Annual Synopsis of Chemical Laboratory Reports from Natal Sugar Factories, Season 1929/1930

By H. H. DODDS *and* O. W. KARLSON

Mr. DODDS read the above-mentioned paper, as follows:—

The number of factories reporting shows a slight increase to 16 from 14 last year. This is due to reports now being received from Factory No. 18, where chemical control has been instituted for the first time, and No. 3, where chemical control has been resumed after an interval of two years.

There is one factory, No. 19, having complete chemical control that has not contributed their returns, and one factory, No. 21, comes into the scheme for the first time.

There has been no change in the numbers allotted to the factories.

Our statistics now represent 91.0 per cent. of the total output of sugar, a further considerable increase on past years. The remaining 9 per cent. is supplied from 9 small factories, of which only one is known to have complete chemical control.

Year.	Number of Factories reporting.	Number of Factories in operation.	Per cent. of total Output represented by Factories reporting.
1925	11	25	60.4
1926	13	23	73.3
1927	14	21	81.0
1928	14	25	83.3
1929	16	25	91.0

Year.	Natal Output in tons of 2,000 lbs.	World's Output of Sugar in tons of 2,000 lbs. (Cane and Beet).	Natal percentage of total.
1924/25	161,250	26,529,864	0.61
1925/26	239,851	27,567,850	0.87
1926/27	242,662	26,576,891	0.91
1927/28	296,273	28,365,015	0.87
1928/29	296,000	29,744,565	1.00
1929/30	298,635	27,076,376	1.10

The total output of sugar for the season shows a further record for South Africa.

The weather for the year 1929 was in remarkable contrast to 1928; while the latter was one of the driest on record, 1929 showed a rainfall more or less above normal in nearly every district, some of the wettest periods occurring during the harvesting months, which are normally the driest season of the year.

Thus the rainfall for the four months June to September of 1929 inclusive totalled 16.42 inches, compared with a normal rainfall of 6.64 inches for the same period, and only 3.53 inches for 1928.

The total rainfall for the year was 43.83 inches, the average for 43 years being 39.81 inches. These statistics refer to Mount Edgecombe, which is, of course, fairly centrally situated in the sugar belt.

The unseasonably wet weather naturally had a profound effect on the crop, the harvest being much delayed and prolonged, and the sucrose content of the cane being very adversely affected.

The following table shows the yields of cane and of sugar for recent years.

Season	1924.	1925.	1926.	1927.	1928.	1929.
Acreage reaped	92,965	109,362	114,279	128,734	141,224	—
Cane harvested	1,729,344	2,638,000	2,335,406	2,482,000	2,878,149	2,818,000
Tons Cane per acre	18.66	24.12	20.44	19.28	20.38	—
Tons Sugar produced	161,250	239,851	242,662	247,273	296,000	298,635
Tons Cane per ton of Sugar	10.73	11.00	9.62	10.03	9.72	9.44
Tons Sugar per acre reaped	1.74	2.19	2.12	1.92	2.10	—
Tons Sugar per acre per annum	0.87	1.10	1.06	0.96	1.05	—
Rainfall in inches (at Mount Edgecombe)	29.93	43.80	25.42	42.46	27.56	43.83

The ratio of cane harvested to sugar manufactured is a good overall index of quality of cane, since it integrates sucrose content of cane, purity of juice, and fibre content of cane.

For 1929 it shows the usual high period for May and June, when much sugar is lost by milling immature cane, followed by satisfactory minima in July to October inclusive. The rise in November and December, however, is much more marked than usual, showing that the cane as a whole begun to grow again unusually early, due to the abnormal rains. The cane required to make a ton of sugar was higher in December than in June, and in January it was equal to the previous May, or over 11 tons, obviously an uneconomical figure.

In the corresponding report last year it was noted that 2,250 tons of sugar had been sacrificed by harvesting cane in May, and 1,584 tons by harvesting in June, instead of later in the season.

During the 1929/30 season there were 56,205 tons of cane crushed in May, yielding 5,026 tons of sugar at a ratio of 11.8. If this cane had been crushed during the months of July to October inclusive, when 1,566,720 tons of cane yielded 163,639 tons of sugar, or a ratio of 9.57, it would have produced 5,873 tons of sugar—a net loss of 847 tons of sugar through premature harvesting in May.

Similarly, if the 215,351 tons of cane reaped in June with a ratio of 10.77 had been spread over the four following months, it would presumably have produced 22,456 tons of usgar instead of 19,983 tons, a difference of 2,520 tons of sugar.

At the other end of the season we find that the 244,179 tons of cane harvested in December produced only 22,404 tons of sugar, while if crushed during the optimum period of July to October 25,515 tons of sugar would most probably have resulted. In a like manner it may be shown that the January crushing resulted in a loss of 864 tons of sugar.

Undoubtedly in many years there will be a certain proportion of drought-stricken cane that must be cut early to save the roots, but this cane is only a minority of the whole, and could be dealt with by only one factory for a district instead of starting-up every factory for this reason.

Another objection advanced last year towards any proposal for shortening the crushing season was that Native labour was usually hired on a six months' contract. But surely it should not be beyond the power of the industry to devise acceptable schemes for shorter contracts, if necessary.

With regard to the late harvesting of cane, however, last year was somewhat exceptional, due to the very early rains resulting in unusually early renewed growth of cane. An inspection of results over a period of years shows that on the whole there would be relatively little to be gained by getting all the milling done before the end of November, December cane often being surprisingly good in quality.

However, when there are very early rains every effort should be made to hasten completion of the crop.

As regards the beginning of the season, it will be found that the harvesting of cane before July almost invariably results in more or less loss of sugar due to immature cane.

This is, however, another possibility to be discussed in this connection.

All the results published hitherto are with Uba cane, which is the only variety now grown on a commercial scale. Although this cane has many great advantages for ordinary conditions in this country, it is a somewhat late maturing variety, and there are many varieties in the collection at the Experiment Station that will ripen very much earlier in the season. This then points out a way of maintaining the length of the crushing season efficiently by growing and harvesting suitable early maturing varieties in the earlier part of the season. Here again much depends on the weather, for although

there are several varieties that have completely ripened as early as March during the present very dry year, no variety may be expected to mature fully during warm showery weather.

