

# NOTES ON THE DEVELOPMENT OF THE SUGAR INDUSTRIES OF QUEENSLAND AND NATAL IN RECENT YEARS

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This paper is not so much an attempt to compare results of sugar production in Queensland and Natal, as an effort to trace broadly progress in each of the two sugar industries over the past two decades. Direct comparisons are hardly practicable, because of the extremely diverse conditions prevailing in the two industries.

Thus in South Africa the sugar industry occupies an area of about 800,000 acres, of which about one-half is under sugarcane, and about one-quarter is harvested each season. The average age of the cane at time of harvesting is therefore close on two years.

This area extends almost continuously along the coast of Natal from 80 miles south of the principal city and seaport of Durban to about 160 miles to the north. These cane-growing lands extend inland from the coast, or within a mile or two of it, for a distance ranging from 2 to 27 miles, according to the topography and general soil and climatic conditions and water supply of the hinterland. There are a few small areas isolated from the main coastal belt, such as those in the Mid-Illovo/Eston, Entumeni, and Pongola districts where sugarcane is being developed.

This stretch of coast extends from 28° S. to 31° S., which seems rather a high latitude for a cold-sensitive crop like sugarcane; but the winter season temperatures are considerably moderated by the warm Mozambique current that flows southward along the Natal coast, with many favourable consequences to this country.

Thus the mean annual costal temperatures from south to north range from 68° to 71°F., and frosts capable of causing severe injury to the cane are very rare.

The principal climatic disadvantage is the somewhat low average rainfall for sugarcane, which is 40 inches for 44 coastal recording stations, ranging from under 33 inches at certain points near Mount Edgecombe in the central area, to over 50 inches at points in Zululand, the northern sector of the Natal coast. Conditions are seldom economically favourable for irrigation, and the crop usually depends on rainfall and generally requires two years' growth to yield a satisfactory crop.

The soils are of seven or eight main types, greatly varying among themselves, but all are capable of producing satisfactory crops of sugarcane, given sufficient rainfall and cultivation.

Rail and road communications serving the industry are generally adequate; local coastal sea traffic does

not exist because of the lack of suitable local harbours other than Durban.

Most of the unskilled field and factory labour consists of African natives, who receive wages of about £3 per month, with free food rations to the value of about £1 10s. 0d. per month.

The Queensland sugar industry begins about 65 miles north of Brisbane, and extends north to Mossman, about 1,100 miles from Brisbane.

It is by no means continuous, however. Thus, between Bundaberg and Sarina there is a distance of 250 miles without any sugar production, and further north there are other gaps of about 170 and 100 miles in extent respectively, until one arrives at Ingham, 900 miles from Brisbane, where the northern area begins and continues, with only relatively short gaps, to Mossman.

The areas where sugarcane is absent are generally lacking in sufficient rainfall and in rivers suitable for irrigation, or further north where the spurs of the Great Dividing Range come down to the sea, and elsewhere that the topography is unsuited for sugarcane.

The Great Dividing Range begins at Cape York, the northernmost point of Queensland, and extends southward approximately parallel to the coast for about 1,100 miles. In the northern portion the range is close to the coast and is of moderate height, a few peaks being over 5,000 feet, while further south it deviates inland and the hills become lower, before it ascends again in New South Wales.

The coastal plains east of the range are generally well watered and are largely suitable for sugarcane growing, especially in the northern and central latitudes of Queensland.

Further south the coastal plain widens out to include what are known as the Darling Downs, west of Brisbane, which are found very suitable for wheat and cattle farming. On the western side of the Range the rainfall is much lower, being only about 10 inches per year; this part of Queensland is mainly utilized for sheep farming.

Sugarcane is grown almost exclusively on level lands of the coastal plain, and not on hillsides such as are frequently utilized in Natal.

The actual area under sugarcane in Queensland is 380,000 acres, most of which is harvested every year, the plant cane at 15 to 18 months and ratoons at 12 to 14 months. The annual production of sugar is now between 900,000 and 1,000,000 tons annually.

It is all grown in Queensland except for a small output of 45,000 to 50,000 tons of sugar per annum for three factories in the northern part of New South Wales, at a latitude of about 29° S.

The range of latitude over which sugar is grown in Queensland is from 26° to 16° S.

