canegrowers. On June 10th over 300 growers, representing districts as far south as Nambour, attended the function. The Honourable the Minister for Agriculture, Mr. F. W. Bulcock, delivered the opening address of welcome to farmers, and this was followed by addresses by the Assistant Director and the Director. A detailed tour of inspection of the Station was then made. Those attending were particularly interested in the seedling propagation and trial work, and in the irrigation spray system operating on the lucerne block.

Laboratory Work.

Laboratory analyses carried out during the year included the following :—

	Samples.
Sugar-canes for growers	272
Sugar-canes for Experiment Station	328
Sugar-canes for Gin Gin Show	217
Sugar-canes for Maryborough Show	23
Sugar canes for Bundaberg Show	207
Sugar-canes for district field trials	70
Irrigation waters	57
Total	1,174

DETAILS OF CROP HARVESTED FROM THE SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG, DURING 1936.

	Tons.
Cane sent to mill	551·4
Cane used for plants	2·0
Large samples used for testing seedlings and other varieties	3·5
Total	556·9

Nature of Crop—

	Tons.
Autumn plant cane	234·6
Spring plant cane	133·7
First ratoon cane	171·9
Third ratoon cane	16·7

Varieties—

	Per cent.
P.O.J. 2878	41·33
P.O.J. 2725	20·75
Co. 290	8·52
Seedlings	15·13
Other Varieties	14·27

Area Harvested	20 acres
Average Tons per Acre	**27.84**

Cane Yields, Bundaberg Station.

It is of interest, at this juncture, to review the total crops and average yields of cane per acre recorded at the Bundaberg Station during the past sixteen years.—

Year.	Total Crop.	Cane Per Acre.	Year.	Total Crop.	Cane Per Acre.
	Tons.	Tons.		Tons.	Tons.
1921	389	26·8	1929	299	16·2
1922	505	16·7	1930	502	20·6
1923	180	8·3	1931	410	18·3
1924	189	13·2	1932	66	6·9
1925	427	22·8	1933	340	16·2
1926	229	13·1	1934	477	26·5
1927	310	19·4	1935	494	22·7
1928	238	18·5	1936	557	27·8

It will be observed that the 1936 figures are records in respect of both total tonnage and yield per acre. This result is due in part to the adoption of irrigation on certain trial blocks, but very largely to the adoption of superior, disease-resistant canes.

REPORT OF COMMITTEE ON SEEDLING RAISING.

In view of the necessity for raising seedlings at three localities in Queensland it has been found desirable for the better co-operation of the work to form a committee of the officers in charge of the three Experiment Stations, under the chairmanship of the undersigned. The work at the Bundaberg and Mackay Stations is under the control of Messrs. King and McBryde respectively while this year Mr. C. G. Hughes, Assistant Pathologist, has been temporarily in charge of breeding operations at Meringa. The new system of control will be definitely inaugurated with the current season's crossing programme and certain innovations, as outlined in last year's report, have been incorporated.

This report is made at the completion of the 1937 cross pollination season but prior to the initiation of the 1937 selections which will be carried out during the next two months.

Due to flood damage there was a paucity of parental material available at the Freshwater breeding plot and a number of substituted crosses have had to be made in consequence. The seasonal conditions prevailing during the arrowing period have been unusual, the winter being exceptionally dry and mild. In general, arrowing was sparse; Oramboo, Korpi and M. 1900 Seedling did not arrow at all, while Q. 813, D. 1135 and Badila produced only a few arrows, those of Badila appearing only after practically all other varieties had finished flowering. Conditions were favourable for the plentiful production of pollen but may not prove to have been favourable for the setting of seed. In the case of Co. 290, particularly, a number of arrows did not emerge completely and many branches died. Towards the end of the season, when such Badila crosses as could be made were under way, unfavourable wet windy weather was experienced.

In general, crosses were made by standing male arrows in SO_2 and P_2O_5 solution, and grouping them around female arrows growing in the field. In addition there were made a number of experimental crosses in which the female arrows were also maintained in solutions of varying strengths of SO_2 and P_2O_5.

The following crosses were carried out :—

Female Parents.	Male Parents.
P.O.J. 2725	7 R. 428 (Pompey), D. 1135, H.Q. 409, N.G. 15 (Badila), S.C. 12/4, E.K. 28
P.O.J. 2878	N.G. 15 (Badila), Co. 290, Q. 1098, 26 C. 148, " X " 10, " X " 1
Co. 290	N.G. 15 (Badila), P.O.J. 2940, S.C. 12/4, P.O.J. 2878
S.J. 4	Co. 356, 20 S. 16, S.W. 499, " X " 1, H.Q. 409, Q. 813.
P.O.J. 213	" X " 9, Mass pollination
Co. 115	P.O.J. 2940
" X " 10	N.G. 15 (Badila).
" X " 6	Co. 281
	EXPERIMENTAL CROSSES.
P.O.J. 2878	Q. 1098, " X " 10
Co. 290	S.C. 12/4

The varieties designated " X " are seedlings from previous years which are not as yet considered of sufficient importance to warrant receiving a " Q " number. In addition to the above a small amount of fuzz was received from the Department of Agriculture in New South Wales, being excess seed received from overseas.

Report of Committee on Seedling Raising—continued.

1936 Seedlings.

Seedlings from the 1936 crossings were planted in the field as follows :—

Meringa. 10,000 app. (chiefly Oramboo × H.Q. 409 ; P.O.J. 2878 × S.C. 12/4 ; Oramboo × N.G. 15 ; N.G. 15 × Q. 2 ; N.G. 15 × (N.G. 15 × Q. 813) ; P.O.J. 2878 × N.G. 15 ; N.G. 15 × S.C. 12/4 ; N.G. 15 × (N.G. 15 × P.O.J. 2878) ; Oramboo × Q. 813 ; together with some crosses for breeding.)

Mackay. 6,906 (P.O.J. 2878 × S.C. 12/4 ; P.O.J. 2878 × S.W. 499 ; P.O.J. 2878 × P.O.J. 2940 ; N.G. 15 × E.K. 28 ; N.G. 15 × S.C. 12/4 ; P.O.J. 2725 × S.C. 12/4 ; P.O.J. 213 × (P.O.J. 2725 × S.C. 12/4) ; S.J. 4 × P.O.J. 2940 ; 7 R. 428 × P.O.J. 2940 ; Oramboo × H.Q. 409).

Bundaberg. 4,413 (Co. 290 × P.O.J. 2878 ; Co. 290 × S.C. 12/4 ; Co. 290 × P.O.J. 2940 ; P.O.J. 2725 × S.C. 12/4 ; P.O.J. 2875 × H.Q. 409 ; P.O.J. 213 × P.O.J. 2940 ; P.O.J. 213 × (P.O.J. 2725 × S.C. 12/4) ; Co. 281 × Q. 1098).

Selections from 1935 Seedlings.

First selections were made from the 1935 planted seedlings as follows :—Meringa 190 (2 per cent.), Mackay 52 (1·5 per cent.), Bundaberg 29 (0·6 per cent.). These seedlings were selected on the basis of vigour and visual characters in 1/40 acre plots, and brix was then determined on the half stool ; any seedling with very low brix was discarded. The finally selected seedlings were then planted out in ten randomised plots (1 seedling per plot) for second selection during the current season.