Taking the past season as a whole, it is seen that the average sucrose content of the cane was 12.95 per cent., which is the lowest since 1925, when it was only 12.55 per cent. In other respects the quality of the cane has been good, the purity of juice being the highest yet recorded in this country, and the fibre content the lowest.

The extraction—that is the sucrose in juice per cent. of sucrose in cane—is lower than it has been for some years, owing to increased losses of sugar in the bagasse, due no doubt mainly to a lower average maceration per cent. cane. However, the fall in extraction is more than compensated for by the recovery on juice, the sucrose in sugar per cent. sucrose in juice being 84.39. which is considerably better than previous records, This is brought about by reduced losses both in filter press cake and in boiling houses losses, including loss in molasses.

The net result is an overall recovery of 75.13, being the sucrose in sugar per cent. of sucrose in cane, an improvement on any previous year, no doubt due to improved purity of juice as well as to better factory work.

To come to individual factory performance, No. 1 factory retains the lead for output of sugar, 32,753 tons (a South African record), and by virtue of the highest extraction and highest recovery on juice attains an overall recovery of over 80 for the first time of any South African factory.

Since they had the lowest purity of mixed juice of any factory and one of the highest average polarizations of sugars, the result is a tribute to the efficacy of the carbonatation process for Uba juices. The ratio of cane to sugar is also the lowest of any factory.

No. 5 factory has maintained and increased its high crushing rate to an average of 89.26 tons of cane per hour for the season, with an average rate of 97.36 tons per hour for the Spetember period.

No. 12 factory also has a creditable showing in this respect and very little time lost in mill stoppages. Both of these are double tandem factories.

No. 3 factory, in the central North Coast area, has the high sucrose content of cane of 14.19 in a year of low sucrose, with a purity of juice of 87.87, and a Java Ratio of over 80.

The area of cane harvested and yield of cane by districts for the 1928 season has now been published by the Census Department, and shows that the Umzinto and the Lower Tugela divisions have each increased slightly their proportion of cane harvested at the expense of the Inanda division and the Lower Umfolozi division. The Lower Tugela division has increased its lead in output of cane over all other divisions, though each district shows a smaller or greater increase in output.

These statistics, however, apply only to European planters. The total cane received at the factories represents an increase of 8.1 per cent. over the total, the balance of 233,249 tons of cane for the 1928 season representing presumably the cane harvested by Native and Indian growers.

The Lower Umfolozi division again has the highest average yield of cane per acre, nearly 23 tons, bu is now closely followed by its neighbour, Eshowe. The lowest yield, as usual, is claimed by Inanda, which is lower than the very dry Hlabisa district.

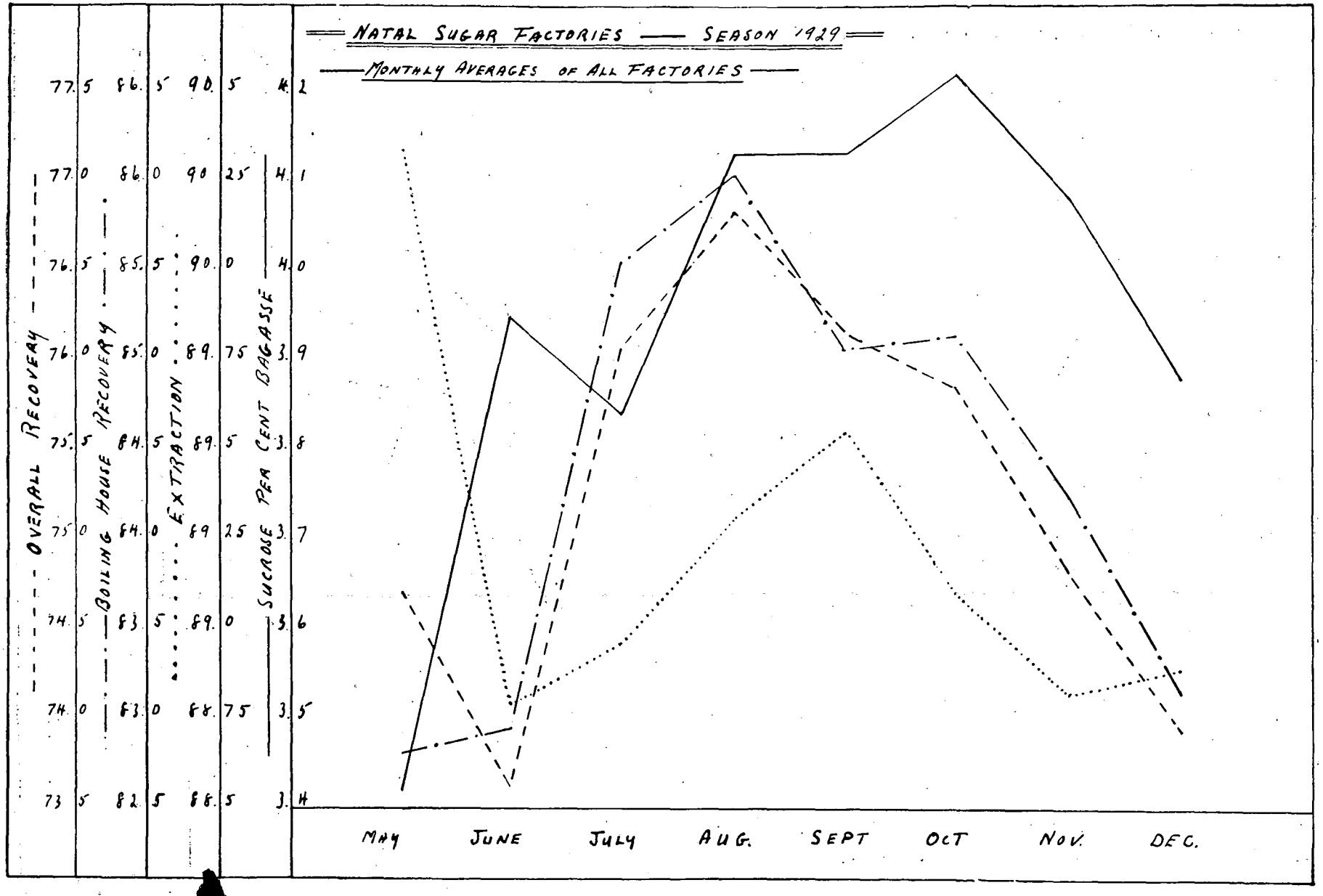
To conclude, the season of 1929/30 has continued the progress in yield and performance that has been evident in recent years, notwithstanding the depressing effect of the world market for sugar.