The annual rainfall in the principal sugar-growing areas varies greatly, but is in most cases greater than in any part of the Natal sugar industry. It ranges at the principal centres from 41.54 inches at Ayr and 43.47 inches at Bundaberg, to 166 inches at Babinda and 180 inches at Tully. Generally speaking, it is considered necessary to irrigate where the rainfall is no more than 45 to 50 inches annually, and Ayr and Bundaberg are both centres of large irrigation areas.

The average rainfall for 22 sugar districts is 74 inches, but in 1950, when the rainfall was exceptionally heavy, the average rainfall at these recording stations was as much as 121 inches. Tully recorded 312.22 inches for the year, Innisfail 217 inches and Babinda 214 inches. These excessive quantities, much of which fell during the latter part of the harvesting season, dislocated the whole system of cutting and transporting of cane, and made the cultivation of the 1951 crop impossible for some time.

Frosts are seldom experienced on the Queensland coast, except in some of the southern areas. The mean minimum winter temperatures, as recorded at the three principal sugar experiment stations, range from 55° in the north to 50° in the central area and 45° in the south; while the mean maximum summer temperatures range from 92° in the north and 87° in the centre to 85° in the south. As in Natal, December to March inclusive are the warmer months, and June, July and August the coolest.

Soils naturally vary over the very extensive areas occupied by the sugarcane crop but the three principal groups are forest, volcanic, and alluvial soils, mainly of medium or loamy texture.

The principal fertilizer elements required are nitrogen and potassium, phosphorus being frequently of secondary importance.

Through communication along the coast is provided by the Queensland Government Railways, extending as far north as Cairns, and by local steamship services.

Queensland is very fortunate in having many good harbours along the coast. The small coastal towns serving the sugar industry have shown much enterprise in developing their harbour facilities, especially the town of Mackay which, in recent years, has constructed a suitable harbour on an open beach.

In view of the long distances already mentioned with little or no settlement, there has been com-

paratively little through road development, but the coastal towns are each well supplied with local road systems, and motor transport is used considerably for cane cartage, except in areas of very high rainfall, where rail transport is more reliable in wet weather.

There are also excellent air travel services for both local and through travellers, which have done much in recent years to relieve the isolation of the more distant settlements.

There is likely to be considerable further agricultural development in Queensland in the near future. A Bureau of Investigation was appointed by the Government a few years ago and has recently reported favourably on the possible development of coastal lands north of Mossman and Daintree, the present northern limits of settlement, and also further development inland of some of the coastal rivers, such as the Burdekin (already extensively exploited for cane production in its lower stretches), Tully, and Herbert Rivers.

The labour employed in the Queensland sugar industry is, with one or two negligible exceptions, white European labour, which is highly organised.

The present rate of pay for a cane-cutter is 10s. per ton of cane, and the usual daily task is 6 tons, so that the average earnings are £15 for a five-day week. Although sugarcane agriculture as a whole is highly mechanised in Queensland, the inherent difficulties of the mechanical harvesting of sugarcane are so great in Queensland, as elsewhere, that only about 10 per cent. of the crop is harvested in this way, notwithstanding the very great amount of work and expenditure that has been put into this problem.

The great bulk of the cane in Queensland is grown by small holders with an average area under cane of only 62 acres.

It may be of interest to record the changes in the leading cane varieties in cultivation in Queensland and Natal respectively in recent years. Needless to say, the selection of varieties in the two countries has always been very different, in view of their very diverse environment.

It is remarkable how long Badila has topped the poll, and has only recently been surpassed by Trojan. Badila is a natural variety originating from New Guinea, and, like many natural varieties, has a capacity for long life, greater than that of most artificially-bred modern hybrids up to the present.

Trojan is only one of many promising varieties produced at the cane-breeding station at Macknade factory of the Colonial Sugar Refining Co. Ltd.

The Q. varieties, of which Q.50 is at present showing particular promise, are a series produced at the cane-breeding station at Meringa of the Bureau of Experiment Stations. The new varieties undoubtedly account largely for the increased yield of cane per

acre in recent years. While for many years the industry was largely dependent on originally imported varieties, now 60 per cent. of the crop is produced by varieties bred in Queensland. As in Africa, there does not appear to be any sugarcane indigenous to the Australian continent.

