THIRTIETH ANNUAL SUMMARY OF CHEMICAL LABORATORY REPORTS

SOUTH AFRICAN SUGAR FACTORIES: SEASON 1954-55

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The 1954-55 sugar production of 828,555 short tons constitutes a new record for the South African Sugar Industry. This crop was manufactured from 7,374,241 tons of cane harvested, which figure establishes a new record for our cane growers. To facilitate comparison of sugar and cane productions in recent years, the productions attained during the last ten years are tabulated:

TABLE A

Sugar Production in South Africa in Recent Years

Season	Sugar Produced	Cane Crushed	Season	Sugar Produced	Cane Crushed
1945-46	553,074	4,607,055	1950-51	685,789	5,721,390
1946-47	474,769	3,990,017	1951-52	532,505	4,805,249
1947-48	512,005	4,543,255	1952-53	670,188	5,722,583
1948-49	607,845	5,216,144	1953-54	725,429	6,221,531
1949-50	561,122	4,929,580	1954-55	828,555	7,374,241

In addition to the new records for cane and sugar productions, the fact that during the 1954-55 season two factories made more than 100,000 tons of sugar has to be put on record. Darnall produced during this season 102,165 tons and Tongaat 101,800 tons of raw sugar.

Regarding the quality of the cane as far as the quality can be indicated by the purity of mixed juice and sucrose and fibre content of the cane, we refer to Table VII (Comparative Data from 1925 to 1954 inclusive) at the end of this summary. We avoid mentioning in this connection cane to sugar ratios, because these ratios are affected by the Overall Recovery and to a lesser extent by the average pol of the sugar made. Particularly when comparing earlier results with present ratios, the differences in overall recovery make cane to sugar ratios unsuitable for comparison of cane qualities. The most suitable yard-stick for cane quality would be *recoverable crystal per cent. cane*, a figure based on—let us say—30 per cent. Lost Absolute Juice and 100 per cent. Boiling House Performance. Such a figure would account for sucrose and fibre content of the cane, for the purity of the mixed juice and would not be affected by differences in factory performance, or sugar pol.

The discussions at the Congress on last year's Summary revealed that it would be appreciated when the comparison of results from cane harvested in the July-November period, compared with those of earlier and later months should again be included in the annual summaries. This review which is shown hereunder starts therefore by recapitulating the seven-year average of 1928-1934 and the ten-year average of 1935-1944; from 1945 on, however, annual data are recorded.

TABLE B

Comparison of Results from Cane Harvested during the July-November Period, compared with those of Earlier and Later Months of the Harvesting Season

	Per cent. Total Cane	Ratio Cane/ Sugar	Sucrose Per cent. Cane	Fibre	Purity Mixed Juice
Mean 1928-1934					
Optimum period...	76.29	9.46	13.64	15.51	85.37
Balance of crop ...	23.71	10.53	12.56	15.98	84.31
Mean 1935-1944					
Optimum period...	71.51	8.86	13.89	15.21	86.46
Balance of crop ...	28.49	9.79	12.61	15.46	84.72
1945 Optimum period	73.75	8.06	14.66	16.03	86.33
Balance of crop	26.25	9.01	13.21	15.88	85.95
1946 Optimum period	85.64	8.27	14.33	16.20	85.74
Balance of crop	14.36	8.96	13.49	16.27	86.48
1947 Optimum period	77.07	8.65	13.58	15.78	85.88
Balance of crop	22.93	9.57	12.45	15.87	85.43
1948 Optimum period	70.48	8.30	14.26	15.83	86.02
Balance of crop	29.52	9.22	13.01	16.07	85.68
1949 Optimum period	67.49	8.50	13.86	16.20	86.49
Balance of crop	32.51	9.36	12.81	16.17	85.66
1950 Optimum period	64.20	7.92	14.79	15.99	86.69
Balance of crop	35.80	9.14	13.11	15.46	85.88
1951 Optimum period	72.06	8.88	13.47	16.36	84.94
Balance of crop	27.94	9.26	12.98	16.06	84.87
1952 Optimum period	65.02	8.16	14.39	15.98	86.71
Balance of crop	34.98	9.24	12.91	16.32	85.40
1953 Optimum period	64.83	8.26	14.32	16.31	86.07
Balance of crop	35.17	9.15	13.22	16.31	84.75
1954 Optimum period	60.38	8.53	13.79	15.96	86.42
Balance of crop	39.62	9.46	12.66	16.13	84.93
Mean 1945-1954					
Optimum period...	70.09	8.35	14.14	16.06	86.20
Balance of crop ...	29.91	9.24	12.98	16.05	85.43

The survey shows that the purity of mixed juice during last season's optimum period is slightly higher than the ten years average figure. The sucrose content of the cane during last season's optimum period is, however, lower than the ten years average. The highest sucrose content of last season occurred during the September month (14.46 per cent.) and the highest purity during the October month (86.8).

Since the figures of the balance of the crop were less favourable compared with the ten years averages, the averages of sucrose content cane and of purity mixed juice for the whole 1954-55 season are lower than the ten years averages. Average sucrose con-

tent of last season is 13.34 against 13.79 per cent. as ten years average and average purity of mixed juice 85.86 against 85.95.

Cane Varieties

The cane variety Co.281 which reached in the 1945-46 season its maximum extension, i.e. 67.77 per cent., has been gradually replaced by other varieties. It was at first Co.301 which replaced Co.281, but after Co.301 had reached its peak of 41.89 per cent. in 1949-50, two other varieties, viz. Co.331 and N:Co.310, started to replaced not only Co.281, but also Co.301. The latter has been diminishing gradually from 41.89 per cent. in 1949-50 to 20.97 per cent. in last season.

Compared with the quick rise of N:Co.310, Co.331 shows a slow progress.

TABLE C

Changes in Percentages of Varieties Crushed During Recent Years

Variety	1949-50	1950-51	1951-52	1952-53	1953-54	1954-55
Miscellaneous ...	1.10	0.76	1.08	2.28	2.02	1.74
Co.281	47.30	35.99	25.34	10.97	5.71	2.34
Co.301	41.89	37.98	38.30	31.80	28.21	20.97
Co.331	4.21	7.87	12.51	15.87	22.01	25.27
N:Co.310	2.60	15.07	21.12	37.86	41.35	49.41
P.O.J.'s	2.90	1.99	1.65	1.23	0.69	0.26

As a result of the steady increase in proportion of N:Co.310, the harvesting of this variety is accelerated. For example, during the 1953-54 season we had to wait till the August period before 40 per cent. of the cane harvested consisted of N:Co.310; last season, however, during the June period, i.e. two months earlier, the 40 per cent. level was already reached. In this respect we draw attention to Umfolozi which, starting earlier than usual this season, crushed during the June period 77 per cent. N:Co.310.