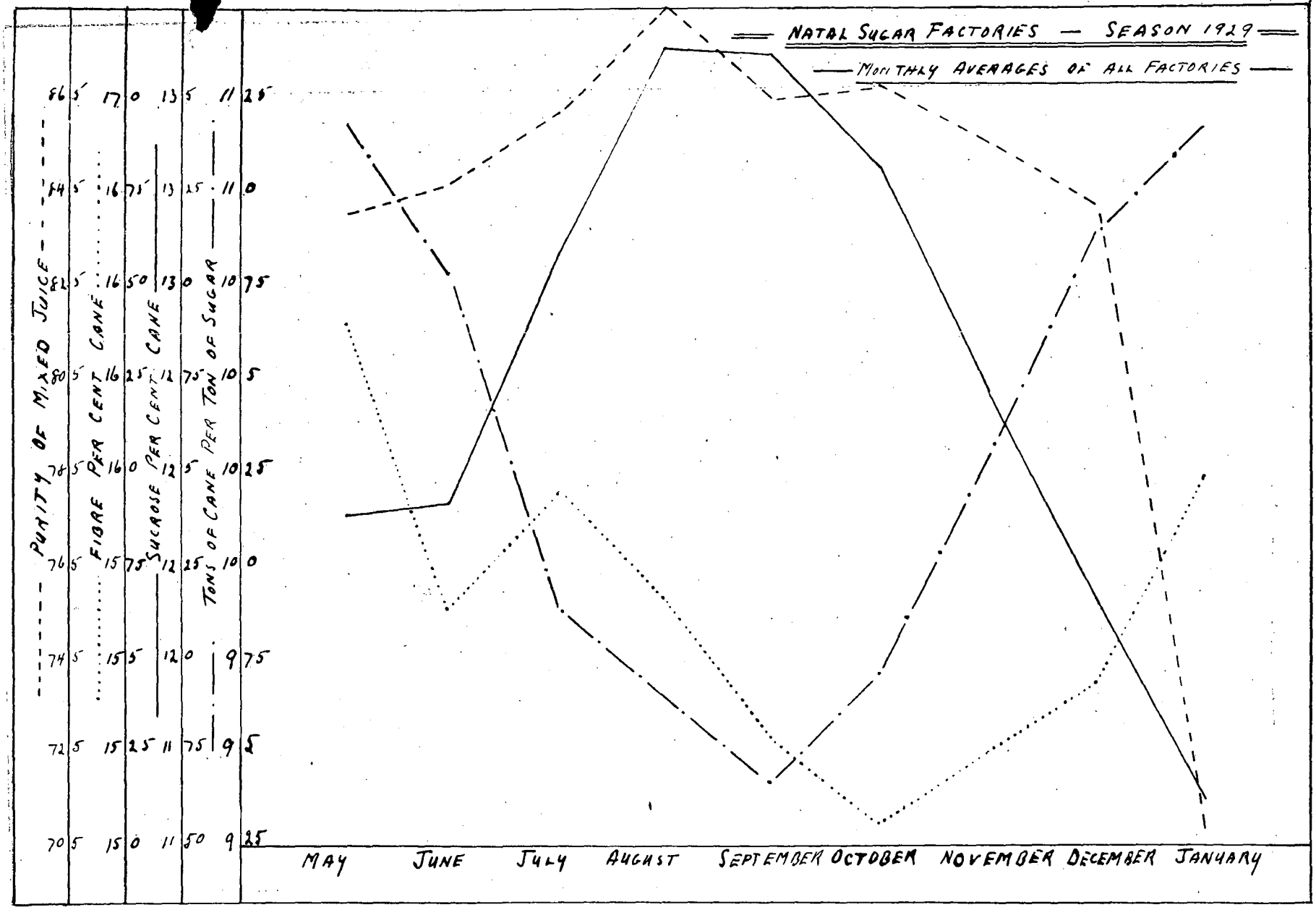
EXPERIMENT STATION,
SOUTH AFRICAN SUGAR ASSOCIATION,
MOUNT EDGECOMBE,

April, 1930. NATAL.