#### Queensland Cane Varieties in terms of Percentage of Total Crop.

Variety.	1934.	1935.	1936.	1937.	1939.	1940.	1941.	1942.	1943.	1944.	1945.	1946.	1948.	1949.
Badila ... ..	36.8	35.6	38.0	41.0	33.0	32.6	34.8	37.2	33.2	28.0	26.9	26.6	18.7	16.9
M.1900 ... ..	9.8	11.4	12.8	10.6	12.0	10.0	8.1	7.8	7.4	8.6	5.2	4.4	1.5	1.3
HQ.426 ... ..	7.6	6.5	6.9	7.3	6.2	6.3	6.5	7.1	7.2	7.5	5.9	5.5	2.3	1.8
EK.28 ... ..	6.8	4.7	5.5	5.9	6.6	6.4	6.1	6.3	5.7	6.7	6.4	6.5	3.5	2.4
POJ.2878 ... ..	1.3	2.4	3.4	4.2	12.2	13.7	15.2	14.0	17.1	14.6	12.9	8.2	5.7	4.9
Co.290 ... ..	—	0.1	0.8	2.1	6.5	9.2	8.4	6.7	8.8	10.1	9.4	6.2	2.9	1.9
Trojan ... ..	—	—	—	—	—	—	—	0.02	0.5	3.7	8.2	9.6	16.4	18.0
CP.29/116 ... ..	—	—	—	—	—	—	—	—	—	—	1.1	2.7	12.8	12.3
Q.28 ... ..	—	—	—	—	—	—	—	—	0.1	2.5	6.4	11.8	14.1	10.4
Q.50 ... ..	—	—	—	—	—	—	—	—	—	—	—	—	1.4	9.2

Note.—The relative data for 1938 and 1947 are not at present to hand.

#### Proportions of Various Cane Varieties in Recent Natal Sugarcane Crops.

Variety.	1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.	1946.	1947.	1948.	1949.	1950.
Co.281... ..	21.0	28.3	37.5	42.4	52.4	64.4	66.5	67.8	63.2	58.7	56.9	47.3	35.99
Co.290... ..	35.0	30.0	28.2	26.5	19.1	11.2	7.2	4.4	2.6	1.5	1.0	0.7	0.53
Co.301... ..	0.3	2.4	3.3	5.9	10.6	14.1	18.1	21.1	28.2	33.1	36.1	41.9	37.93
Co.331... ..	—	—	—	—	—	—	0.1	0.6	0.6	1.7	2.5	4.2	7.87
Uba ... ..	32.2	30.2	23.2	16.6	11.1	6.5	4.2	2.8	1.9	1.5	0.7	0.4	0.23
POJ.2725 ... ..	11.3	9.1	7.8	8.6	6.8	3.8	3.8	3.3	3.4	3.5	2.7	2.9	1.99
N:Co.310 ... ..	—	—	—	—	—	—	—	—	—	—	0.1	2.6	15.07

Until 1935, Uba had been practically the only cane in cultivation for forty years or more, but Co.290 and some of the P.O.J. varieties were successfully established at about that time and, together with Co.281, soon brought about a material and progressive increase in yield of cane and of sugar per acre. At one time Co.281 produced more than two-thirds of the crop, but has declined in recent years. Co.301 is a more recent and still expanding variety that is serving the industry very well; but the most promising varieties at present in cultivation are Co.331, and N:Co.310, a seedling raised originally in Natal from seed-fuzz imported from Coimbatore in India. Now that the problem of cane-breeding in Natal has been solved, it is probable that a series of new and improved varieties will be developed from locally flowering canes.

The general conditions of sugarcane production in Queensland and Natal having been briefly outlined, there now follow tables summarising production results in field and factory in each country over the two successive periods 1930-39 and 1940-49.

It should be kept in mind (1) that weights in Queensland are expressed in long tons of 2,240 lbs., and in tons of 2,000 lbs. in Natal; and (2) that cane in Queensland is only slightly more than a twelve-months crop when harvested and has usually had an adequate supply of moisture; while in Natal it is a two-year crop and has been subject to very possible water shortages, especially in recent years.

There are 32 sugar factories in Queensland, ranging in the 1949 season between 2,000 and 49,000 tons of sugar per factory. In Natal for the same

year there were 18 factories, producing from 9,900 to 78,118 tons of sugar each.