Second Selections (1934 Series).

Second selection seedlings were planted out in four randomised blocks, each block containing one ten-stool plot of each seedling. Selections and plantings were made as follows :—Meringa 55 seedlings, Mackay 6 seedlings, Bundaberg 20 seedlings.

Yield Selection Trials.

Yield selection trials, in order to make a selection of seedlings which are to go out into farm yield trials have been set out at each centre as follows :—Meringa 16 seedlings, Mackay 3 seedlings, Bundaberg 10 seedlings. Varieties selected from these trials will be given Q. numbers and will be planted in farm yield propagation trials during the forthcoming spring.

Q. Seedlings.

The seedling Q. 2 was released for commercial planting this year in the far northern districts. This cane is of the thin type but is a remarkably free trasher. It is an erect cane, good stooler and yields a good plant crop under conditions of adequate moisture, with medium to good sugar content ; it is a slow ratooner and its capacity for producing satisfactory ratoon crops has yet to be tested. It is resistant to the attack of the beetle borer and is satisfactorily resistant to red stripe top rot and leaf-scald.

Of the four seedlings set out in trials last year, viz., Q. 1, 4, 10 and 12, only Q. 10 shows encouraging promise at the present time. This cane also is erect, resistant to top rot and promises to be considerably more resistant to the beetle borer than is Badila.

Experimental.

A considerable programme of experimental work has been initiated, but this will necessarily have to be carried on over a few years before conclusions can be drawn. This work covers mainly the basis of selection involving the question of maintenance of first year characters, requirements for sampling, selection of plant or ratoon crops, &c.

ARTHUR F. BELL,
Assistant Director.

Division of Entomology and Pathology.

By Arthur F. Bell, Assistant Director.

I present herewith a report of the activities of the Division of Entomology and Pathology for the twelve monthly period ending 30th June, 1937. Personnel of the Division remains as at the time of presentation of the previous report. Entomological investigations have been carried out in the laboratories at the Northern (Meringa) and Central (Mackay) Experiment Stations. At Meringa Messrs. Mungomery and Buzacott have concentrated their attention upon the development of further control methods for the beetle borer and cane grub pests, while Mr. McDougall, at Mackay, is devoting his time to a study of the ecology and habits of the rat species which attack cane. Owing to the potential seriousness of gumming and downy mildew diseases in far northern areas Mr. Hughes, Assistant Pathologist, has been temporarily seconded to Meringa, while Messrs. Steindl and Leece are attached to the Brisbane Laboratory.

ENTOMOLOGY.

Cane Pest Boards Conference.

The third conference of Cane Pests Boards was held at the Experiment Station, Meringa, on Thursday, 13th May, and was attended by 31 delegates, representing 14 Pests Boards and the Bureau of Sugar Experiment Stations. The Conference, which met under the chairmanship of Mr. W. C. Griffin, adopted a set of rules for the future conduct of such conferences annually. Proceedings were devoted chiefly to consideration and discussion of progress reports of investigations being conducted by the entomological staff, and several resolutions arising from these discussions were adopted.

The Greyback Beetle or Northern Cane Grub. (*L. albohirtum* Waterh.)

Damage caused by this pest during the current season has varied considerably throughout the northern and central portions of the State, this variation in infestation and damage being attributable mainly to weather conditions during and following the normal flight period. In the Johnstone River district, where early beetle emergences are normal, dry weather was experienced until the end of November: the result was that only one major beetle flight took place and, as this was numerically less important than the previous year's flight, a much reduced grub infestation resulted. In a section of this district an extensive co-operative scrub clearing project was carried out on the Basilisk Range with the object of reducing grub infestation. Previous experience does not warrant an optimistic view of the probable value of such campaigns and a warning should be sounded against the hasty drawing of conclusions as to the benefits resulting therefrom since there is this year a generally reduced infestation over the whole area.

In the drier Cairns district, where late beetle emergences are normal, the December rainfall was well up to average intensity and distribution, resulting in a high survival of both beetles and grubs. In contrast with the two previous years, when unfavourable weather conditions decimated this pest, the past year has witnessed a rapid regeneration of populations and under normal seasonal conditions we may expect greatly increased damage in these areas in 1938, unless systematic fumigation is adopted. It should be pointed out that this rather rapid regeneration of populations following one favourable season does not indicate the likelihood of substantial success attending large scale beetle collecting campaigns; in some districts where the number of beetles noticed during the flighting period was definitely small, the subsequently high rate of survival of grubs has caused infestations to be fairly considerable.

A total of approximately 564 acres was fumigated in the area from Tully northwards and this covered practically the whole of the heavily infested crops. Generally speaking the damage caused per unit grub population was high due to the exceptionally dry conditions experienced from the end of April onwards; for the same reason fumigated cane did not give the response it would have done had normal wet conditions prevailed following fumigation.

Division of Entomology and Pathology—continued.

The high degree of damage per unit of grub infestation, mentioned above, was accentuated in the Mackay district where exceptionally droughty conditions prevailed from March onwards. Indeed, in some localities an average infestation of one grub per stool was sufficient to kill varieties with root systems of only moderate strength. In consequence, grub damage in the Mackay district has been more extensive and intensive than for many years past. This has caused a great deal of apprehension regarding the near future, but it may confidently be predicted that a return to normal weather conditions will see an immediate return to normal grub infestations. Grub control in this district presents a special problem in that lighter crops, extended beetle flight periods, and the intermittent and sporadic nature of infestations render fumigation uneconomic except, perhaps, in a few restricted areas. Control is therefore virtually restricted to the use of stronger rooting varieties which will the better withstand grub attack and a considerable improvement has been made in this direction in recent years. The canes P.O.J. 2714, P.O.J. 2725, and P.O.J. 2878, possess these strong rooting properties to a marked degree but P.O.J. 2725 is to be preferred to the other two owing to its resistance to both downy mildew and top rot. Parallel with the Mackay district, grub damage has lately increased in sections of the Lower Burdekin district. Here the heavier crops make fumigation a practicable consideration and interest in this form of control is increasing.

In response to requests, the possibilities of using flame throwers to kill beetles on their feeding trees was investigated but did not yield encouraging results: Beetles can be killed only on those feeding trees whose height comes within the limited range of commercial flame throwers; moreover these instruments are difficult to work in hilly country and amid undergrowth, while it is possible to operate only on the outer fringe of more or less dense rain forests. Experiments in spraying feeding trees, as detailed in last year's report, were repeated and extended. Lead arsenate with linseed oil as a sticking agent proved an effective and efficient spray at concentrations of 4, 6 and 8 lb. per 100 gallons of water. Analyses of sprayed foliage after exposure to natural weather conditions for 4½ months showed that a high percentage of the lead arsenate still adhered to the leaves. It is intended to explore the economic possibilities of this line of attack in an area where the extra-canefield grub populations are low.

A newly recorded parasite, bred from an adult specimen of *L. albohirtum* Waterh. last year, was identified at the Imperial Institute of Entomology as being *Sturmia elzneri* Towns.

Giant American Toad (*Bufo marinus* L).