	NATAL, 1925.	NATAL, 1926.	NATAL, 1927.	NATAL, 1928.	NATAL, 1929.	JAVA, 1927.	JAVA, 1928.
Number of Factories Represented	**11**	**11**	**13**	**14**	**16**	**171**	**175**
CANE—							
Per cent. Sucrose	12.55	13.23	13.66	13.75	12.95	12.90	13.50
Per cent. Fibre	15.88	16.01	16.27	15.88	15.52	12.70	12.70
JUICES—							
Purity of Frist Crusher	87.24	87.11	88.30	87.80	88.81	—	—
Purity of Mixed Juice	84.47	84.65	85.47	84.90	86.04	83.30	84.30
Purity of last Mill Juice	78.20	76.12	80.20	78.50	80.72	—	—
Purity of Syrup	86.39	86.14	87.20	86.60	87.44	—	—
Drop in Purity Crusher to Mixed Juice	2.77	2.46	2.80	2.90	2.77	—	—
Drop in Purity Crusher to last Mill	9.04	10.99	8.10	9.30	8.09	—	—
Drop in Purity Crusher to Syrup	0.85	0.97	1.10	1.20	1.37	—	—
Increase in Purity Mixed Juice to Syrup	1.92	1.49	1.70	1.90	1.40	—	—
JAVA RATIO	75.77	75.73	77.78	76.78	77.01	—	—
NATAL RATIO	—	—	—	76.99	76.83	—	—
BAGASSE—							
Per cent. Sucrose	4.03	3.53	4.06	4.10	4.07	2.90	2.90
Per cent. Moisture	49.38	49.33	49.89	50.01	50.69	45.50	45.20
EXTRACTION—							
Maceration per cent. Cane	—	—	—	26.34	25.54	—	—
Sucrose in Juice per cent. Sucrose in Cane	89.30	90.86	89.30	89.47	89.02	94.73	94.07
FILTER PRESS CAKE—							
Per cent. Sucrose	5.24	6.46	5.41	5.15	6.15	3.40	3.70
Weight per cent. Cane	5.63	5.10	5.33	4.77	4.33	—	—
FINAL MOLASSES—							
Clerget Purity	44.50	45.30	46.10	45.30	45.11	29.30	30.10
RECOVERY—							
Sucrose per cent. Cane lost in manufacture	3.37	3.38	3.53	3.43	3.38	1.77	1.91
Sucrose in Sugar per cent. Sucrose in Cane	73.23	74.48	74.13	75.06	75.13	85.50	85.80
Sucrose in Sugar per cent. Sucrose in Juice	81.98	81.97	83.01	83.90	84.39	90.50	90.70
YIELD—							
Tons of Cane per ton of Sugar	10.77	9.92	9.69	9.49	10.06	9.57	8.72
LOSSES—							
Sucrose in Bagasse per cent. Sucrose in Cane	10.70	9.14	10.70	10.53	10.99	5.60	5.40
Sucrose in Press Cake per cent. Sucrose in Cane	2.44	2.49	2.11	—	2.06	0.56	0.57
Sucrose in Molasses per cent. Sucrose in Cane	—	—	—	—	9.82	6.46	6.24
Undetermined Sucrose per cent. Sucrose in Cane	13.63	13.89	13.06	14.41	3.02	1.87	1.89
Sucrose lost in Boiling House per cent. Sucrose in Cane	16.06	16.38	15.17	14.41	13.56	8.89	8.70
Sucrose in Total Losses per cent. Sucrose in Cane	26.77	25.52	25.87	24.94	24.39	14.50	14.20
SUGAR—							
Average Polarization, all Sugars	98.89	97.74	98.08	98.00	97.87	—	—

NOTE.—Figures for Java are from the "International Sugar Journal."
The increase in Sucrose per cent. Cane in Java from 1927 to 1928 is very marked, and is largely due to the variety POJ.2878 coming into cultivation to a considerable extent.


NATAL SUGAR FACTORIES — SEASON 1929
MONTHLY AVERAGES OF ALL FACTORIES
OVERALL RECOVERY
BOILING HOUSE RECOVERY
EXTRACTION
SUCROSE PER CENT BAGASSE
77.5 86.5 90.5 4.2
77.0 86.0 90 25 4.1
76.5 85.5 90.0 4.0
76.0 85.0 89.75 3.9
75.5 84.5 89.5 3.8
75.0 84.0 89 25 3.7
74.5 83 5 89.0 3.6
74.0 83.0 88.75 3.5
73 5 82 5 88.5 3.4
MAY
JUNE
JULY
AUG.
SEPT
OCT
NOV.
DEC.


NATAL SUGAR FACTORIES — SEASON 1929
MONTHLY AVERAGES OF ALL FACTORIES
PURITY OF MIXED JUICE
FIBRE PER CENT CANE
SUCROSE PER CENT CANE
TONS OF CANE PER TON OF SUGAR
86 5 17 0 13 5 11 25
84 5 16 75 13 25 11 0
82 5 16 50 13 0 10 75
80 5 16 25 12 75 10 5
78 5 16 0 12 5 10 25
76 5 15 75 12 25 10 0
74 5 15 5 12 0 9 75
72 5 15 25 11 75 9 5
70 5 15 0 11 50 9 25
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY

AREA OF CANE HARVESTED AND YIELDS BY DISTRICTS (EUROPEAN PLANTERS ONLY)

Compiled from Union Department of Census Returns.

DISTRICT.	ACREAGE HARVESTED.			PER CENT. OF TOTAL AREA.			YIELD OF CANE IN TONS.			PER CENT. OF TOTAL TONNAGE.			TONS CANE PER ACRE.		
	1926.	1927.	1928.	1926.	1927.	1928.	1927.	1926.	1928.	1926.	1927.	1928.	1926.	1927.	1928.
Port Shepstone	2,116	2,087	2,705	2.0	1.9	2.1	37,421	34,891	48,662	1.7	1.6	1.8	17.68	16.72	19.98
Umzinto	17,367	18,162	24,351	16.3	16.2	18.8	308,038	319,105	470,723	14.1	14.8	17.8	17.74	17.57	19.33
Durban and Pinetown	4,691	5,245	5,442	4.4	4.7	4.2	102,218	102,218	123,231	4.6	4.7	4.7	21.39	19.49	22.64
Total South of the Umgeni River	24,174	25,494	32,948	22.6	22.8	25.1	445,814	456,214	642,616	20.4	21.1	24.3	18.44	17.89	19.77
Inanda	19,646	20,284	19,060	18.4	18.1	14.7	328,554	340,501	351,667	15.1	15.8	13.3	16.72	16.79	18.45
Lower Tugela	24,857	24,620	32,616	23.3	22.0	25.1	499,583	468,315	654,828	22.8	21.7	24.8	20.10	19.02	20.08
Total for North Coast between Umgeni and Tugela Rivers	44,503	44,907	51,676	41.7	40.1	39.8	828,317	808,816	1,006,505	37.9	37.5	38.1	18.61	18.01	19.48
Total for Natal South of the Tugela (exclusing Zululand)	68,667	70,398	84,174	64.3	62.9	64.9	1,273,951	1,265,030	1,649,121	58c3	58.6	62.4	18.55	17.97	19.59
Mtunzini	14,846	15,432	17,008	13.9	13.8	13.1	332,465	326,502	354,523	15.1	15.1	13.4	22.39	21.16	20.84
Eshowe	2,332	2,812	4,036	2.2	2.5	3.1	52,578	57,882	91,866	2a4	2.7	3.5	22.55	20.58	22.76
Lower Umfolozi	20,948	20,226	21,083	19.6	18.1	16.2	523,629	456,517	484,625	24.0	21.2	18.3	25.00	22.57	22.99
Hlabisa	—	3,041	3,483	—	2.7	2.7	—	51,470	64,768	—	2.4	2.5	—	16.93	18.58
Total North of the Tugela (Zululand)	38,126	41,511	45,612	35.7	37.1	35.1	908,672	892,371	995,779	41.6	41.4	37.6	23.83	21.50	21.83
GRAND TOTAL FOR NATAL (including Zululand)	106,803	111,909	129,786	100.0	100.0	100.0	2,182,623	2,157,401	2,644,900	100.0	100.0	99.99	20.44	19.28	20.38