It will be seen from the following tables that there was in Queensland a marked rise in 1931, both in tons of cane per acre and total output of sugar, over the immediately preceding years. This was followed in 1936 by a further increase in production and of tonnage per acre, associated with increased mill extraction. This improvement continued until 1940, when the effects of war-time conditions began to be evident, and increased until 1943, when the output of sugar fell below 500,000 tons for the first time for many years, and the yield of cane per acre fell below 15 tons.

This was, of course, due to the acute shortage of labour and of fertilizer and materials generally. In this respect Australia had the great disadvantage of its distance from Britain, from which most of the requirements for industry were imported, and its dangerous proximity to the war in the Far East and the high risk of invasion at one stage of the hostilities.

It is remarkable, however, that the high quality of the cane supplied to the mills was well maintained, and the extraction also kept up, with only a moderate fall in boiling-house recovery.

After 1943 the recovery was rapid, although there was still a serious shortage of labour and of fertilizer and machinery; and it was not until 1948 that the industry attained its present very high level of production and performance. Many factors no doubt contributed to this, but there can be no doubt that the introduction and spread of the new varieties,

Trojan, Q.28, Q.50, and the American variety C.P. 29/116, greatly contributed to the remarkable increase in tons of cane per acre.

The increased mechanisation of agriculture must also have had a very beneficial effect in making possible more thorough preparation of the soil before planting, more rapid and extensive planting of cane just at the right time for doing so, more thorough cultivation of cane; also the more effectual control of the cane diseases and insect pests that severely attack the cane in many parts of Queensland.

So that even if the great advance that began about 1936 was not maintained throughout the following decade because of the misfortunes of war, it paved the way for the still greater advance that has now begun and promises to continue still further.

A study of the corresponding South African figures shows that a great and progressive improvement in yield of cane and of sucrose per acre began in this country in 1936, coinciding with a sudden reduction of the proportion of Uba in the crop from nearly 90 per cent. to 63 per cent. and its partial substitution

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by Co.290 and P.O.J.2725 and P.O.J.2878. These were among the first new varieties to be introduced, and though they did not serve the industry long they were certainly of great benefit for some years, until eventually superseded by Co.281 and Co.301.

The war did not cause any acute shortage of native field labour in Natal, and although the shortage of supplies of fertilizers and field and factory spares caused much difficulty and loss in this country also, the advance in production and productivity continued until 1944. There were then three lean years, when the average rainfall from the 44 recording stations in the industry was only 33.49 inches per annum over the whole cycle, and the maldistribution of the rainfall was even more disastrous than its deficiency. The industry has hardly recovered yet from this blow and from further deficient rainfalls in 1948 and 1950; but there are many indications that when the normal seasons return, the production of sugar and the yield of cane and sugar per acre will far surpass anything gained in the past.

**Sugar Production Figures for Queensland and Natal from 1930 to 1939.**

**A. QUEENSLAND (Tons of 2,240 lbs.).**

Year	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1930-39.
Tons cane milled ... ..	3,521,705	4,035,129	3,546,443	4,667,028	4,269,991	4,220,267	5,171,211	5,132,934	5,342,085	6,038,821	45,945,614
Short tons ... ..	—	—	—	—	—	—	—	—	—	—	51,459,088
Tons sugar made ... ..	515,270	581,276	514,085	638,734	612,570	610,326	744,261	763,325	778,136	891,422	6,649,405
Short tons... ..	—	—	—	—	—	—	—	—	—	—	7,447,334
Sucrose per cent. Cane ... ..	15.97	15.94	15.90	14.85	15.57	15.84	15.66	16.15	15.84	15.88	15.76
Tons Cane per acre... ..	15.89	17.29	17.30	20.46	19.56	18.47	21.10	20.56	21.28	23.14	19.50
Short tons... ..	—	—	—	—	—	—	—	—	—	—	21.845
Tons Sugar per acre . ... ..	2.33	2.49	2.51	2.80	2.80	2.67	3.04	3.06	3.10	3.41	2.82
Short tons... ..	—	—	—	—	—	—	—	—	—	—	3.16
Acreage harvested ... ..	222,044	233,304	205,046	228,154	218,426	228,515	245,152	249,683	251,064	261,047	2,342,435
Fibre per cent. Cane ... ..	12.59	12.28	11.51	12.00	12.23	12.39	11.63	11.17	11.63	11.56	11.90
Purity first expressed Juice ... ..	90.90	89.59	89.64	89.40	89.95	89.83	89.36	89.61	90.32	89.85	89.84
Extraction . ... ..	94.49	94.10	94.58	94.49	94.46	94.43	95.01	95.22	95.12	95.34	94.72
Boiling House Recovery . ... ..	91.89	91.79	91.86	91.88	92.49	92.98	92.52	92.20	92.01	90.94	92.05
Overall Recovery ... ..	86.83	86.37	86.88	86.76	87.37	87.80	87.90	87.79	87.52	86.70	87.19
Ratio Cane to Sugar ... ..	6.84	6.92	6.90	7.31	6.97	6.91	6.94	6.73	6.87	6.77	6.91