The Giant American Toad, which was introduced from Hawaii in June, 1935, with the object of assisting in the natural control of the greyback beetle pest, has continued to increase in numbers in a highly satisfactory manner. At the time of the presentation of the last report liberations had been confined to the Cairns–Johnstone–Tully districts on account of restrictions imposed by the Commonwealth Government. Following the communication of further data on the feeding habits of the toad under Queensland conditions these restrictions were subsequently removed, and colonies have now been liberated in the Mossman, Herbert, Lower Burdekin, Mackay, Bundaberg and Isis districts.

As anticipated in last year's report, the first Australian born generations commenced to reproduce in the early summer months. Egg laying under natural conditions became prolific during February–April and the toad may now be considered to be well established in the far northern districts, and especially in the vicinity of the Little Mulgrave River. Even here, of course, populations are still very far from saturation point and until then it will be impossible to judge their ultimate effect on the beetle pest. It is of some interest to record, however, that already we are receiving favourable reports of the toad's work in reducing insect pests in vegetable gardens and household pests such as cockroaches.

Beetle Borer (*R. obscura* Bois).

The beetle borer pest has been the subject of intensive investigation during the past year, following the large amount of damage caused in the Johnstone district during the 1936 season, and the conclusion that the tachinid fly parasite would not fulfil earlier prognostications. Although the general incidence of this pest is distinctly less than that of last year, serious losses have again been caused.

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As part of the investigational programme a number of fields were selected in areas of heavy borer infestation, and continuous examination of these fields was initiated prior to and immediately after harvesting; in this way the normal cycle of infestation and reinfestation has been followed through a complete growing season. It has been found that pre-harvest burning offers the best means of quickly reducing borer populations since this effectively disposes of the free living beetle population and prevents oviposition in cane tops and old stubble. Naturally, to be fully effective, pre-harvest burning would require to be general throughout the season and it is realised that there are objections to the institution of such practice. When cane is harvested green the free beetles persist and oviposit in discarded cane tops and in the butts of any stools which happen to be cut high. In disposing of the crop residues later by burning, many of the cane tops receive only a partial burn and the developing borers therein are unaffected by the fire; when this debris is raked into rows to rot it offers a highly favourable breeding ground for the pest. Where tops and trash are conserved without burning, the extent of borer survival depends mainly on subsequent weather conditions; if the tops dry out well the majority of borers die, but if they pack down and resist desiccation many borers emerge and re-infest the young ratoons. From the point of view of borer control low topping of cane, especially early in the season, and high cutting, are practices to be roundly condemned.

The question of alternate hosts has been investigated but is considered as having a negligible influence on the large canefield populations already existing. Field sanitation, especially along the lines indicated above is, however, of the utmost importance.

The incidence of top rot has a profound effect in building up localised borer populations; beetles are strongly attracted to diseased stalks which are also well suited for oviposition and borer development. Thus fields predisposed to top rot should be planted to varieties resistant to this disease. Varietal resistance to borer attack *per se* is also a promising line of attack and four borer resistance trials with new seedlings were planted last spring. These show that the newly released Q. 2 has high resistance while Q. 10, another promising seedling, has considerably higher resistance than Badila. These two canes also have added resistance by virtue of their greater resistance to top rot.

Rind hardness tests with a specially constructed instrument have been carried out in conjunction with varietal trials. It is evident that rind hardness, although important, is not the only factor responsible for borer resistance in a particular variety. On the other hand it appears probable that when other factors such as top rot susceptibility, lodging, &c., are eliminated, rind hardness will be found to have a direct relation to borer susceptibility. Rind hardness tests have now been incorporated as a routine part of variety tests and some interesting facts are being brought to light. For example, current tests show that top rot diseased cane and some grub infested cane are softer than normal healthy cane and this may explain, at least in part, some of the increased infestation in such cane.

Trials were instituted to determine whether early trashing would effect a reduction in borer infestation through hardening of the rind and/or reducing the shelter for adult beetles. It is as yet too early to draw conclusions from these trials. The two or three trashings necessary are costly operations but these are definite indications of reduced borer populations and increased tonnages in the trashed plots. Contrary to expectation there have been no significant increases in rind hardness as a result of the trashing.

Rat Pests.

Taking Queensland as a whole, damage due to rat species was much reduced during the past season and present indications do not indicate any appreciable upward trend for the coming season.

Ecological, life history and toxicological investigations are being carried out in the preliminary investigation of this pest. Early in the period under review a rapid species survey was made in Central and Northern mill districts. The house rat, *Rattus rattus*, the field rat, *R.*

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culmorum, and the khaki or tree rat *Melomys littoralis*, were common to all districts, but the first named was not found to damage cane to an appreciable extent ; the common scrub rat *R. assimilis* was not found to damage cane. Recently Mr. McDougall has found cane in the Mackay district being attacked by another rat *M. cervinipes*.

Continuous daily trapping of rats, with weight recordings, is now being carried out in the Habana district, but the data obtained are not sufficiently extensive to call for comment and the same applies to life history studies. It should be mentioned, however, that a new "live" trap recently developed shows every promise of yielding trappings comparable with those obtained with the break-back trap.

Wireworms.

Conditions during the 1937 rainy season in the Mackay area were such as to ensure a high rate of survival among the early instars of the lowland wireworm *Lacon variabilis* Cand. and in these localities where adequate drainage has not been provided extensive damage may be expected. Consequently farmers with low lying, ill-drained fields have been advised to postpone the planting of these until next year or, if this is impracticable, to delay this season's planting until at least late September. Repeated experience has demonstrated that *L. variabilis* is the only wireworm responsible for extensive damage in the central districts, although bad strikes in well drained and even hillside fields are often attributed to wireworms simply because wireworm species are found to be present.

Miscellaneous.

Following last year's record of extensive outbreaks of the army worm, *Spodoptera exempta* Wlk., throughout Queensland cane fields, and the recording of such a high degree of parasitism among these caterpillars, two parasites which were bred out were submitted to the Imperial Institute of Entomology for identification. We are indebted to that institution for the following identifications :—

Sturmia inconspicuoides Bar.,

Eutachina mungomeryi n. sp. Bar.

The former was the more important of these two tachinids and it is also a parasite of other common noctuid sugar cane pests.

Insect surveys have been continued with a view to obtaining a lead as to possible insect vectors of chlorotic streak but no suggestive results were obtained.

PATHOLOGY.

General Disease Situation.

The general disease situation remains similar to that of last year. That is to say, now that gumming disease has been virtually eliminated from the Southern districts there have been no very great direct losses as a result of the incidence of disease, especially during a year when top rot was of little importance. However, in a country such as Australia with its rich array of cane diseases, the question of indirect losses is always present, due to the impracticability of cultivating certain varieties on account of their disease susceptibility. Under the conditions which obtain in this country, fresh outbreaks of sugar-cane diseases in new localities are at all times a very present possibility and, in order to safeguard the general interests of the community, it is essential that rigid control of the variety situation be maintained. It is only under complete control that the necessary flexibility of varietal change is available in order to make adjustments of plantings in accord with changing circumstances in the disease situation.

The extremely droughty conditions which have prevailed in the southern part of the State have seriously hampered disease investigations and resistance trials.

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Leaf Scald Disease.