NOTE. — These statistics represent European-owned plantations only. The total cane harvested and received by factories for the three years under review are :—

2,335,406 *	1926		
2,482,000	1927		
2,878,149	1928		
2,817,000	1929		

* Cane tonnage for 1926 is an estimate only arrived at by adding an arbitrary allowance of 7 per cent. for cane not included in the census returns. The figures for 1927 onwards, however, are for actual total receipts of cane at the factories.

AVERAGE MANUFACTURING RESULTS FOR NATAL SUGAR FACTORIES BY PERIODS.

SEASON 1929.

Period ending		JUNE 1st.	JUNE 29th.	JULY 27th.	AUGUST 31st	SEPTEMBER 28th	NOVEMBER 2nd	NOVEMBER 30th	DECEMBER 28th	JANUARY 31st	SEASON.
Tons Cane Crushed	This period	56,203	215,351	320,248	438,478	375,046	432,948	341,965	244,179	58,103	2,734,387
	To date	56,203	281,326	623,885	1,055,943	1,504,012	1,936,959	2,279,025	2,336,030	2,734,387	
Tons Sugar Bagged and Estimated	This period	5,026	19,983	32,358	46,931	39,804	44,546	33,239	22,404	5,207	271,894
	To date	5,026	26,137	60,455	106,726	153,535	198,085	231,326	232,711	271,894	
Tons Cane per ton Sugar	This period	11.18	10.77	9.89	9.34	9.42	9.71	10.29	10.89	11.16	10.06
	To date	11.18	10.76	10.31	9.89	9.79	9.77	9.85	10.04	10.06	
Tons Cane Crushed per Hour	This period	—	—	—	—	—	—	—	—	—	—
	To date	—	—	—	—	—	—	—	—	—	—
Sucrose per cent. Cane	This period	12.34	12.37	13.09	13.64	13.62	13.31	12.72	12.17	11.63	12.95
	To date	12.34	12.36	12.67	13.10	13.20	13.22	13.15	12.97	12.95	
Fibre per cent. Cane	This period	16.40	15.63	15.95	15.66	15.28	15.07	15.24	15.43	15.99	15.52
	To date	16.40	15.80	15.91	15.80	15.74	15.59	15.53	15.51	15.52	
Sucrose per cent. Bagasse	This period	3.42	3.95	3.84	4.13	4.15	4.22	4.08	3.88	3.61	4.07
	To date	3.42	3.85	3.93	4.05	4.05	4.09	4.09	4.09	4.07	
Moisture per cent. Bagasse	This period	48.38	50.61	51.01	50.41	50.65	50.94	50.98	50.72	51.20	50.69
	To date	48.38	50.00	50.64	50.42	50.53	50.62	50.67	50.77	50.69	
Maceration per cent. Cane	This period	28.09	23.98	26.62	26.20	26.75	25.61	24.12	24.89	23.50	25.54
	To date	28.09	23.31	26.53	25.71	26.56	26.35	25.12	25.98	25.54	
Extraction	This period	90.34	88.78	88.96	89.30	89.55	89.10	88.82	88.89	88.83	89.02
	To date	90.34	89.05	88.95	89.05	89.15	89.14	89.09	88.94	89.02	
Boiling House Recovery	This period	82.80	82.94	85.53	86.02	85.05	85.13	84.22	83.15	86.73	84.39
	To date	82.80	82.85	84.21	84.92	84.90	84.90	84.80	84.40	84.39	
Overall Recovery	This period	74.70	73.63	76.09	76.82	76.17	75.85	74.81	73.92	77.05	75.13
	To date	74.70	73.78	74.91	75.62	75.70	75.68	75.55	75.06	75.13	
Java Ratio	This period	77.70	78.36	76.75	76.71	77.39	77.33	77.13	75.56	—	76.79
	To date	77.70	78.25	77.49	77.15	77.16	77.24	77.50	77.11	76.79	
Natal Ratio	This period	77.80	77.37	76.60	75.04	76.80	76.83	76.67	76.32	—	76.83
	To date	77.80	77.47	77.10	76.61	76.74	76.83	76.63	76.81	76.83	
Purity of Mixed Juice	This period	84.14	84.72	86.20	88.67	86.52	86.78	85.52	84.20	70.79	86.04
	To date	84.14	84.55	85.35	85.93	86.01	86.17	86.07	85.95	86.04	
Reducing Sugar Ratio	This period	4.20	3.75	2.92	2.83	2.94	2.88	2.67	4.56	6.50	3.35
	To date	4.20	3.88	3.35	3.32	3.08	3.04	2.95	3.29	3.35	
Purity of Syrup	This period	86.47	87.17	[redacted]	88.56	88.62	88.67	87.91	86.16	—	87.44
	To date	86.47	86.92		88.14	88.22	88.37	88.26	87.87	87.44	
Sucrose in Press Cake	This period	2.58	3.90	3.91	4.83	4.05	4.80	4.53	3.83	—	6.15
	To date	2.58	3.53	3.74	4.12	4.42	4.51	4.51	4.44	6.15	
Purity of Final Molasses	This period	44.26	42.63	43.90	45.37	45.98	46.15	46.00	45.02	—	45.11
	To date	44.26	43.46	43.81	44.91	45.42	45.54	45.61	45.29	45.11	
Average Polarization of Sugars	This period	98.17	98.12	97.96	97.91	97.79	96.16	97.95	98.07	97.64	97.87
	To date	98.17	98.16	97.98	98.03	97.88	97.83	97.89	97.78	97.87	