**B. NATAL (Tons of 2,000 lbs.).**

Year	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1930-39.
Tons Cane milled ... ..	3,801,886	3,123,792	3,490,000	3,673,375	3,878,079	3,867,536	4,180,973	4,489,022	4,658,962	5,346,006	53,092,270
Tons sugar made ... ..	393,009	325,899	358,905	391,173	358,738	417,829	446,334	507,219	522,732	595,556	5,728,800
Sucrose per cent. Cane ... ..	13.66	13.84	13.48	13.88	11.88	13.65	13.30	13.92	13.64	13.41	13.19
Tons Cane per care... ..	22.39	18.90	19.29	20.24	20.84	20.10	21.27	23.75	27.37	30.22	27.55
Tons Sugar per acre . ... ..	2.31	1.97	1.98	2.16	1.93	2.17	2.27	2.68	3.07	3.37	2.39
Acreage harvested ... ..	169,803	165,280	180,923	181,490	185,903	192,415	196,567	189,011	170,221	176,903	1,810,910
Fibre per cent. Cane ... ..	15.82	15.75	15.65	15.78	15.24	15.92	15.01	15.14	14.51	14.80	15.56
Purity first expressed Juice ... ..	88.66	87.92	87.89	87.46	86.03	89.35	88.18	88.15	88.37	88.45	87.44
Java Ratio ... ..	76.36	76.92	76.99	77.27	78.66	76.24	77.44	77.43	78.87	78.70	77.94
Extraction ... ..	89.78	89.40	89.86	90.28	91.07	90.64	91.08	91.53	91.90	92.24	91.91
Reduced extraction . ... ..	92.23	91.90	92.19	92.59	92.90	92.94	92.78	93.22	93.18	93.62	93.72
Boiling House Recovery . ... ..	83.80	83.21	84.27	84.88	85.20	86.52	87.44	87.85	88.48	88.88	87.98
Overall Recovery ... ..	74.77	74.39	75.73	76.63	77.59	78.40	79.64	80.41	81.31	81.98	80.86
Ratio Cane to Sugar ... ..	9.59	9.53	9.61	9.28	10.67	9.19	9.29	8.80	8.89	8.95	9.26
Rainfall ... ..	37.30	29.33	48.20	31.12	44.60	46.12	50.10	39.48	40.38	47.63	43.37

## Sugar Production Figures for Queensland and Natal in Recent Years (1940 to 1949).

### A. QUEENSLAND (Tons of 2,240 lbs.).

Year	1940.	1941.	1942.	1943.	1944.	1945.	1946.	1947.	1948.	1949.	1940-49.
Tons cane milled ... ..	5,180,756	4,793,589	4,350,642	3,397,424	4,398,190	4,551,982	3,714,475	4,150,987	6,430,556	6,518,642	47,490,238
<i>Short tons...</i> ... ..	—	—	—	—	—	—	—	—	—	—	53,189,067
Tons sugar made ... ..	759,446	697,345	605,680	486,747	643,540	644,661	512,086	571,658	910,049	897,267	6,728,479
<i>Short tons...</i> ... ..	—	—	—	—	—	—	—	—	—	—	7,535,896
Sucrose per cent. Cane ... ..	16.04	15.74	15.44	15.71	16.08	15.41	14.91	15.30	15.48	15.01	(av.) 15.51
Tons Cane per acre... ..	19.50	19.41	18.26	14.84	19.79	18.98	16.26	18.81	24.88	23.67	19.44
<i>Short tons...</i> ... ..	—	—	—	—	—	—	—	—	—	—	21.77
Tons Sugar per acre . ... ..	2.86	2.82	2.54	2.12	2.90	2.69	2.24	2.59	3.52	3.26	2.75
<i>Short tons...</i> ... ..	—	—	—	—	—	—	—	—	—	—	3.08
Acreage harvested ... ..	265,738	246,939	238,213	228,895	222,215	239,826	228,395	220,649	258,585	275,313	2,424,768
Fibre per cent. Cane ... ..	11.58	11.29	11.76	12.08	12.25	12.66	11.83	12.72	12.78	12.74	12.17
Purity first expressed Juice ... ..	89.65	89.47	89.76	89.82	90.24	89.53	84.71	88.81	88.35	87.84	88.82
Java Ratio ... ..	83.41	83.87	83.28	83.01	82.93	82.35	83.53	82.23	82.08	82.13	82.88
Extraction . ... ..	95.46	95.76	95.88	95.78	95.48	95.51	95.31	95.86	95.74	95.48	95.62
Reduced extraction . ... ..	95.05	95.24	95.58	95.61	95.38	95.56	94.93	95.90	95.78	95.43	95.45
Boiling House Recovery . ... ..	91.49	91.54	89.50	89.92	90.19	88.67	86.67	88.00	89.31	89.36	89.46
Overall Recovery ... ..	87.34	87.66	85.81	86.12	86.11	84.69	82.57	84.37	85.51	85.29	85.55
Ratio Cane to Sugar ... ..	7.03	7.17	7.45	7.30	7.14	7.58	8.02	7.65	7.46	7.27	7.41