The routine leaf-scald resistance trial was carried out, but results were somewhat vitiated by adverse conditions for germination. The status of this disease remains the same; that is, any loss is indirect rather than direct. So far as recent surveys have shown leaf-scald does not exist south of Townsville; in the far northern area the two chief commercial susceptible varieties are Clark's Seedling (H.Q. 426) and S.J. 4. These two canes are extensively grown in the drier (Cairns-Mossman) belt and under these conditions their sensitivity to the disease enables them to survive. That is to say natural spread is very slow and adverse seasonal conditions cause a heavy mortality among such stools as are diseased, thus removing sources for mechanical infection.

Red Stripe Disease.

Red stripe disease was responsible for little damage during the past season, doubtless due, at least in part, to the comparative lightness of the rainy season.

Downy Mildew Disease.

Downy mildew has increased somewhat in the Mackay district and plantings of P.O.J. 213, P.O.J. 2714, and P.O.J. 2878 should be carefully supervised. This disease is potentially very serious in the presence of high numbered P.O.J. canes (except P.O.J. 2725) and their progeny. An outbreak occurred on the Meringa Station this year and strong measures have been necessary to restrict its spread.

Gumming Disease.

Gumming disease may now be considered to be practically eliminated from the southern districts, it being difficult to locate a field where the full range of symptoms can be satisfactorily demonstrated. No reports of the disease were received from Mackay during the year and positive symptoms were found on only one farm on the Ingham line. In the Mulgrave area the prolonged wet season of 1936 provided excellent conditions for the spread of this disease and when a survey was completed at the end of November, 1936, the disease had been found on 24 farms, and its presence was suspected on at least four more. The spread of the disease has been in a general north-westerly direction—that is with the prevailing wind. Following the first outbreak, and establishment of a quarantine area, it had been hoped that the Mulgrave River would act as a natural barrier; but unfortunately, an illicit transfer of cane plants from the south side of the river to the north took place. The boundaries of the quarantine area have been extended and all farmers within this area have been informed by Ministerial letter of the conditions of the quarantine. Plantings of eight new varieties have been made within the area in a search for a suitable resistant variety to replace the prohibited S.J. 4, and yield trials with several better known resistant varieties have been set out by the Division of Soils and Agriculture.

Family resistance trials carried out at Bundaberg indicated that P.O.J. 2725, like P.O.J. 2878, confers high resistance on a very high proportion of its progeny; P.O.J. 2722 and P.O.J. 2940 were not nearly so striking in this respect. The usual routine varietal resistance trials were also carried out, chiefly with Bureau seedlings.

Work on the question of alternate hosts for gumming disease was continued and it is now well established that the disease may be transmitted, both naturally and artificially, to several varieties of Dent and sweet corns. The pathogenes, when reisolated from the corn, appear to have lost none of their virulence.

Fiji Disease.

Although little direct loss has been occasioned through Fiji disease the situation in southern Queensland is always disquieting due to the greater cultivation of the very susceptible P.O.J. 2878. During the year the disease has been found on several farms in the Isis mill area; only a trace of the disease has been found but the situation calls for every effort at eradication. The amount of disease in the Kalkie quarantine area has again decreased and this year it is expected that it will be eradicated south of the Sandhills Road. The general situation in the Maryborough district has improved with greater attention on the part of the farmers, but stricter attention is required in the Moreton area, where the disease is definitely not being held in check by the growers.

Division of Entomology and Pathology—continued.

Rind Disease.

The old and well known rind disease (*Pleocyta sacchari*) assumed some considerable importance in the Bundaberg–Isis area last year. Due to dry conditions, standover cane was well advanced towards maturity and in many cases over mature at the commencement of the crushing season. As the season progressed, and cane become increasingly overmature, the bright red stem rot associated with rind disease became increasingly evident and a considerable amount of death supervened. Analyses showed that the sucrose content and purity of infected canes fell rapidly. Repeated isolations and inoculations demonstrated that the disease was caused by the fungus *Pleocyta sacchari*. Analyses of healthy cane in a number of infected fields indicated that in each instance the cane was fully mature at the time of the appearance of the disease. In the Bundaberg–Isis district, the disease was almost entirely confined to standover P.O.J. 2878 but was also found in H.Q. 458 at Mourilyan and Hambledon.

Inasmuch as the incidence is apparently closely related to overmaturity of the cane, it would appear that control lies in the avoidance of this condition where possible, either by the adjustment of time of harvesting or delaying the time of maturity by adjustment of time of planting, fertilization, &c. Trials in which late applications of nitrogenous fertilizers were made to standover cane were initiated this season, but the intensely droughty conditions prevailing have made the successful conclusion of the experiments improbable; maturity tests carried out to date, however, indicate that the late fertilized cane is holding up much better than the unfertilized.

Maturity tests carried out this year at the beginning of June indicate that some standover crops of P.O.J. 2878 were already overmature at that early date, and the red stem rot characteristic of rind disease was already becoming evident. There is no doubt that a large proportion of the standover cane will be overmature, and death due to rind disease quite extensive, long before the crushing season commences. Actually from the standpoint of this disease the crushings should have been advanced rather than retarded in this dry year of small crops, but early maturity.

A considerable investigation of this disease, and the strains of the causal fungus, has been carried out and will be published when another season's field trials can be completed.

Chlorotic Streak.

Further cultural and histological work in the laboratory has failed to produce evidence of the existence of a visible causal organism, while inoculation with cultures of *B. albilineans* attenuated in various ways has failed to produce chlorotic streak symptoms. Field surveys serve to confirm the greater incidence of the disease in low badly drained localities, where secondary spread may be very rapid: in fact there may be marked apparent differences in the incidence of the disease in ridges and hollows in the same field. Work on the question of possible insect vectors has not been advanced to any considerable degree, and is at present in abeyance pending the conclusion of the present intensive investigation on the cane beetle borer.

An experiment in which diseased and healthy setts were planted in soil and sand, with and without the addition of complete nutrients, gave no indication that the disease was associated with plant food deficiencies. Adjacent plantings of a susceptible variety have been made (*a*) in the field and (*b*) the same soil, fumigated with CS_2, but placed in tubs raised from the ground. This crop is now eight months old and will be ratooned shortly: it is hoped that by the end of the year it will yield some information on transmission.

An initial attempt at conducting a varietal trial was made in 1935, when some seventeen varieties were planted in a locality at Babinda where secondary spread was thought to be reasonably rapid. Rows of diseased Badila were interplanted between the varieties under test. No sign of the disease appeared in the plant crop, but after harvesting in September, 1936, the ratoon crop began to display disease symptoms during November and continued until February, when there was a sudden cessation of the appearance of further symptoms. At the time of ratooning a number of the stools failed to ratoon (originally twenty-five), but whether this was due to the effects of the

disease or not could not be ascertained. It is known, of course, that the disease is responsible for an appreciable mortality among ratoons and consequently some of these failures, at least, should be debited to the chlorotic streak.