CLARIFIED JUICE—																	
Brix	12.11	—	15.80	16.50	—	13.87	14.02	16.39	13.55	14.22	14.05	14.50	16.11	16.97	15.46	14.95	**14.89** (B)
Purity (apparent)	89.70	86.30	89.02	87.80	—	87.50	88.50	89.20	86.30	87.50	87.30	86.40	87.71	88.60	86.20	87.76	**87.72** (B)
Reducing Sugar Ratio	1.54	—	—	—	—	2.76	2.07	—	3.16	—	3.34	2.80	2.41	—	3.34	—	**2.68** (B)
pH	6.93	—	6.82	—	—	7.36	7.40	—	7.20	—	7.20	7.00	—	6.80	—	—	**7.09** (B)
Calcium Salts	8.37	—	—	—	—	—	—	—	—	—	—	16.76	10.20	—	—	—	—
Per cent. of Ash	—	—	—	—	—	4.47	—	—	—	—	3.53	2.80	—	—	—	—	—
PRESS CAKE—																	
Per cent. Sucrose	2.88	9.57	7.33	6.82	5.95	4.86	5.69	6.40	5.54	5.75	5.39	5.48	7.80	7.80	6.68	7.38	**6.15**
Weight per cent. Cane	—	2.56	—	4.42	—	5.43	4.93	—	4.50	—	3.90	4.09	—	—	4.83	4.01	**4.33**
SYRUP—																	
Brix	53.72	—	48.00	50.20	56.10	47.99	53.43	44.29	53.77	46.77	50.73	55.25	49.49	52.80	54.51	51.20	**51.21** (B)
Purity (apparent)	89.38	86.30	88.81	87.60	87.60	87.10	88.00	89.30	86.50	87.70	87.60	87.10	89.50	88.00	86.60	82.80	**87.44** (B)
Reducing Sugar Ratio	1.62	—	—	2.67	—	2.72	1.96	—	3.01	—	2.65	2.50	2.55	—	3.15	—	**2.54** (B)
pH	—	—	6.56	6.80	—	7.10	7.20	—	7.10	—	7.10	7.10	—	—	—	—	**6.91** (B)
Purity drop from First Crusher	+ 1.84	+ 0.30	— 1.19	— 1.50	— 5.00	— 1.90	— 0.90	— 0.04	— 2.10	— 1.30	— 1.60	— 1.40	+ 0.90	— 2.70	— 2.40	— 7.50	**1.37**
Purity increase from Mixed Juice	5.40	1.20	0.94	0.60	2.60	1.00	1.00	0.01	1.40	2.70	0.70	1.40	3.10	—	1.40	1.40	**1.40**
Parts SO_2 per million of Brix	—	—	—	—	—	2.88	—	—	—	—	—	—	—	—	—	—	—
Per cent of Ash	—	—	—	—	—	3.56	—	—	—	—	3.53	2.89	—	—	—	—	—
FIRST MASSECUITE—																	
Brix	91.20	94.30	92.70	92.20	93.10	92.70	91.00	89.10	92.40	93.20	92.60	93.20	92.30	90.70	91.70	91.10	**92.03** (B)
Purity (apparent)	88.00	81.80	85.00	86.10	84.70	82.20	85.90	85.60	82.80	82.00	81.70	81.70	84.90	87.30	80.60	85.90	**84.07** (B)
Purity of run-off	74.60	—	68.10	64.20	67.10	58.20	67.30	61.70	62.30	—	63.40	—	64.60	69.00	58.90	69.90	**60.81** (B)
SECOND MASSECUITE—																	
Brix	94.30	96.20	94.30	95.00	94.50	95.40	92.90	82.90	94.40	93.90	93.50	94.70	94.70	91.60	93.00	92.30	**93.35** (B)
Purity (apparent)	77.40	65.80	72.90	72.80	70.10	70.00	77.00	62.70	69.30	72.60	70.30	70.60	70.40	74.80	68.80	72.00	**71.07** (B)
Purity of run-off	58.50	53.20	53.20	48.40	50.80	45.40	56.60	49.70	47.90	—	52.70	—	52.10	54.80	49.30	52.00	**41.68** (B)
THIRD MASSECUITE—																	
Brix	96.30	—	93.20	94.50	—	96.40	—	81.60	—	93.70	—	—	94.50	92.50	—	92.80	**92.83** (B)
Purity (apparent)	65.30	—	60.50	65.30	—	63.50	—	53.40	—	63.80	—	—	58.70	67.50	—	63.30	**62.36** (B)
Purity of run-off	40.70	—	—	40.70	—	41.10	—	45.70	—	—	—	—	—	50.00	—	43.90	**43.68** (B)
JELLY—																	
Brix	—	—	92.00	90.00	94.10	96.00	89.80	—	92.00	—	90.10	90.30	—	88.90	91.30	—	**91.45** (B)
Purity (apparent)	—	—	52.80	51.10	51.10	46.80	55.10	—	48.60	—	52.00	53.30	—	53.90	50.50	—	**51.51** (B)
Purity of run-off	—	—	—	45.50	—	41.90	47.40	—	—	—	—	—	—	—	44.10	—	**44.72** (B)
FINAL MOLASSES—																	
Brix	88.80	90.80	85.00	86.20	88.40	86.70	87.40	—	84.60	—	82.10	81.40	88.80	80.90	87.60	79.90	**85.58** (B)
Purity (apparent)	46.00	41.50	45.60	42.60	44.10	42.30	47.50	45.70	45.20	43.50	47.50	48.50	43.90	50.00	44.10	43.90	**45.11** (B)
85° Brix per cent. Cane	2.92	3.00	—	4.25	3.43	2.57	—	4.72	—	—	—	2.78	3.27	—	—	—	—
POLARISATION OF SUGARS—																	
White	99.89	—	99.80	—	—	—	96.78	—	96.89	—	—	—	—	99.60	—	99.75	**98.78** (B)
Raw	97.26	—	96.40	—	—	98.08	96.00	—	97.98	—	97.64	97.85	99.04	96.54	—	97.70	**97.45** (B)
Low Grade	—	—	90.00	—	—	82.00	—	—	81.98	—	91.15	89.69	—	89.74	—	93.00	**88.22** (B)
Average of all Sugars	98.76	97.35	96.77	98.59	98.40	98.08	86.00	99.70	97.19	98.67	97.56	97.74	—	96.44	97.48	98.57	**97.87**
SO_2 parts per 10,000	—	—	0.44	0.40	—	0.60	—	—	0.50	0.48	—	0.66	0.49	0.75	—	—	**0.54** (B)
Ash per cent.	—	—	—	—	—	0.296	—	—	—	—	—	—	—	—	—	—	—