TABLE D

Proportions of Cane Varieties Milled by Months for the Period Ended as Shown

Variety	May 29 1954	June 26 1954	July 31 1954	Aug. 28 1954	Oct. 2 1954
Miscellaneous.	1.16	1.99	0.62	2.38	1.67
Co.281	8.16	4.66	3.37	1.38	1.77
Co.301	37.17	32.87	26.85	21.25	19.01
Co.331	21.23	19.36	21.76	25.72	27.87
N:Co.310 ...	30.39	40.80	46.20	48.96	49.33
P.O.J.'s	1.89	0.32	1.20	0.31	0.35

	Oct. 30 1954	Nov. 27 1954	Jan. 1 1955	Jan. 29 1955	Feb. 26 1955	March 1956
Miscellaneous ...	1.61	1.75	1.40	2.44	2.15	3.83
Co.281	1.36	1.55	0.84	1.49	1.38	1.05
Co.301	16.04	14.87	15.43	11.85	8.97	23.88
Co.331	28.86	28.61	25.61	24.69	30.62	25.72
N:Co.310	51.93	52.99	56.39	59.39	56.72	45.52
P.O.J.'s	0.20	0.23	0.32	0.14	0.16	—

When during the 1952-53 crushing season the proportion of Uba cane had dropped to a mere 0.13 per cent., the proportion of this cane has not been recorded separately any more. Since the proportion of P.O.J.'s crushed has dropped presently to 0.26 per cent., also this variety will not be mentioned any more separately, but will be included too in the group "Other Varieties." If it appears during the next season that one of the new varieties has reached an extension of more than 1 per cent., this variety will be mentioned separately in future.

Regarding the rainfall during the crushing season and as far as the rainfall interfered with crushing operations, we want to record that considerably more rain than the average has fallen during the following months:

Month	Sept. inches	October inches	January inches
1954-55 ...	4.85	10.98	7.94
Mean	2.48	3.45	4.37

Note—The mean monthly rainfall data are derived from Weather Report 1953-54; the rainfall experienced during the 1954-55 season is quoted from Rainfall Statistics compiled by the Experiment Station.

December has been an exceptionally dry month; only 1.89 inches of rain has fallen; the mean for December being 4.93 inches.

General Factory Performance

Nineteen instead of eighteen factories have been in operation during the 1954-55 season; Esperanza being transferred from the South Coast site to Pongola joined the crushing operations again. The tables and the discussions will refer to seventeen of the nineteen factories which have been in operation, viz. to those seventeen factories which regularly contribute data to our monthly and annual summaries. Since these seventeen factories crush 99 per cent. of all cane harvested and manufacture more than 99 per cent. of all sugar produced, the data shown and discussed in this summary are largely representative of the whole South African Sugar Industry.

To show how this "bigger crop than ever" was handled, we have collected a number of data which will facilitate comparison with the previous two crops.

TABLE E

Season	1952-53	1953-54	1954-55
Number of Factories Crushing	17	16	17
Tons Cane Crushed	5,661,604	6,159,770	7,296,805
Total Hours Mills Open	74,821	75,524	89,488
Average Number of Weeks ...	30½	32¾	36½
Total Hours Actual Crushing	70,274	69,449	78,525
Average Days Actual Crushing	172	181	192
MEAN CRUSHING RATE	81	89	93
MEAN TIME EFFICIENCY ...	94	92	90
Hours of Stoppage per cent. Hours Mills Open	6	8	10
Hours of Stoppage due to Cane Shortage per cent. Hours Mills Open	2	4	5

The MEAN CRUSHIHG RATE (average crushing rate in tons of cane per hour actual crushing per mill) of the 1953-54 season is affected by the falling out of Esperanza. When this factory would have crushed during that season the mean crushing rate would have been lower because Esperanza crushing rate was lower than the mean.

The collected data show that owing to the steadily increasing crop and notwithstanding the increased crushing rate the average duration of the crushing season has grown from 30½ to 36½ weeks, when comparing the two season that seventeen factories were crushing, viz. 1952-53 and 1954-55.

TABLE F

The next table shows the part each factory had in the increase of the joint crushing rate.

Season ...	1950-51	1951-52	1952-53	1953-54	1954-55
PG ...	—	—	—	—	49
UF ...	96	131	137	145	151
ZM ...	105	100½	97	98	113
FX ...	90	90	87	90	100
EN ...	16	15	14	15	16
AK ...	90	87	88	94	103
DK ...	30½	30	31	33	40
DL ...	124	119	121	150	171
GL ...	73	77	81	86	97
MV ...	33	33	36	36	40
CK ...	44	40	42½	44	43
TS ...	179	169	170	171	174
NE ...	145	134	140	146	152
IL ...	53	49	62	59	64
RN ...	43	42	42	42	42
ES ...	48	44	48	—	—
SZ ...	86	88	98	108	124
UK ...	28½	28½	28	28	31
Sum of all Rates ...	1284	1277	1322	1345	1511

This shows that the actual crushing rate increased from 1284 to 1511 tons of cane per hour, or with 18 per cent. in a period of four years.

To illustrate the general factory performance of the seventeen mills as a group the relevant data of recent years are tabulated.