Since this constitutes the first resistance trial attempted the results are given below in detail :—

Variety.	Stools Remaining.	No. Diseased.	Proportion Diseased.
S.J. 4	19	16	0·84
H.Q. 426	19	14	0·74
Q. 12	20	11	0·55
Badila	24	13	0·54
Q. 8	21	10	0·48
Q. 2	20	8	0·40
M. 189	23	7	0·30
Q. 1	17	4	0·24
(P.O.J. 2878 x Robustum)	22	5	0·23
Q. 813	14	3	0·21
P.O.J. 2364	17	2	0·12
B. 147	16	1	0·06
D. 1135	18	1	0·06
Uba	20	1	0·05
Q. 4	17	0	..
Co. 290	22	0	..
P.O.J. 234	27	0	..

This trial will be repeated this year with an enlarged selection of " blood lines " so that some conclusions may be drawn as to possible sources of breeding material with which to incorporate resistance to this disease.

Pineapple Disease.

Pineapple disease was responsible for rather more than the usual amount of damage in plantings made in the early part of the period under review, the position doubtless having arisen as a result of cold weather delaying germination and favouring the attack of the fungus. A laboratory investigation of several aspects of the disease is nearing completion, and some interesting data have been obtained particularly in respect to temperature co-efficients and antagonism. The results of this investigation will be set out in a technical communication.

Soil Rehabilitation.

The Honourable the Minister for Agriculture has repeatedly directed attention of persons engaged in the sugar industry to the necessity for making serious efforts to place the agriculture of sugar cane on a more rational basis, particularly by the adoption of the principle of crop rotation. It is true that our present system of legislative crop control frequently militates against the adoption of such principles, but even where this factor does not supervene, the subject has received little attention. Permanent systems of agriculture in the old world are founded on well planned crop rotation, and there is no reason to believe that cane growers can continue to violate this old established principle with impunity. Such evidence as we have been able to accumulate indicates that our old sugar soils—such as the Woongarra area—are " running out " with continuous cropping. Root diseases are becoming more prevalent, the soils are losing their fertility, texture and moisture holding capacity, while the numbers of soil inhabiting micro-organisms are being greatly reduced. It is obvious that legume culture must play an important part in any system of

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crop rotation which may be adopted, whether the legumes be grown as green manure crops or for fodder purposes. With this object in view and having in mind recent important work on the host specificity of nitrogen fixing bacteria, some forty odd cultures of various strains of *Rhizobium* have been collected, together with seeds of various legumes. During the forthcoming spring it is proposed to sift out the best strains for each particular legume by means of replicated glass house tests. The selected strains will then be carried into field trials. At the same time sowings of these various legumes have been established at the three Experiment Stations and their growth will be studied.

Variety Introductions.

The following varieties have been introduced from abroad during the period under review :—

Variety	Country from which Introduced.
Katha	India.
Saretha	India.
Saccharum spontaneum—Burma	India.
S. spontaneum—Tank	India.
Co. 364	India.
A brown striped variety, name unknown	New Guinea.

Publications.

In addition to numerous articles in the Quarterly Bulletin the following technical papers have been published by the Division during the year :—

"Gumming Disease in the Mulgrave Mill District," by Arthur F. Bell.

"Factors Adversely Affecting the Strike of Sugar Cane Plants," by Arthur F. Bell and C. W. Leece.

"Progress Report of Sugar Cane Beetle Borer Investigations in North Queensland," by R. W. Mungomery.

"Rind Hardness Determinations as an Aid in Borer Control," by J. H. Buzacott.

Division of Mill Technology.

Ir. J. Eigenhuis, Engineer Technologist.

Staff.

Since the last Annual Report was presented, Mr. G. E. Young left the Bureau on 24th January, 1937, returning to the University to complete his engineering course. Mr. N. Smith was offered a position outside our service, for which reason he resigned as from 19th June, 1937. Due recognition must be given here for the excellent work done by Mr. Smith during his, unfortunately short, service in the Bureau.

Steps are being taken to fill the vacancies caused by the resignation of the abovementioned officers.

Mutual Control.

The synopsis for the 1936 season of the Mutual Control has been composed and distributed. The calculation sheets for the 1937 season have been sent to the mills.

Twenty-four mills will again participate in the scheme this year.

Standardization of Apparatus.

The work of standardizing apparatus for the mills was continued, and the following is a record of the work undertaken :—

Brix Spindles.—Two hundred and fifty-two spindles were tested and all but fifty-two conformed with the official requirements. Two of these were broken or damaged, twenty-four beyond the set limits of tolerance, seventeen were of unofficial range, and seven were of unofficial range with error beyond the set limits of tolerance.

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

Flasks.—Two hundred and thirty-three were tested and thirty condemned.

Pipettes.—One hundred were tested and seventeen condemned.

Burettes.—Fifty-one were tested and nine condemned.

Polariscope.—One instrument was checked and adjusted.

Weights.—One set of weights was tested.

Sundries.—Four analyses of waters were done.

Laboratory Work.

Colorimetric Standard pH Sets.

As in the previous year, standard pH sets of phenol-red for a range pH 7·0 to 8·6 were made up and supplied to the mills, together with a standard indicater solution.

Sugar Bureau pH Meter.

An improved design was made of the electrometric pH meter as used in the 1936 season. The opportunity was given to the mills to acquire such a meter. The response to this offer was so great that the Bureau had ultimately 17 meters on order. Much difficulty was experienced in arranging the manufacture of these sets, but finally satisfactory arrangements were made with

Division of Mill Technology—continued.

a Brisbane radio firm. The manufacture of the required sets is well on the way and already several have been calibrated by the Bureau. The antimony electrodes were made by the Bureau, but it is hoped that in the future the firm which supplies the instruments under a guarantee of a year will take up the complete manufacture. This would minimise considerably the work to be done by the Bureau in this respect and limit it to only the calibration. In connection with the pH meter, much work was done in studying different problems on pH measurement.

Slack Season Research by Mill Officers.

The directorates of three mills availed themselves of the opportunity of having a mill officer in the Bureau for investigating sugar technology problems under guidance of the Bureau officers during the slack season.

This scheme was evolved in order to establish a more direct contact between the mills and the Bureau, to give a better insight into the Bureau work, and to be able to study problems which otherwise would have to wait by lack of facilities. This work made a considerable demand on the time of the Bureau officers, but it must be immediately mentioned that this was more than justified by the success of the scheme.

Furthermore, it was found that the closer contact between the various mill officers in the Bureau was very fruitful. The following gives an outline of the researches done in this way, the results from which will be published in due time in the Technical Communications:—

Mr. F. H. C. Kelly, M.Sc., Research Officer of Kalamia Mill.—The problem investigated was "The Ultimate Analysis of Bagasse," which by reason of the analytical procedure was coupled with an introductory study into the bagasse-moisture system.

Mr. R. W. G. Hessey, M.Sc., Research Officer of the Amalgamated Sugar Mills Limited, Pleystowe.—The combustion value of bagasse was studied, partly in connection with the above-mentioned research and the publications of Professor Ir. E. C. von Pritzelwitz van der Horst.

Mr. E. Mitchell, Assistant Chemist, Fairymead Sugar Co.—"The Influence of Viscosity on Fugalling Final Massecuites" was extensively studied in its various aspects.

Technical Publications.