### B. NATAL (Tons of 2,000 lbs.).

Year	1940.	1941.	1942.	1943.	1944.	1945.	1946.	1947.	1948.	1949.	1940-49.
Tons cane milled ... ..	5,309,227	3,921,436	4,704,430	5,278,914	5,351,945	4,607,055	3,990,017	4,543,255	5,216,144	4,929,580	47,852,003
Tons sugar made ... ..	572,880	452,119	524,975	585,392	614,158	553,074	474,769	512,005	607,845	561,122	5,458,339
Sucrose per cent. Cane ... ..	13.19	14.00	13.40	13.14	13.67	14.28	14.21	13.32	13.89	13.52	13.66
Tons Cane per acre... ..	27.55	22.36	25.49	30.87	29.08	25.70	21.99	24.47	26.80	24.60	25.89
Tons Sugar per acre . ... ..	2.97	2.58	2.84	3.42	3.34	3.08	2.62	2.76	2.90	2.80	2.93
Average harvested ... ..	192,712	175,377	184,566	171,060	184,032	179,263	181,435	185,667	194,600	200,140	1,848,852
Fibre per cent. Cane ... ..	15.56	15.66	15.24	15.26	15.83	15.99	16.21	15.80	15.90	16.19	15.71
Purity first expressed Juice ... ..	87.44	87.94	88.27	88.70	88.35	88.36	88.22	88.48	88.12	88.64	88.25
Java Ratio ... ..	77.94	77.74	77.67	77.78	77.38	77.36	77.03	76.99	76.98	76.97	77.33
Extraction . ... ..	91.91	92.37	92.69	92.97	93.13	93.28	93.07	93.44	93.32	92.94	92.91
Reduced extraction . ... ..	93.72	94.13	94.19	94.42	94.78	94.96	94.88	95.01	94.95	94.78	94.58
Boiling House Recovery . ... ..	87.98	88.40	88.98	89.84	89.27	89.29	89.12	89.61	89.14	89.68	89.13
Overall Recovery ... ..	80.86	81.66	82.48	83.52	83.14	83.30	82.94	83.73	83.19	83.35	82.82
Ratio Cane to Sugar ... ..	9.72	8.67	8.96	9.02	8.71	8.33	8.36	8.85	8.58	8.79	8.80
Rainfall ... ..	43.48	26.18	49.40	53.31	36.45	31.99	32.02	44.83	35.25	43.35	36.42

**Mr. du Toit** asked if Dr. Dodds could say why the sucrose content of varieties was always higher in Queensland than, say, in Natal.

**Dr. Dodds** replied that the answer was not obvious. The varieties grown in Queensland were high sucrose varieties; Co.290 did remarkably well there, as did P.O.J.2878 and several other varieties. He had seen canes growing in one or two places which appeared to be rather thin compared with the general thick-growing Queensland canes and had been informed that they compared favourably in sucrose. Why the cane in Queensland was higher in sucrose content than in Natal he did not know.

**The President** said the American C.P.29/116 was rejected in Natal as being particularly low in sucrose. We expected it to be of the highest sucrose content but were not now interested in it.