TABLE G

Crushing Rate

Season	1950-1	1951-2	1952-3	1953-4	1954-5
Tons Cane per hour ...	79.57	78.96	80.56	88.70	92.92
Tons Fibre per hour ...	12.57	12.85	12.97	14.47	14.90
Tons Brix per hour ...	12.05	11.53	12.20	13.38	13.34
Tons Sugar per hour ...	9.56	8.79	9.47	10.37	10.47
Lost Juice per cent. Fibre	39.3	40.2	40.8	41.7	44.1
Imbibition per cent. Fibre	206	215	217	200	191
Boiling House Performce	96.9	96.7	97.2	96.9	97.4
Purity Final Molasses ...	40.5	40.3	39.3	39.5	39.3
Percentage Und. Losses	1.34	1.36	1.46	1.59	1.44

The fibre content of the cane varies from season to season, but these variations are completely outdone by variations in fibre content from mill to mill, even when occurring in the same season. For example, one of Pongola's Weekly Reports records a weekly average of 11.82 per cent. fibre in cane, but on the other hand Weekly Reports of Natal Estates of the same season report 18.82 per cent. as weekly averages. It is obvious that when there is such a wide dispersion in fibre content, figures as "Extraction" and "Imbibition Water per cent. Cane" must be unsuitable for comparison purposes. In the case of 11.82 per cent. fibre an application of 30 per cent. water on cane corresponds with 254 parts of water per 100 parts of fibre, in the case of 18.82 per cent. fibre an application of 30 per cent. water on cane would mean that there are only 159 water available per 100 fibre. It is the same with "Extraction;" 2.50 per cent. sucrose in bagasse means in the first case an extraction of 95.3 and in the second case of only 92.5 per cent.; assuming that in both cases the sucrose content of the cane is 14.0 per cent. and the fibre content of the bagasse 45 per cent. Particularly for Natal with its big variations in fibre content it is to be recommended to use figures which are based on fibre ratios as "Imbibition Water per cent. fibre" and "Lost Absolute Juice per cent. fibre."

Table G reveals that since a minimum of 39.3 per cent. Lost Absolute Juice was attained during 1950-51, this ratio has been increasing steadily. We can mention two reasons for this increase of Lost Absolute Juice. Firstly the imbibition ratio is decreased and secondly the crushing rate has increased more than the capacity of the mill trains has been increased by extending of the trains.

To prove the latter statement the following data are tabulated:

(*a*) The capacity ratings of all milling trains as they were in 1950-51 and as they are at present (in tons of fibre per hour).

(*b*) The actual throughput of all milling trains in 1950-51 and in 1954-55 (in tons of fibre per hour).

Note—The Capacity Ratings have been calculated with the aid of the formula derived by Royston (Proc. 21st Ann. Conf. S.A.S.T.A. 1947; p. 37-51):
Capacity Rating in tons of fibre per hour = $(D^2 \times L \times N)/38.56$
D and L in feet.

TABLE H

Tons of Fibre Per Hour Actual Crushing

Mill	Season 1950-51 Rating	Season 1950-51 Actual	Season 1954-55 Rating	Season 1954-55 Actual
PG ...	—	—	12.60	6.34
UF ...	14.03	13.23	19.61	19.44
ZM ...	17.25	16.74	17.25	19.09
FX ...	17.19	14.29	17.19	15.67
EN ...	2.14	2.60	2.14	2.51
AK ...	17.20	14.88	17.20	17.03
DK ...	5.91	4.75	6.88	6.53
DL ...	16.66	19.40	30.04	27.37
GL ...	13.74	11.65	14.88	16.06
MV ...	6.50	5.12	6.50	6.43
CK ...	6.00	7.14	6.00	7.01
TS ...	37.46	27.47	37.46	27.96
NE ...	21.84	24.11	23.39	27.01
IL ...	13.56	8.50	13.56	10.62
RN ...	8.32	7.20	8.32	7.18
ES ...	12.60	7.50	—	—
SZ ...	23.74	14.12	23.74	20.63
UK ...	6.42	4.53	6.42	4.62
Total ...	240.56	203.23	263.18	241.50
Ratio ...	Actual 85 per cent. of Rating		Actual 92 per cent. of Rating	

Table H shows that the average proportion between the calculated rating and the actual performance was in 1950-51 as 240.56 to 203.23, or in other words the trains were crushing 15 per cent. less than they could do according to their rating. In 1954-55, however, the actual performance amounted to 92 per cent. of the capacity rating. In addition the imbibition ratio had to be decreased as a result of the higher crushing rates, viz. from 206 per cent. in 1950-51 to 191 per cent. on fibre in 1954-55. These are two reasons why the figure of Lost Absolute Juice increased from 39.3 per cent. in 1950-51 to 44.1 per cent. on fibre in 1954-55.

Not only has the figure for Absolute Juice per cent. fibre gone up; the moisture content of the bagasse is also steadily increasing: 51.22 per cent. (1950); 51.71 per cent. (1951); 52.53 per cent. (1952); 52.47 per cent. (1953) and 52.92 per cent. (1954). Not only is the increase in moisture content of the bagasse one of the main reasons of the increase in Lost Absolute Juice, but the increase in moisture impairs also the calorific value of the bagasse: 3176 (1950); 3136 (1951); 3064 (1952); 3067 (1953) and 3028 Btu per lb. of bagasse (1954). We draw attention to the fact that the moisture content of the bagasse is increasing notwithstanding the imbibition ratio is decreasing (see Table G).

The extraction obtained by a milling train is the combined results of (*a*) the repeated pressings exerted by the consecutive units and of (*b*) the degree of mixing of the administered imbibition water with the juice present in the intermediate bagasse. If we did not apply water to the bagasse, or if the applied water did not mix at all with the juice, the units following the first two mills would not add to the extraction at all and the extraction of 18-roller train would be of the same magnitude as of a 6-roller train. Since the extraction which can be obtained by a milling train depends for such a great part on the degree of mixing of imbibition water and juice, a figure which indicates the attained degree of mixing is appreciated. One of the efforts to evaluate the efficiency of the imbibition water as applied is the so-called "Imbibition Efficiency" figure of which the meaning has been explained on page 19 of the Proceedings of the Twenty-Sixth Annual Congress of the S.A.S.T.A. Another figure is the ratio between "Tons of Imbibition Water present in Final Bagasse" and "Tons of Imbibition Water present in Mixed Juice." Since the part of the imbibition water which ends up in mixed juice does not serve a useful purpose at all and the part present in final bagasse did partake in the driving out of the juice, the higher the ratio the better. However, it does not mean that this ratio can be used as a yardstick for the degree of mixing, i.e. for the efficiency of the used imbibition water.

When we now, after this expatiation, study the following table (Table I) showing the imbibition efficiency figures and the imbibition ratios of recent years, then it strikes us: that the degree of mixing of Chaka's Kraal is steadily improving from 54 per cent. in 1951 up to 85 per cent. in 1954. Gledhow's figure, which jumped from 57 per cent. (1951) to 76 per cent. (1952) when a Searby shredder was installed in front of the milling train, made another jump this year, viz. from 76 per cent. to 92 per cent. Since no change has been made in the equipment, this raise must be due to the reduction of the imbibition, from 178 per cent. to 137 per cent. The figures of Renishaw are also striking; perhaps the change of intermediate carriers from slat type to dredge type is the cause of the higher level of the figures in 1953 and 1954 compared with 1951 and 1952.