The following papers were presented at the Eighth Annual Conference of the Queensland Society of Sugar Cane Technologists, by members of the Staff:—

E. R. Behne, "Errors in the Determination of Pol in Bagasse."
E. R. Behne, "Notes on the Milling of Cane."
Ir. J. Eigenhuis, "Notes on Combustion of Bagasse."
N. Smith, "Notes on Continuous Subsiders."

Technical Communications.

In the form of official bulletins the results of the 1936 seasonal investigations were published as follows:—

Technical Communication 1937, No. 3—"Seasonal Investigations on Hot and Cold Liming," by N. Smith.

Technical Communication 1937, No. 4—"Circulation in Coil Vacuum Pans," by N. Smith.

Technical Communication 1937, No. 5—"Boiler and Furnace Testing in a Cane Sugar Mill," by J. Eigenhuis.

Technical Communication 1937, No. 6—"The Analysis and Sampling of Final Bagasse," by E. R. Behne.

Technical Communication 1937, No. 7—"Milling Tests," by E. R. Behne.

Technical Communication 1937, No. 8—"Furnace Investigations, 1936 Season," by J. Eigenhuis.

Division of Mill Technology—continued.

Miscellaneous Work.

The Eighth Annual Conference of the Queensland Society of Sugar Cane Technologists in Cairns, opened by the Minister for Agriculture and Stock, was attended by all officers. Some mills were visited, several specific and general advices given, and two addresses delivered to the Bundaberg Institute of Milling Engineers. The writer visited the Southern States in order to make a special study of the combustion and briquetting of brown coal in Yallourn.

Four hundred and forty-six letters and reports were written since October, 1936.

Seasonal Investigations, 1937 Harvest.

During the Cairns Conference of the Queensland Society of Sugar Cane Technologists a meeting of the Mill Research Programme Committee was held. In the absence of the first chairman, Mr. J. W. Inverarity, the chair was taken by Mr. J. C. Collier for the election of a successor. Mr. N. Bennett, manager of Racecourse Mill, was unanimously appointed as chairman, and Mr. P. J. Staunton, chief chemist of Racecourse Mill, as secretary.

The following programme of work was presented and adopted by the meeting :—

1. *Investigations in Mill Work.*—These proposed investigations will continue the work in connection with the development of milling tests.

2. *Furnace Investigations.*—The proposed work is a continuation of that started in 1936 season.

3. *Investigations into Defecation Methods.*—The work in this field, started in 1936, will be continued. In addition, it is felt that advantages may be obtained by an investigation into the Sulphitation-Defecation Method.

A most essential detail of clarification is subsider performance, and it is necessary that the mills at which investigations on this subject will be conducted have efficient subsiders. In this connection attention is drawn to the paper of N. Smith, "Notes on Continuous Subsiders," in the Proceedings of the Queensland Society of Sugar Cane Technologists for the Cairns Conference.

Investigations into subsider performance will also form part of this programme, and improvement of the subsiders during this slack season in accordance with recommendations of the above paper has been urged.

4. *Investigations in Pan Work.*—Work in this direction, as initiated last season, is contemplated in the 1937 season, but more in the nature of investigations into the performance of more specific pan designs—*e.g.*, the Webre pan.

5. *Following up of Bureau Advices.*—In accordance with the policy of the Bureau, steps will be taken, whenever it is considered advisable and circumstances permit, to investigate the results from important advices given to the mills.

6. *Miscellaneous work as occasion may arise.*

The necessary steps for carrying out this programme were taken by the Bureau, though considerable difficulties are being experienced due to the uncertainty of staff matters.

Mill Work for the 1936 Season.

The 1936 season established a new Queensland record, both for tons of cane crushed and tons of 94 net titre sugar produced. These high figures resulted from bumper crops in the Northern and Central Districts, due to excellent growing conditions and a dry harvesting period. In the Southern District the total tons of cane crushed was the third highest on record, but due to the excellent quality of the cane the sugar produced was the second highest.

Division of Mill Technology—continued.

The average cane qualities for the different districts and for Queensland as a whole are compared with those of previous seasons in the following table :—

—	Season.	Pol in Cane	Fibre in Cane.	Purity, 1st Expd. Juice.
		Per cent.	Per cent.	Per cent.
Southern District	1930	14·58	15·00	89·91
	1931	15·01	15·40	88·25
	1932	13·32	15·16	84·95
	1933	13·55	15·21	87·65
	1934	14·67	14·59	89·74
	1935	14·56	14·47	88·6
	1936	15·31	14·32	88·83
Central District	1930	16·80	13·06	91·70
	1931	16·73	12·42	89·93
	1932	16·22	11·99	90·02
	1933	15·40	12·25	90·84
	1934	16·45	12·20	90·82
	1935	16·54	12·36	90·78
	1936	16·43	11·84	90·91
Northern District	1930	15·98	11·38	90·77
	1931	15·56	10·61	89·94
	1932	16·01	10·51	90·11
	1933	14·92	10·27	88·84
	1934	15·16	10·30	89·08
	1935	15·91	11·35	89·63
	1936	15·01	9·92	87·92
All Districts	1930	15·97	12·59	90·90
	1931	15·94	12·28	89·59
	1932	15·90	11·51	89·64
	1933	14·85	12·00	89·40
	1934	15·57	12·23	89·95
	1935	15·84	12·39	89·83
	1936	15·66	11·63	89·36

As will be seen from this table, the quality of the cane in the Northern and Central Districts maintained average values in spite of the prolonged crushing periods at many of the mills concerned. The pol in cane in the Southern District was the highest since 1929. The combined effect of these factors was that the overall average pol in cane compared favourably with that of previous years.

The fibre in cane for each district was the lowest recorded since 1929, but the average for all districts was the second lowest, that for 1932 being slightly lower. However, it will be recalled that 1932 was an abnormally poor year in so far as the Southern District was concerned, and the low fibre figure for that year was due to the predominating influence of the relatively high tonnages of low-fibred canes in the Northern and Central Districts, rather than to any actual decrease in the fibre content of the cane.

The average quantity of cane required to produce one ton of 94 n.t. sugar remained substantially the same as in the two previous years, as will be seen in the following table :—

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

1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.
7·18	6·91	6·83	6·94	6·90	7·31	6·97	6·92	6·94

It is interesting to note in this table that in the last nine crushing seasons, on only two occasions has it required more than seven tons of cane to produce one ton of 94 net titre sugar, the lowest value being 6·83 in 1930, and the highest 7.31 in 1933.

Division of Mill Technology—continued.

In the following tables the averaged figures for all mills during the 1936 season are given, and for comparative purposes the main features are set out with those of the previous six seasons :—

SOUTHERN DISTRICT.