Number of Factory	1	2	3	4	5	6	8	9	10	11	12	14	16	18	20	21	TOTALS AND AVERAGES.
Tons Cane Crushed	306,341	132,841	69,642	147,956	294,136	201,800	159,799	38,179	258,338	214,860	281,726	233,225	70,225	70,795	119,285	135,239	**2,734,387**
Tons Sugar Bagged and Estimated	32,753	11,093	7,323	14,400	30,109	20,310	15,914	3,190	25,225	20,211	28,955	23,825	6,921	7,114	12,054	12,497	**271,894**
Tons Cane per ton of Sugar	9.35	11.97	9.51	10.27	9.77	9.94	10.04	11.97	10.24	10.63	9.73	9.79	10.15	9.95	9.90	10.82	**10.06**
Time Crushing per cent. Available Time	87.37	86.11	77.04	84.44	82.08	82.14	81.93	94.32	88.69	63.08	95.20	77.15	75.02	79.27	86.31	90.31	**83.15** (B)
Tons of Cane per hour Actual Crushing	69.11	50.02	23.25	39.02	89.26	64.47	46.78	16.00	67.57	41.50	78.02	58.58	22.21	21.30	26.19	39.58	**47.05** (B)
Tons of White Sugar made	18,624	6,393	760	7,605	—	—	11,070	3,165	18,041	11,547	—	—	—	15	—	6,432	**83,653**
Tons of Raw Sugar made	14,129	4,700	6,528	6,616	29,563	20,269	4,844	—	7,088	8,363	28,453	23,500	6,916	6,963	12,054	5,554	**185,539**
Tons of Low Grade Sugar made	—	—	35	179	546	41	—	25	96	301	502	325	—	135	—	511	**2,696**
Sucrose per cent. Cane	13.14	11.83	14.19	13.33	13.15	12.81	12.69	12.36	12.48	12.73	13.24	12.93	13.18	13.77	12.96	12.98	**12.95**
Fibre per cent. Cane	15.65	15.09	15.90	14.97	15.21	14.88	17.11	17.51	14.22	15.59	15.95	15.82	15.56	16.13	15.28	16.03	**15.52**
Java Ratio	79.10	78.97	80.85	75.95	77.31	75.46	76.86	—	76.43	78.15	77.02	75.17	77.40	77.34	77.33	75.25	**76.79**
Natal Ratio	—	—	—	77.86	—	75.71	77.67	—	78.03	—	76.13	75.39	77.40	77.12	—	—	**76.83**
Tonnage Ratio	2.28	—	1.38	0.26	1.61	—	0.78	1.20	—	—	1.70	1.94	—	1.33	—	—	**1.38** (B)
Extraction Ratio	0.49	—	0.77	0.82	0.66	0.75	0.63	0.75	0.73	0.87	0.72	0.70	0.83	0.88	—	0.68	**0.73** (B)
Maceration per cent. Cane	36.53	16.49	27.68	21.24	22.63	21.31	36.42	24.82	24.82	28.12	23.85	23.44	16.79	15.94	25.20	27.55	**25.54**
Sucrose in Juice per cent. Sucrose in Cane	92.33	87.63	87.71	87.78	89.99	88.88	89.14	86.89	89.61	86.44	88.53	88.86	87.07	85.83	90.30	89.05	**89.02**
Sucrose per cent. Bagasse	3.04	4 30	4.87	4.68	3.89	4.06	3.55	4.28	3.87	4.87	4.25	3.93	5.06	5.30	3.71	4.01	**4.07**
Moisture per cent. Bagasse	48.91	50.19	49.64	51.35	50.11	52.59	51.65	48.21	52.71	50.52	50.18	52.07	47.53	—	50.16	49.92	**50.69**
Lely Ratio	40.40	—	63.31	63.50	52.74	—	49.70	—	58.68	—	56.27	54.91	—	70.07	—	53.76	**56.33** (B)
Sucrose per cent. Cane lost in manufacture	2.58	3.61	4.01	3.73	3.08	2.94	3.13	4.03	3.00	3.44	3.22	2.94	3.59	4.08	2.92	3.86	**3.38** (B)
Sucrose in Sugar per cent. Sucrose in Cane	80.37	69.48	71.70	71.09	76.57	77.04	75.32	67.41	75.98	72.86	75.73	77.22	72.81	70.35	75.98	70.15	**75.13**
Sucrose in Sugar per cent. Sucrose in Juice	87.04	79.26	81.74	80.98	84.09	86.68	84.49	77.58	84.79	84.29	85.53	86.90	83.62	81.97	84.15	78.78	**84.39**
Available Sucrose per cent. Sucrose in Juice	91.75	—	88.85	88.50	86.18	88.16	89.76	87.56	87.10	86.50	88.84	87.31	88.42	89.12	—	87.96	**88.28** (B)
Boiling House Efficiency	94.86	—	92.00	92.69	98.74	98.32	94.13	88.60	97.36	97.40	96.28	99.54	94.57	91.97	—	89.57	**94.71** (B)
Sucrose in Bagasse per cent. Sucrose in Cane	7.67	12.34	12.29	12.22	10.01	11.12	10.86	13.11	10.39	13.56	11.47	11.14	12.93	14.17	9.70	10.95	**10.99**
Sucrose in Press Cake per cent. Sucrose in Cane	0.68	—	—	2.31	1.47	2.07	2.22	2.02	2.00	—	1.59	1.72	—	—	2.51	2.28	**2.06**
Sucrose in Molasses per cent. Sucrose in Cane	8.80	—	—	11.71	9.78	7.40	9.58	14.83	—	—	11.21	8.89	—	9.59	11.87	—	**9.82**
Undetermined Sucrose per cent. Sucrose in Cane	2.46	—	16.01	1.76	2.17	2.37	2.02	2.62	11.62	—	—	1.02	—	5.89	—	16.61	**3.02**
Sucrose lost in Boiling House per cent. Sucrose in Cane	11.96	—	—	15.78	13.42	11.84	13.82	19.47	—	—	12.80	11.63	14.26	15.48	14.38	18.89	**13.56**
Sucrose in Total Losses per cent. Sucrose in Cane	19.63	30.51	38.30	28.00	23.43	22.95	24.68	32.58	24.01	—	24.27	22.77	27.19	29.65	24.08	29.84	**24.39**
FIRST CRUSHER JUICE—																	
Brix	18.98	17.42	19.50	19.70	19.31	19.07	18.57	18.14	18.65	18.31	19.22	19.43	19.22	19.63	18.83	19.10	**18.94** (B)
Purity (apparent)	87.54	86.00	90.00	89.10	88.10	89.00	88.90	89.70	87.60	89.00	89.20	88.50	88.70	90.70	89.00	90.30	**88.81** (B)
LAST ROLLER MILL—																	
Brix	3.09	9.22	4.71	5.90	5.55	8.55	5.50	6.75	6.35	5.95	6.22	5.86	9.47	8.70	4.17	8.93	**6.55** (B)
Purity (apparent)	78.46	79.00	82.16	80.20	79.90	81.05	83.20	78.00	79.80	80.50	81.40	82.00	80.90	83.80	79.20	82.00	**80.72** (B)
Purity drop from First Crusher	9.08	7.00	7.84	8.90	8.20	7.95	5.70	11.70	7.80	8.50	7.80	6.50	7.80	6.90	9.80	8.30	**8.09**
MIXED JUICE—																	
Brix	13.98	14.78	15.30	15.60	15.68	15.32	13.29	14.27	14.41	13.97	15.31	15.45	15.95	16.98	15.04	14.53	**15.00** (B)
Purity (Clerget)	83.98	85.10	87.87	87.00	85.00	86.10	87.10	86.60	85.10	85.00	86.90	85.70	86.40	88.00	85.20	86.40	**86.04** (B)
Reducing Sugar Ratio	3.78	4.00	—	3.04	—	3.48	2.37	—	3.43	—	3.31	3.60	2.61	—	3.90	—	**3.35** (B)
Parts SO_2 per million of Brix in Sulphited Juice	—	—	—	—	—	15.38	—	—	—	—	—	—	—	—	—	—	—
Purity drop from First Crusher	3.56	0.90	2.12	2.10	3.10	2.90	1.80	3.10	2.50	4.00	2.30	2.80	2.20	2.70	3.80	3 90	**2.77**