TABLE I

Imbibition Efficiency

Season ...	1951-52	1952-53	1953-54	1954-55
PG ...	—	—	—	59 (159)
UF ...	46 (192)	43 (191)	49 (176)	53 (167)
ZM ...	39 (219)	44 (252)	54 (220)	51 (194)
FX ...	36 (225)	49 (224)	56 (189)	58 (195)
EN ...	27 (259)	27 (252)	29 (250)	25 (231)
AK ...	43 (219)	51 (219)	68 (191)	64 (204)
DK ...	65 (187)	80 (202)	63 (182)	64 (160)
DL ...	62 (225)	55 (229)	58 (193)	59 (162)
GL ...	57 (182)	76 (193)	76 (178)	92 (137)
MV ...	52 (192)	44 (228)	49 (228)	42 (206)
CK ...	54 (169)	64 (167)	66 (166)	85 (177)
TS ...	48 (185)	49 (193)	46 (198)	51 (192)
NE ...	39 (237)	42 (240)	47 (226)	40 (225)
IL ...	41 (246)	49 (193)	35 (203)	44 (217)
RN ...	43 (234)	59 (236)	78 (221)	61 (227)
ES ...	40 (249)	41 (226)	—	—
SZ ...	64 (227)	53 (226)	63 (219)	62 (211)
UK ...	41 (265)	47 (267)	47 (268)	51 (250)
Arithmetical Average:	47 (218)	51 (217)	55 (207)	56 (195)
Averages of those factories which apply more than 200 water per cent. fibre:	43 (237)	49 (223)	50 (229)	47 (221)
Averages of those factories which apply less than 200 water per cent. fibre:	54 (184)	56 (187)	60 (184)	63 (171)

Note—This division in factories using more and factories using less than 200 water per cent. fibre is required, because the higher the imbibition the less complete will be the mixing and conversely.

When considering the Boiling House Performance figures of recent years, we want to compare the Undetermined Losses percentages and the Purities of Final Molasses simultaneously, this is the reason why Table G shows these values too.

In the following Table J a review of all losses and of Overall Recoveries is given in order to enable us to trace why in one year the Overall Recovery was higher than in another year.

TABLE J

Sucrose Balance (Sucrose Per Cent. Sucrose in Cane)

Season ...	1950-51	1951-52	1952-53	1953-54	1954-55
Lost in:					
Bagasse (A) ...	6.67	7.01	7.00	7.33	7.60
Filter Cake (B) ...	0.37	0.52	0.43	0.49	0.54
Final Molasses (C)	8.00	8.61	7.45	7.78	7.22
Undetermined (D)	1.34	1.36	1.46	1.59	1.44
Boiling House Losses:					
(B)+(C)+(D) ...	9.68	11.28	9.34	9.86	9.20
Total of All Losses:					
(A)+(B)+(C)+(D)	16.35	17.50	16.34	17.19	16.80
Overall Recovery ...	83.65	82.50	83.66	82.81	83.20
Sucrose in Cane ...	100.00	100.00	100.00	100.00	100.00

In Table K those factories are shown which obtained undetermined losses between 0.50 and 1.75 per cent. (on sucrose in cane). It shows that the number of these factories increased from six in 1950 to 11 in 1954.

TABLE K

Factories Showing Undetermined Losses of More Than 0.50 and Less Than 1.75 per cent. of Sucrose in Cane

	1950-51	1951-52	1952-53	1953-54	1954-55
UF ...	0.88	0.97	H	1.00	1.06
ZM ...	1.15	0.97	1.24	0.69	0.95
FX ...	(x)	0.59	1.04	0.95	1.17
EN ...	H	H	H	1.56	1.54
AK ...	0.62	0.92	0.71	1.05	0.74
DK ...	(x)	(x)	H	H	1.54
DL ...	(x)	(x)	1.12	1.36	1.12
GL ...	1.26	1.26	1.40	1.38	1.54
MV ...	H	H	1.16	1.26	1.34
TS ...	(x)	(x)	(x)	H	1.36
IL ...	0.92	0.82	L	0.59	L
RN ...	(x)	(x)	(x)	1.41	0.74
Number	6	6	6	10	11

Note—The letter H denotes that in that year the losses were more than 1.75 per cent. and L indicates that the losses were less than 0.50 per cent. (on sucrose in cane).

It has been explained in previous Summaries how the undetermined losses of those factories which do not weigh their molasses, has been estimated. In order to check the factor 0.83 which has been used for these calculations we computed for all factories the ratio:

$$\frac{\left(\begin{array}{c}\text{Tons Nonsucrose in Final Molasses}\\ + \\ \text{Tons Nonsucrose in Sugars}\end{array}\right)}{\text{Tons Nonsucrose in Mixed Juice}}$$

The results of these computations have been tabulated :

Review of Nonsucrose Ratios for Recent Years

TABLE L

Seasons	1950-51	1951-52	1952-53	1953-54	1954-55
PG ...	—	—	—	—	0.82
UF ...	0.82	0.89	0.83	0.85	0.82
ZM ...	0.87	0.89	0.91	0.89	0.88
FX ...	—	0.87	0.91	0.79	0.75
EN ...	0.77	0.78	0.75	0.82	0.77
AK ...	0.82	0.81	0.84	0.86	0.74
DK ...	0.87	—	0.82	—	0.87
DL ...	—	—	—	0.83	0.86
GL ...	0.82	0.81	0.70	0.79	0.84
MV ...	0.85	0.88	0.80	0.80	0.76
TS ...	—	—	—	0.81	0.79
NE ...	0.53	0.61	0.55	0.57	0.52
IL ...	0.77	0.81	0.79	0.66	0.68
RN ...	0.87	—	—	0.85	0.88
*Average	0.82	0.84	0.82	0.81	0.80

* Exclusive NE

The review shows us the so much higher nonsucrose removal by carbonatation than by sulphitation juice clarification. As an average the nonsucrose present in final molasses and sugars is only 56 per cent. of the quantity present in mixed juice in the case of Natal Estates compared with 83 per cent. as an average for the other factories. Natal Estate's ratio of 56 per cent. compares favourably with Java's average of 72 per cent. for carbonatation factories (period 1938-1941).