—	1930.	1931.	1932.	1933.	1934.	1935.	1936.
Tons of cane	647,794	691,247	208,591	659,393	817,551	909,223	794,390
Tons of 94 n.t. sugar	84,114	91,546	23,747	77,229	107,676	117,467	109,142
Tons of cane per ton 94 n.t. sugar	7·72	7·551	8·784	8·538	7·593	7·74	7·28
Pol in cane	14·58	15·01	13·32	13·55	14·67	14·56	15·31
Fibre in cane	15·00	15·40	15·16	15·21	14·59	14·47	14·32
Purity—							
First expressed juice	89·91	88·25	84·95	87·65	89·74	88·6	88·83
Clarified juice	89·00	87·77	83·87	86·88	88·44	87·78	87·57
Syrup	88·51	87·37	83·59	87·38	88·73	88·1	87·97
Gallons molasses per ton cane	4·66	4·73	5·97	4·95	4·02	4·11	4·36
Apparent purity final molasses	..	40·90	39·06	40·96	41·24	39·72	40·07
Overall recovery	85·32	85·13	81·62	83·63	85·70	86·08	85·98
Recovery on mixed juice	90·42	90·45	87·42	89·74	89·59	91·995	90·64
Boiling house efficiency	94·67	95·54	94·09	95·11	96·12	96·94	95·41

CENTRAL DISTRICT.

—	1930.	1931.	1932.	1933.	1934.	1935.	1936.
Tons of cane	1,155,912	1,265,744	1,283,821	1,737,205	1,766,564	1,530,240	1,966,183
Tons of 94 n.t. sugar	176,619	189,440	190,995	249,680	271,437	233,901	301,893
Tons of cane per ton 94 n.t. sugar	6·53	6·682	6·722	6·958	6·508	6·542	6·51
Pol in cane	16·80	16·73	16·22	15·40	16·45	16·54	16·43
Fibre in cane	13·06	12·42	11·99	12·25	12·20	12·36	11·84
Purity—							
First expressed juice	91·70	89·93	90·02	90·84	90·82	90·78	90·91
Clarified juice	91·30	88·88	89·38	90·47	90·42	90·01	90·25
Syrup	91·60	89·20	89·52	90·52	90·41	90·06	90·54
Gallons molasses per ton cane	3·61	4·65	4·60	4·08	3·60	3·91	3·71
Apparent purity final molasses	40·52	40·45	39·50	40·28	38·91	39·52	37·22
Overall recovery	86·69	85·35	86·56	87·44	88·69	88·79	88·62
Recovery on mixed juice	92·23	91·35	91·77	92·38	93·53	93·79	93·20
Boiling house efficiency	95·69	95·63	96·02	96·26	97·47	97·8	97·08

NORTHERN DISTRICT.

—	1930.	1931.	1932.	1933.	1934.	1935.	1936.
Tons of cane	1,717,999	2,078,138	2,054,031	2,270,430	1,685,876	1,780,804	2,410,638
Tons of 94 n.t. sugar	254,537	300,289	299,343	311,825	233,457	258,958	333,613
Tons of cane per ton 94 n.t. sugar	6·75	6·920	6·862	7·281	7·221	6·877	7·23
Pol in cane	15·98	15·56	16·07	14·92	15·16	15·91	15·01
Fibre in cane	11·38	10·61	10·51	10·27	10·30	11·35	9·92
Purity—							
First expressed juice	90·77	89·94	90·11	88·84	89·08	89·63	87·92
Clarified juice	90·59	89·74	89·63	89·19	89·68	89·96	88·59
Syrup	90·77	90·02	90·30	89·23	89·64	89·89	88·58
Gallons molasses per ton cane	3·39	3·61	3·63	3·65	3·79	3·86	3·94
Apparent purity final molasses	39·55	35·33	37·33	35·21	37·78	36·53	31·66
Overall recovery	87·63	87·67	87·85	87·94	86·80	87·93	88·10
Recovery on mixed juice	92·22	92·40	92·43	92·71	91·62	92·86	92·58
Boiling house efficiency	96·13	96·72	96·67	97·60	96·34	97·34	97·97

ALL QUEENSLAND DISTRICTS.

—	1930.	1931.	1932.	1933.	1934.	1935.	1936.
Tons of cane	3,521,705	4,035,129	3,546,443	4,667,028	4,269,991	4,220,267	5,171,211
Tons of 94 n.t. sugar	515,270	581,276	514,085	638,734	612,570	610,326	744,648
Tons of cane per ton 94 n.t. sugar	6·84	6·942	6·885	7·307	6·970	6·915	6·94
Pol in cane	15·97	15·94	15·90	14·85	15·57	15·84	15·66
Fibre in cane	12·59	12·28	11·51	12·00	12·23	12·39	11·63
Purity—							
First expressed juice	90·90	89·59	89·64	89·40	89·95	89·83	89·36
Clarified juice	90·50	89·06	89·15	89·25	89·42	89·51	89·07
Syrup	90·60	89·28	89·42	89·41	89·48	89·57	89·27
Gallons molasses per ton cane	3·70	4·18	4·18	4·07	3·76	3·93	3·96
Apparent purity final molasses	40·65	39·19	38·31	38·58	39·29	38·33	35·54
Overall recovery	86·83	86·37	86·38	86·76	87·37	87·8	87·90
Recovery on mixed juice	91·89	91·79	91·86	91·88	92·49	92·98	92·52
Boiling house efficiency	95·72	96·27	96·31	96·40	96·82	97·36	97·18
Pol extraction	92·49	94·10	94·58	94·43	94·46	94·43	95·01
C.C.S. in cane	14·957	14·798	14·767	13·76	14·485	14·79	14·52
Coefficient of work	97·82	97·85	98·15	98·31	98·41	97·78	99·17

Division of Mill Technology—continued.

season are given,
ius six seasons :—

1935.	1936.
909,223	794,390
117,467	109,142
7·74	7·28
14·56	15·31
14·47	14·32
88·6	88·83
87·78	87·57
88·1	87·97
4·11	4·36
39·72	40·07
86·08	85·98
91·995	90·64
96·94	95·41

1935.	1936.
530,240	1,966,183
233,901	301,893
6·542	6·51
16·54	16·43
12·36	11·84
90·78	90·91
90·01	90·25
90·06	90·54
3·91	3·71
39·52	37·22
88·79	88·62
93·79	93·20
97·8	97·08

1935.	1936.
80,804	2,410,638
58,958	333,613
6·877	7·23
15·91	15·01
11·35	9·92
89·63	87·92
89·96	88·59
89·89	88·58
3·86	3·94
36·53	31·66
87·93	88·10
92·86	92·58
97·34	97·97

935.	1936.
0,267	5,171,211
0,326	744,648
6·915	6·94
5·84	15·66
2·39	11·63
9·83	89·36
9·51	89·07
9·57	89·27
3·93	3·96
8·33	35·54
7·8	87·90
2·98	92·52
7·36	97·18
4·43	95·01
4·79	14·52
7·78	99·17

Once again the average crushing rate increased, the values for the last four seasons being :—

AVERAGE CRUSHING RATES (TONS CANE PER HOUR).

1933.	1934.	1935.	1936.
44·73	47·82	53·10	57·08

In spite of the increased crushing rates, the milling work showed a slight improvement, the "lost cane juice per 100 fibre" being 1·34 units lower than in the previous year, whilst the pol extraction was 0·58 per cent. higher, although the dilution per cent. first expressed juice was 3·13 per cent. lower. The lower fibre per cent. cane would, of course, reflect favourably on the extraction figure, but the improvement in the milling results is quite definite, as is indicated by the lost cane juice per 100 fibre and also by the better final bagasse figures, the pol in final bagasse being lower and the dry substance being higher than in the previous year. The percentage of time lost was reduced from 3·84 in 1935 to 3·52 in 1936—an improvement of about 9 per cent. on the actual lost time.