Mr. MOBERLY: We must congratulate the Experiment Station, and particularly Mr. Dodds and Mr. Karlson, who got up this report, for the very concise summary of the year's work. a year which none of us will look back upon with very joyful recollections. I don't know that there is any particular point to comment on. It takes a little time to pick out points to discuss. There is one point I notice particularly in the census return, that the variation in the different area is not as large as one might expect—round about 20 tons to the acre seems to be a figure for almost any district. I think you will all agree that that still leaves a long way to go. When that is referred to terms of sugar per acre per year, and we get something like a ton of sugar per acre per year compared with figures of 6, 7 and 8 for Hawaii, we still have a long way to improve. We hope the Experiment Station will be able to help us with some of the new varieties they have obtained.

CHAIRMAN: I would like to call your special attention to the footnote on the first graph where the records for Natal in past years are compared with Java. I call attention to the big increase in sucrose per cent. cane in Java from 1927 to 1928 which has been credited almost entirely to the change to the new variety P.O.J. 2878. It shows what room there is for improvement even in a highly developed country like Java.

SECRETARY: There is only one comment I would make in regard to this reference of labour. I think it should be understood that when you speak of a six months' contract, under present day practice it means really work for seven calendar months. That is, the contracts in the great majority of cases are for 180 shifts, which it takes seven calendar months to work out. The difficulty in regard to labour is not one entirely that the employer can remove because it is governed by the economic conditions applying to the labourer himself; that is his periods of planting and harvesting of his own crop have a profound influence on the incidence of his labour period. I just want to make that known, so that in dealing with labour it is understood that six months actually means seven calendar months labour.

CHAIRMAN: I have heard somewhere that the Chamber of Mines are now recruiting natives for four months contract.

SECRETARY: The policy of the Chamber of Mines so far as I understand is to encourage voluntary labour, that is, the native is encouraged by all possible means to offer his services to the Mines without being recruited. In order to encourage that he can go to Johannesburg and contract himself for 3, 4, 5, 6, 7, 8 or 9 months, but if he is recruited in the Native Territories his contract is, I think, for 9 months, but not less than 6 months. If he offers his services voluntarily then they will take him for 4 months, or even less I believe. You can say that with the widespread organisations for labour they have they are in a very much more favourable position than the Sugar Industry is where the organisation for employing labour is at the present moment really chaotic. That arises to a great extent because of the difference of conditions. In Johannesburg there is no reservoir of labour close by where he is employed. In Natal and Zululand all along the coast there is labour which can be obtained for work on the sugar estates. That voluntary labour is the most important part of the labour employed by the Sugar Industry; perhaps I should not say the most important, but it is extremely important. And the very fact that it exists, and the fact that it is extraordinarily unreliable just imparts into our labour question that element of complete uncertainty which makes things so difficult for the Sugar Industry as a whole. It is an extraordinarily complicated problem, but so far as using that factor in dealing with the period of crushing, I think it should be kept in mind that actually the period of contract is seven calendar months and not six months, and everybody is thankful to get them for seven calendar months.