Since we were met in a few cases with undetermined gains (negative losses) when assuming a ratio of 0.83 and calculating in this manner sucrose losses in final molasses and undetermined, we recommend checking as routine the undetermined sucrose losses in the manner shown hereunder:

Tons Brix in Mixed Juice	63,390	
Tons Sucrose in Mixed Juice	55,388	
		(−)
Tons Nonsucrose in Mixed Juice	8,002	
Assumed Ratio	0.83	
		(×)
Assumed Tons Nonsucrose in *Total* Final Molasses	6,642	
Tons Nonsucrose in Sugars (Actual)	167	
		(−)
Assumed Tons Nonsucrose in Final Molasses	6,475	
Ratio Sucrose to Nonsucrose as in Actual Final Molasses	0.6319	
		(×)
Assumed Tons Sucrose in Final Molasses.	4,092	
Tons Sucrose in Filter Cake	327	
Tons Sucrose in Sugars	50,035	
Resulting Tons Undetermined Sucrose	934	
		(+)
Tons Sucrose in Mixed Juice	55,388	

In this case the actual undetermined losses tallied because the actual ratio (0.84) did not differ much from the assumed ratio (0.83).

TABLE M

Factories Showing Final Molasses Purities Equal to or Lower than 39.0

Season	1950-51	1951-52	1952-53	1953-54	1954-55
UF ...	—	—	—	—	38.9
ZM ...	—	—	—	37.1	37.8
FX ...	38.6	37.8	37.8	38.5	38.8
AK ...	—	—	36.8	37.7	38.9
DK ...	37.6*	38.5*	—	38.4*	—
DL ...	38.8	38.6	37.6	37.5	37.3
GL ...	—	—	—	—	38.7
CK ...	—	38.5	—	38.6	—
TS ...	—	—	39.0	38.8	38.5
RN ...	—	39.0*	—	—	38.6*
ES ...	38.8	37.8	39.0	—	—
SZ ...	38.2	38.0	37.7	37.5	36.8
UK ...	—	—	39.0*	—	38.5*
No. of Factories	5	7	7	8	10

* Apparent Purity

Felixton, Darnall and Sezela constitute at present the backbone of this Table since they have not been absent once the last five years. A newcomer is Umfolozi, while Gledhow returned to the fold. The Table shows that molasses purities of 39.0 or lower are not limited to one special area of the sugar belt. The Table is steadily growing and we hope that this will be continued in the years to come.

Reducing the final molasses purity and reducing the undetermined losses is the only manner to improve the Boiling House Performance figure.

Chemicals

The consumption of lime, sulphur and phosphoric is indicated as usual in parts consumed per 1000 parts of brix in mixed juice.

TABLE N

Parts per 1000 Parts of Brix

	1950-53 included	Sulphur 1954	Defecation 1954
Lime			
Average	19.10	17.44	4.20
Maximum ...	27.58	26.81	4.70
Minimum ...	11.61	13.24	4.07
Sulphur			
Average	7.60	7.16	—
Maximum ...	10.90	11.74	—
Minimum ...	4.19	5.68	—
Phosphoric			
Average	2.53	2.12	0.90
Maximum ...	6.81	4.43	0.99
Minimum ...	0.19	0.87	0.87

Lime (*Sulphitation*). This year the maximum consumption was twice the minimum consumption against two and a half times during the 1950-53 period. The lowest line-consumption in 1954 is shown by Darnall, viz. 13.24 p/1000 p, while the lowest figure during the 1950-53 period was achieved by Doornkop in 1953, viz. 11.61 parts of lime per 1000 parts of brix.

Sulphur (*Sulphitation*). The maximum sulphur consumption has been twice the minimum consumption of 5.68 parts/1000 parts brix which was attained by Darnall. In the 1950-53 period Doornkop achieved the lowest consumption, viz. 4.19 in 1953.

Phosphoric (*Sulphitation*). The lowest phosphoric consumption in the 1950-53 period was 0.19 parts/1000 parts brix, attained in 1951 by Umfolozi. This year Umfolozi heads the list again; this time, however, with a consumption of 0.87 parts of phosphoric consumed per 1000 parts of brix in mixed juice.

Finally we tabulated separately the consumptions of chemicals of Illovo and Tongaat during the sulphitation and the defecation periods:

TABLE O

Sulphitation and Defecation Compared	Sulphitation		Defecation	
	Illovo	Tongaat	Illovo	Tongaat
Lime				
lbs. per ton of cane ...	5.80	4.49	1.26	1.25
lbs. per ton of sugar ...	51.62	37.74	10.37	10.17
Parts per 1000 parts brix	20.60	15.02	4.70	4.07
Sulphur				
lbs. per ton of cane ...	2.16	1.63	—	—
lbs. per ton of sugar ...	1.93	13.73	—	—
Parts per 1000 parts brix	7.68	5.47	—	—
Phosphoric				
lbs. per ton of cane ...	0.75	0.81	0.27	0.27
lbs. per ton of sugar ...	6.67	6.80	2.23	2.18
Parts per 1000 parts brix	2.66	2.71	0.99	0.87

We draw attention in particular to the drop in phosphoric consumption in the defecation periods of Illovo and Tongaat compared with the sulphitation period. When the chemistry of the clarification was scrutinized more closely than usual as a result of the defecation tests, it appeared that the phosphoric dose could be reduced considerably at these two factories. It is our opinion that in general too much phosphoric is used by the Natal raw sugar factories. The use of phosphoric and the adjustment of the quantity of phosphoric ought to be based on P_2O_5 determinations in mixed juice. Too high a dose of phosphoric leads to a bigger mud volume, which cannot be redressed by an increased lime and sulphur consumption.

TABLE VI

Comparative Results from Other Countries for Recent Years

In previous years, Table VI contained more than thirty items. We have cut the number this year to twenty-three to facilitate comparison. A number of data which had limited value for comparison purposes have been dropped; however, two more useful figures have been added, viz. brix per cent. first expressed juice, and Boiling House Performance.

The figure of brix per cent. first expressed juice has been added to the figure of purity of first expressed juice, because these two figures together give a better idea of the cane juice quality than purity alone does. The newly-added figure shows that brix of the first expressed juice of Natal cane is markedly higher than that of other reported countries. This implies that Natal's figure for sucrose per cent. bagasse cannot be used to compare milling efficiency of Natal with that of other countries. Since the fibre content of the cane of the reported countries differ, extraction cannot be used either; Lost Absolute Juice per cent. Fibre being the only remaining figure which can be used for comparison. The same applies to imbibition per cent. fibre compared with imbibition per cent. cane.