The quantity of final molasses produced per ton of cane was substantially the same as that of the previous year, but the brix was slightly higher and the apparent purity 2·79 per cent. lower. Although a large portion of this reduction in purity may be attributed to the higher reducing sugar content of the molasses of the 1936 season, nevertheless there appears to have been an improvement in the average exhaustion for all districts.

A considerable reduction in the quantity and pol of mud was noted, resulting in a considerable improvement in the mud loss figure in the pol balance. This, no doubt, was due in a measure to the increased use of rotary vacuum filters, although the dry weather during the crushing would materially assist in reducing this loss.

The pol in sugar was again slightly lower, the reducing sugars slightly higher, but the ash remained the same; hence the average net titre of the sugar was slightly lower than in the previous year.

The coefficient of work, 99·17, is the highest average value yet recorded, each district having shown a decided improvement over the figures of the previous year, but the boiling-house efficiency showed a slight drop.

Per ton of cane, less wood and coal but nearly twice as much molasses were used as fuel, resulting in a higher percentage of excess fuel. However, due to the lower fibre in cane, the fuel value of the bagasse per cent. cane was lower, and the total fuel was decreased slightly.

Crushing for the 1936 season was commenced on 3rd June, 1936, and continued till 22nd January, 1937. The first mills to start were Victoria and Macknade, and the last to finish was Mulgrave. The maximum harvesting period was 234 crop days at Mulgrave and the minimum 24 crop days at Eagleby.

The aggregate number of crop days, 4,809, was the second greatest since 1931, the greatest being in 1933, when the previous record tonnage was handled. This will be seen from the following figures :—

	1931.	1932.	1933.	1934.	1935.	1936.
Crop days	4,377	3,276	5,130	4,382	4,296	4,809

Division of Mill Technology—continued.

FIGURES FOR 1936 SEASON.

	Northern.	Central.	Southern.	Totals and Averages.
Tons cane crushed	2,410,638*	1,966,183*	794,390*	5,171,211*
Tons sugar made (94 n.t.)	333,613*	301,893*	109,142*	744,648*
Net titre	97·24	97·19	96·77	97·13
Tons of cane per ton 94 n.t. sugar	7·23*	6·51*	7·28*	6·94*
C.C.S. in cane	13·78	15·39	14·13	14·52
Coefficient of work	100·73	99·19	97·23	99·17
Crushing rate	75·08	54·82	41·35	57·08
Lost time, per cent.	1·93	4·70	3·94	3·52
Fibre, per cent. cane	9·92	11·84	14·32	11·63
Pol, per cent. cane	15·01	16·43	15·31	15·66
First expressed juice—				
Brix	20·06	21·73	21·37	21·02
Purity	87·92	90·91	88·83	89·36
Clarified juice—				
Brix	16·45	16·73	15·69	16·41
Purity	88·59	90·25	87·57	89·07
Syrup—				
Brix	68·03	68·16	66·30	67·73
Purity	88·58	90·54	87·97	89·27
Last expressed juice—				
Purity	78·57	80·62	77·06	79·11
Clarified juice per 100 cane	97·48	103·19	105·26	101·38
Dilution, per cent. first expressed juice	21·95	29·89	36·20	28·09
Final bagasse—				
Pol	3·30	3·11	2·57	3·07
Dry substance	49·28	49·44	50·07	49·51
Pol extraction	95·16	95·09	94·86	95·01
Lost cane juice per cent. fibre	46·46	38·98	33·46	40·44
Final molasses—				
Gallons per ton cane	3·94	3·71	4·36	3·96
Brix	87·10	87·03	86·26	86·87
Apparent purity	31·66	37·22	40·07	35·54
Reducing sugars	19·87	13·34	11·62	15·90
Final mud—				
Tons per 100 tons cane	2·81	2·53	3·42	2·82
Pol	3·25	2·53	1·84	2·63
Sugar—				
Pol	98·62	98·74	98·60	98·67
Reducing sugars	·38	·25	·23	·29
Ash	·20	·26	·32	·25
Moisture	·33	·27	·28	·29
Dilution indicator	31·43	27·27	25·00	27·88
Pol balance—				
Sugar (recovery)	88·10	88·62	85·98	87·90
Bagasse	4·84	4·91	5·14	4·99
Molasses	4·71	5·30	6·39	5·04
Mud	·61	·39	·41	·47
Undetermined	1·74	·78	2·08	1·60
Boiling house efficiency	97·97	97·08	95·41	97·18
Fuel—				
B.T.U.'s 1,000s. per ton cane—				
Wood	20·68	157·33	230·57	121·28
Coal	2·44	24·40	..	11·07
Molasses	219·24	44·13	6·71	102·08
Bagasse	1,992·29	2,233·05	2,817·92	2,318·06
Total	2,234·65	2,458·91	3,055·20	2,552·49
Crop days	1,782*	1,912*	1,115*	4,809*

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

Price: 1s. 3d.

Division of Mill Technology—continued.

Cane Milled and Sugar Yields, Season 1936.

Mill.	Tons Cane Crushed.	Tons 94 n.t. Sugar made.	Tons Cane per Ton 94 n.t. Sugar.	
			1936.	1935.
Mossman	152,198	21,254	7·161	6·788
Hambledon	291,794	38,508	7·577	6·998
Mulgrave	353,538	46,733	7·565	7·030
Babinda	249,213	34,257	7·275	6·881
Goondi	182,223	25,232	7·222	6·704
South Johnstone	245,506	34,307	7·156	6·904
Mourilyan	167,877	24,746	6·784	6·807
Tully	263,311	37,431	7·035	6·907
Victoria	273,711	38,719	7·069	6·853
Macknade	231,267	32,426	7·132	6·782
Total for Northern District ..	2,410,638	333,613	7·226	6·877
Invicta	86,841	13,634	6·369	6·446
Pioneer	167,653	26,759	6·265	6·359
Kalamia	221,323	34,093	6·492	6·325
Inkerman	211,714	32,890	6·437	6·340
Proserpine	151,750	23,030	6·589	6·463
Cattle Creek	91,454	13,532	6·758	6·609
Racecourse	197,325	30,154	6·544	6·789
Farleigh	158,990	23,673	6·716	6·649
North Eton	94,533	14,080	6·714	7·149
Marian	193,463	29,862	6·479	6·449
Pleystowe	188,450	28,786	6·547	6·589
Plane Creek	202,687	31,400	6·455	6·834
Total for Central District ..	1,966,183	301,893	6·513	6·542
Qunaba	69,163	9,310	7·429	8·028
Millaquin	130,565	17,390	7·508	7·934
Bingera	146,627	20,641	7·104	7·629
Fairymead	136,287	18,190	7·492	7·634
Gin Gin	30,281	4,133	7·327	8·845
Isis	145,313	20,154	7·210	7·577
Maryborough	29,644	4,266	6·949	7·558
Mount Bauple	27,717	3,852	7·195	7·840
Moreton	68,303	9,924	6·883	7·202
Rocky Point	9,626	1,195	8·055	8·785
Eagleby	864	87	9·931	8·824
Total for Southern District ..	794,390	109,142	7·278	7·740

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