**Mr. Lewis** asked how planters were paid, as the average for small holders was only 62 acres under cane.

**Dr. Dodds** said C.P.29/116 must be well up to Queensland standard because it was increasing rapidly in their plantings. He thought the average price paid to planters was about £3 per ton.

**Mr. Rault** wanted to know the length of the crushing season as compared with South African conditions, where during the six to seven months' operations the curve of sucrose content of cane started low, rose to a peak for only two to three months, and fell sharply at the end. He noted that the canes were cut after fifteen months' growth in Australia and he wondered whether, in view of the fact that here the rate of growth per month was much slower during the second year's growth, the industry would not produce more from the available land by the Australian practice, which would admittedly give a lower sucrose content of cane but a quicker return of total sucrose.

In connection with the maceration bath system between mills, this had been tried during two seasons, 1927 and 1928, at Mount Edgecombe. Although the efficiency of water penetration in the bagasse was high, due to long contact and high temperature, it was finally discarded on account of the swelling of the bagasse creating feeding difficulties, requiring rammers to force the bagasse, etc., and lowering the throughput of milling plant, which had to crush a very heavy tonnage of fibre per hour—a feature common to most South African factories.

**Mr. Grant** said that, speaking as an engineer, the rind fibre in Queensland was like tissue paper compared with Natal cane.

**Dr. Dodds** said that from a milling point of view cane with low fibre would be considered an excellent cane. Taking Natal's two-year crop into account, the

yield was not as great as Queensland where the cane was of approximately fifteen months' growth. He could not understand the high results, for there was nothing about the equipment of the factories which would lead one to expect a high recovery figure. Few had more than four sets of mills, one or two had five, and there was nothing to account for their high percentage of sugar, except that in two respects they differed radically from Natal methods of milling. One was maceration, when the cane was rammed forcibly between the rollers. It appeared very possible that the difference in method was responsible for their recovery and he would like to know what the engineers present thought about it.

**Mr. Camden Smith** said Queensland had the advantage of a very low fibre cane which was usually quite soft. They went in for the bath-maceration system whereby the discharge from the mill fell into a deep trough of hot water. As Dr. Dodds had said, the cane was forcibly fed which was the only way to get the mills to take it. The ramming apparatus was very heavily built, the shafts being about six inches in diameter. If the ramming apparatus broke down the mill was stopped. Only raw sugar was manufactured and the clarification was very simple,—the addition of a little lime to the required pH. Little use had so far been made of crystallizers, and in quite a number of factories there were no crystallising tanks. As Dr. Dodds had pointed out, it was not possible to make comparisons because of the extreme difference in conditions. In Australia, for example, they would never dream of planting cane on what would be regarded in Natal as even a slight rise, and if they did they would not get men to cut it. Every facility was provided to eliminate labour, and working methods were designed to economise in labour. Every advantage was taken of physical conditions; transport was simpler than in Natal and the extremely high-class varieties of cane developed in Queensland itself made the whole process of milling and manufacture free of the problems that had to be faced in Natal.

**Mr. Grant** said the cane was virtually cut up before it reached the crushing plant proper.

**Mr. Phipson** asked how the mills in Australia compared with mills in Natal.

**Mr. Camden Smith** replied that they had mills originally designed for 45 tons an hour and stepped up to 90 tons, as in this country. There were indications where factories had been extended in recent years and several were in process of enlargement, but not on the scale to which extensions had been carried out in this country. He thought not one factory in Australia made more than 50,000 tons of sugar in one season.

**Mr. Hill** asked what percentage of maceration was used in the bath and whether it was compound maceration.

**Dr. Dodds** said that about 35 per cent. of maceration was used in the bath. The compound system was used, which was drawn off in the last two mills and then went back.

**Mr. Hill** said that with four mills compound maceration would mean that the 35 per cent. all came back to second mill and apparently it was all absorbed at that early stage, otherwise there would

be a progressive accumulation of maceration juice in the baths. On an ordinary apron type carrier he thought it would be difficult to absorb all this maceration at this early stage in a train of mills.

**Mr. Lewis** said that when attempts were made to raise the temperature of maceration from the milling side there was always talk of impurities. He asked whether it would be possible to get up to about 200°.

**Mr. Camden Smith** said this would be difficult and only the initial purity of the Queensland cane made it possible.