Boiling House Performance figures of all countries have been added, because Boiling House Recovery is not suitable since mixed juice purity varies from 79.7 to 85.6 and pol of sugar from 96.68° to 98.66°S. In addition to the factors affecting Boiling House Recovery, Overall Recovery is affected by the variations in fibre content of the cane (lowest figure 11.58 per cent. and highest figure 16.31 per cent.). The same applies to Tons of Cane per Ton of Sugar and to Tons of Cane per Ton of 96° Sugar.

Table I.—CANE CRUSHED, CANE QUALITY, VARIETIES, SUGARS PRODUCED, TIME ACCOUNT AND THROUGHPUT.

FACTORY	PG	UF	ZM	FX	EN	AK	DK	DL	GL	MV	CK	TS	NE	IL	RN	SZ	UK	Totals Averages
Crushing period From	9.8.54	4.6.54	3.5.54	3.5.54	2.6.54	4.5.54	20.5.54	10.5.54	26.5.54	18.5.54	21.4.54	20.4.54	5.5.54	17.5.54	19.5.54	21.6.54	11.6.54	20.4.54
To	25.2.55	17.2.55	15.2.55	28.2.55	25.1.55	27.2.55	12.2.55	13.3.54	19.1.55	12.2.55	23.1.55	23.12.54	8.1.55	17.12.54	17.1.55	10.2.55	9.12.54	13.3.55
CANE CRUSHED Tons of 2,000 lbs.	145,900	731,919	601,730	568,850	73,409	551,368	175,084	941,618	452,436	193,196	226,214	842,706	756,424	237,458	189,738	509,855	98,900	7,296,805
Metric tons	132,353	653,986	545,830	516,052	66,596	500,193	158,833	854,222	410,443	175,265	205,218	764,489	686,216	215,418	172,128	462,533	89,720	6,619,554
CANE QUALITY																		
Sucrose per cent.	14.76	13.27	13.48	12 51	13.15	13.13	12 79	13 05	13.36	13.22	13.20	13 66	13.70	13 31	13 70	13.61	13.81	13.34
Fibre per cent.	12.85	12 83	16.91	15 72	15 83	16.47	16.19	16 04	16.61	15 93	16 19	16.11	17.73	16 50	17 08	16.67	15.04	16.03
Java Ratio	81 50	80.47	77.06	76 02	76 01	78.22	77.57	76 55	76.36	77.76	77 59	76 58	76 21	77.41	75.44	78.08	81.28	77.39
Tons Cane per ton Sugar	8 32	2.89	8 87	9.66	9 30	8.94	9.70	9.22	8 96	8 92	9 22	8.28	8 76	—	8 61	8 58	8.38	8 87
Tons Cane per ton Sugar of 96° polarization	8 05	8.70	8.65	9 43	9.01	8 73	9.41	9 03	8 63	8 73	8 90	8 10	8.44	8 54*	8 35	8.31	8.18	8 65
VARIETIES CRUSHED																		
Miscellaneous per cent.	0.02	—	0.14	6.15	0.01	0.74	0 09	2.15	7.27	0 43	10 43	0.40	0 54	0.01	0 10	0.20	0.74	1.74
Co.281 per cent.	2.49	2.03	11.41	5 58	1 03	1.43	0.14	0 92	0 10	0 40	0.12	0 35	0 48	2.06	0.38	1.73	12.26	2.34
Co.301 per cent.	0 53	2.76	7.86	17 57	1.88	7.04	16.06	21.85	25.46	31.49	26 37	23.20	44.72	12.72	34 04	41.93	10.02	20.97
Co.331 per cent.	11.76	1 57	13 81	18.94	53.49	52.90	39 54	33 94	16.83	29.13	32.12	27 97	16.15	38.09	22.11	34.55	33.90	25.27
N:Co.310 per cent.	85.20	91.38	66.66	51.64	43.59	37.89	44 17	41.14	50 33	38 55	30.96	48.08	38 03	47.12	43.42	21.53	42.74	49.41
P.O.J.s per cent.	—	2.26	0.12	0 12	—	—	—	—	0 01	—	—	—	0 08	—	—	0.06	0.34	0.26
TOTAL RAINFALL, Year 1954 (ins.)	26 08	33.76	55.33	67.29	43 57	47.00	50 28	49.22	50 43	47.85	54.10	42 87	41.92	34 50	39.86	37.28	49.24	45.33
SUGARS																		
Tons of 2,000 lbs. White Sugar	10,507	—	—	—	4,185	—	8,441	—	28,384	—	13,793	—	70,041	—	11,220	33,049	31	—
Tons of 2,000 lbs. Government Grade	7,022	14,382	30,364	175	1,694	27,818	5,008	5,628	5,821	4,350	1,792	11,747	16,335	5,630	4,162	5,774	7,219	163,921
Tons of 2,000 lbs. Raw Sugar	—	67,921	23,486	53,681	2,013	33,855	4,599	96,537	16,279	17,296	8,959	90,054	—	6,960	6,651	20,585	5,456	—
Sugar made and estimated Tons of 2,000 lbs.	17,529	82,303	67,850	58,856	7,892	61,673	18,048	102,165	50,484	21,646	24,544	101,799	86,799	27,798	22,033	59,408	11,796	822,201
Metric tons	15,902	74,664	61,552	53,394	7,160	55,949	16,373	92,683	45,798	19,639	22,266	92,351	78,359	25,218	19,988	53,894	10,701	745,888
White Sugar per cent. Total Sugars Made	60	—	—	—	53	—	47	—	56	—	56	—	81	*	51	56	—	—
SO_2 p.p.m. in White Sugar	56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	60	—	—
SO_2 p.p.m. in Government Grade	74	120	62	50	—	99	—	76	72	—	—	—	—	—	—	75	—	—
Safety Factor of Raw Sugar	—	0 31	0 32	0 30	—	0 34	0.40	0 23	—	0 34	—	0 34	—	0.22	—	—	—	—
Polarization of Goverament Grade	98.00	98.16	98 58	98.43	98 51	98 30	98 2	98 17	98 16	98 19	—	98.17	—	98.36	98 23	98.43	98.39	98.28
Polarization of Raw Sugar	—	98.13	98.27	98.36	98 29	98 30	98 2	98.04	98.16	98.15	—	98.16	—	98.23	98.17	98.15	98.39	98.21
Average Polarization of All Sugars	99.25	90.14	98 45	98.36	99.14	98.30	98.94	98.05	99.73	98.16	99.76	98.16	99 56	96	99.02	99.17	98.39	98 51
OVERALL TIME EFFICIENCY (Hours Actual Crushing per cent. Hours Mill Open)	73.46	92.25	92.02	91.06	95.66	85 62	81.59	86.53	95.26	88.45	93.17	92.86	97.81	83.50	93.57	87.13	88.43	90.00
Hours of Stoppage due to Shortage of Cane per cent. Hours Mill Open	4.37	3 81	4 35	5 06	2.92	6.16	12.01	7.28	1.94	5 98	2.82	3.34	0 57	13.09	4.36	6.90	10.45	5.20
Total Hours of Stoppage per cent. Hours Mill Open	26.54	7.75	7.98	8.94	4.34	14.38	18.41	13.47	4.74	11.53	6.83	7.14	2.19	16.50	6.43	12.87	11.57	10.00
THROUGHPUT per hour crushing																		
Tons of Cane Crushed	49.35	151.47	112.93	99 71	15.85	103.45	40.37	170.65	96.71	40 35	43.32	173.54	152 34	64.35	42.05	123.77	30.70	92.92
Tons of Fibre crushed	6.34	19.44	19.09	15.67	2.51	17.03	6 53	27.36	16.06	6.43	7.01	27.96	27.01	10.62	7.18	20.63	4.62	14.90
Tons of Brix processed	7.77	22.05	16.19	13.47	2.19	14.56	5.51	23.29	13–55	5.69	5.97	26.24	22.86	9.33	6.29	18.05	4.64	13.34
Tons of Sugar bagged	5.93	17.03	12.73	10.32	1.70	11.57	4.16	18.51	10.79	4.52	4.70	20.96	17.40	7.53	4.88	14.42	3.66	10.47

*Illovo's figures refer to rawhouse operations and are based on sugar of 96°. Part of the raw sugar has been remelted and round 14,000 tons of refined sugar have been manufactured.

Table II.—SUCROSE BALANCE, RECOVERIES, BAGASSE, JUICES, FILTER CAKE AND SYRUP.

FACTORY	PG	UF	ZM	FX	EN	AK	DK	DL	GL	MV	CK	TS	NE	IL	RN	SZ	UK	Averages
SUCROSE BALANCE (Sucrose per cent. Sucrose in Cane)																		
Sucrose in Bagasse (A)	7.76	6 92	8.71	9 33	8 60	8 17	9.00	9 84	8.40	8 24	8 92	4.78	5.98	7 52	6.63	6 38	6.85	7.60
Sucrose in Filter Cake (B)	0 78	0.91	0 49	0 48	1 17	0 49	0.73	0 87	0 54	0 35	0.46	0.13	0 54	0 31	0 39	—	0.35	0.54
Sucrose in Final Molasses (E)	8 10	7.94	7 50	7 66	7 61	6 85	8.38	6 68	6 77	6 86	—	6.94	7.09	7.33	8 33	—	—	7.22
Undetermined Losses (D)	2 59	1 06	0 95	1.17	1 54	0 74	2.17	1.12	1.54	1.34	—	1.36	3 30	0.45	0.74	—	—	1.44
Sucrose lost in Boiling House (B)+(C)+(D)	11 47	9 92	8 94	9 31	10 32	8 00	11 28	8.67	8 85	8 55	9 38	8.43	11 01	8 09	9.46	8.70	8.17	9.20
Total of all losses (A)+(B)+(C)+(D)	19 23	16 84	17 65	18 64	18 92	16 25	20 28	18 51	17.25	16.79	18.30	13.21	16.99	15 61	16.09	15 08	15.02	16.80
LOST ABSOLUTE JUICE PER CENT. FIBRE	60 2	51 6	47.7	54 2	50 5	45 0	49 2	56.7	46 0	46 6	49 8	29.1	31 8	43 0	35 6	37.1	43.6	44 08
BOILING HOUSE PERFORMANCE	94 6	97.1	97.6	98 2	95 9	98 7	95.1	97.3	97 2	97.9	96.6	98.4	95.9	99.1	97 5	97.5	99.2	97.43
Imbibition Water per cent. Fibre	158	151	194	195	231	204	166	166	137	206	177	192	225	217	227	211	250	191.41
Imbibition Water per cent. Cane	20.2	19 4	32 8	30 7	36 6	33 5	26.9	26.6	22.8	32 9	28 6	31.0	40.0	36.2	38.8	35.2	37.6	30.68
EXTRACTION	92 2	93 1	91.3	90 7	91 4	91 8	91.0	90 2	91.6	91 8	91.1	95 2	94 0	92.5	93.4	93.6	93.2	92.40
BOILING HOUSE RECOVERY	87 6	89 4	90 2	89 7	88 7	91 2	87.6	90 4	90 3	90 7	89.7	91.1	88 3	91.2	89.9	90.7	91.2	90 04
OVERALL RECOVERY	80 8	83 2	82.4	81.4	81.1	83.8	79 7	81.5	82.8	83 2	81.7	86 8	83.0	84.4	83.9	84.9	85 0	83.20
FINAL BAGASSE																		
Sucrose per cent. Bagasse	3.75	2 98	2 95	3 07	3 34	2 72	3 21	3.26	2.97	3 01	3.14	1 87	2.13	2.79	2.48	2.33	2.97	2.75
Moisture per cent. Bagasse	52 93	51 49	53.70	54 62	48 93	54.70	50.85	55.14	52.32	52.16	53 00	51.27	51 05	50 20	50 05	52.09	48.64	52.92
Fibre per cent. Bagasse	42 05	41 63	42 43	41 38	46 78	41.83	45.15	40.65	43.94	44.07	43 09	46.16	46.06	46.05	46.71	44.76	47.38	43.50
Weight per cent. Cane	30 55	30.82	39 84	37 99	33 84	39.36	35 85	39.45	37 81	36 15	37 58	34.90	38 49	35 84	36 57	37.23	31.76	36 84
Lower Calorific Value (7,650−18S−36.4W Btu/lb.)	**3009**	**2388**	**2357**	**2378**	**3302**	**2375**	**2199**	**2827**	**3076**	**3089**	**3014**	**3187**	**3231**	**3202**	**3281**	**3107**	**3394**	**3028**
FIRST EXPRESSED JUICE																		
Brix	20 46	19 07	19 95	18 88	19.28	19 08	18.74	19.42	19.93	19 40	19.30	20.29	20.40	19.65	20.41	19 68	19.39	19.61
Purity (Apparent)	88 5	86.4	87.7	87.2	89.7	88 0	87.6	87.8	87.6	87 6	88.2	87.9	88.1	87.5	89.0	88 6	87.6	87.94
LAST EXPRESSED JUICE																		
Brix	5 03	3 51	3.43	3.52	1.99	3 85	4.67	4 10	6.15	2.86	3.72	2 44	2.14	2.29	3.52	3 54	3.86	3.60
Purity (Apparent)	75 0	77 5	76.1	76 6	77.9	78 5	80 3	77.4	79.2	80.2	79 8	72 8	74 4	74.4	76.8	74.3	74 6	76 81
Purity Drop from First Expressed Juice	13 5	8.9	11 6	10 6	11 8	9.5	7.3	10.4	8 4	7.4	8.4	15 1	13.7	13.1	12.2	14.3	13.0	11.13
MIXED JUICE																		
Brix	17 56	16 04	15 43	14 58	13 46	14 95	14.99	15 65	16.49	14.57	15.14	15.74	14.79	14 51	14.62	14.89	14.27	15.30
Purity (Gravity)	86.4	84 8	85 8	83 9	86 8	85 6	85.3*	86.2	87.4	86.0	87.2	86.0	85 8	85 0	85 6*	87.3	85.1*	85 86
Reducing Sugar/Sucrose Ratio	2 41	2 68	3 80	3 77	2 99	4 07	—	3 58	3.14	3 63	3 31	—	3 03	3 68	2.75	3.27	—	3.28
Purity Drop from First Expressed Juice	2.1	1 6	1 9	3 3	2 9	2 4	2.4	1.6	0.2	1.6	1.0	1.9	2 3	2.6	3 4	1.3	2. 5	2.08
CLARIFIED JUICE																		
Brix	18.82	15 18	15 90	13 33	12 60	14 29	15 74	14.72	16.19	14.16	15 13	15 39	14 02	14.65	16 50	14.16	—	14.80
Purity (Apparent)	87.0	86 2	86 4	85 8	88 1	86 7	86.8	86 9	88.4	86.6	88.0	87.1	92 5	86 8	86.2	87.9	85.6	86.91†
Reducing Sugar/Sucrose Ratio	2.22	2 55	3.20	3 25	2 71	3 79	—	3 62	—	3.40	—	—	1 43	3 09	2.73	3.08	—	3.14†
pH	7 2	7 2	7.4	7.4	7.0	7.3	6 8	7 1	6.8	7.2	6.8	7.4	6 9	—	7 0	7 0	7.4	7.1
FILTER CAKE																		
Sucrose per cent. Cake	2 11	2 06	1 33	0 95	2 10	1 06	1.77	2 06	1.49	0 93	1.23	0 37	0 65	1.04	0 83	0.94	1.02	1.18
Weight of Cake per cent. Cane	5 46	5 87	5	7.41	7.32	6 05	5 29	5 54	4 84	5	4 98	4 86	11 54	4	6 40	—	4.73	5.48†
SYRUP																		
Brix	54 79	54.71	51 97	53.77	59.17	53.33	50 00	53.91	48.75	50 69	52.80	48 07	58 92	62 88	58 88	57.64	51.59	54.19
Purity (Apparent)	86.5	86 5	86 4	85 9	88 4	87 0	88.2	87 0	89.1	87 5	88.2	87.1	92 2	86 6	86 3	87.7	85.7	87.13†
Reducing Sugar/Sucrose Ratio	1.89	2.48	3 09	2.92	2.91	3 58	—	3.38	3.10	3.20	—	—	1.43	2 90	2.82	2.73	—	3 01†
pH	7.0	6 9	7 1	7 1	—	7.2	6 7	6 8	6 8	7 0	6 6	—	7.0	—	6 8	6.6	7.1	6.9

*Apparent Purity †Exclusive Natal Estates

Table III.—MASSECUITES AND MOLASSES, CHEMICALS.

FACTORY	PG	UF	ZM	FX	EN	AK	DK	DL	GL	MV	CK	TS	NE	IL	RN	SZ	UK	Averages§
A-MASSECUITE																		
Cub. feet per ton of Brix‡	25.50	24.58	19.67	20.16	20.42	22 66	29 25	29.41	25.24	26.19	—	20.60	38.62	26.62	20.45	22.08	24.87	22 77
Brix of Massecuite	92.9	93 5	93.7	92.8	91.9	91.9	90 1	92.6	90.6	91.4	91 0	93.3	90 7	92.4	93.3	91.8	92 5	92.2
Purity of Massecuite	82.6	84.0	86.1	83.0	88.9	84 5	88.4	84.8	89.7	83.4	89.1	87.6	94.1	86.9	85.6	87 0	85 6	86.3
Purity of Molasses	66.3	63 8	65.0	64 8	78.7	65 5	73.4	67.3	73 3	63 9	73.1	69.1	85 4	69 0	68 0	70.7	66.3	68.8
Drop in purity	16.3	20.2	21 1	18.2	10 2	19 0	15 0	17.6	16 4	19.5	16 0	18 5	8.8	17 8	17.6	16.2	19.2	17.5
Crystal per cent. Massecuite	45.0	52.2	56.5	48.0	43.9	50.6	50 8	49.7	55 7	49.3	54.1	55 8	54.6	53.2	51.3	50.9	52.8	51.7
B-MASSECUITE																		
Cub. feet per ton of Brix‡	6.35	10.14	11.16	9.87	10.29	11.87	10 81	11.13	11.04	12.79	—	10.38	21.20	10.69	9 87	11.23	8.60	10.83
Brix of Massecuite	97.8	96.6	97 5	96.6	94.7	95 8	93.7	96.0	98.0	94.6	95.8	95.7	94.2	94.0	97 7	95.1	94.9	95.8
Purity of Massecuite	70.2	71.6	71 0	70 9	73 5	70 6	75.2	71.6	73.7	69.5	73 8	75 2	84.9	76.8	72 3	74.6	76.2	73.1
Purity of Molasses	48.3	47.4	43.2	45.2	55 0	45 0	52.8	46.8	47.5	46.6	48 8	50 2	64 8	52.5	49.7	48 8	54.2	48.2
Drop in Purity	21.9	24.2	27.8	25 7	18 5	25 6	22.3	24.7	26.2	22 9	25 0	25 0	20 1	24.2	22.6	25 8	22.0	24.9
Crystal per cent. Massecuite	41.5	44.4	47.7	45.3	39.0	44.6	44.4	44.7	47.4	40 5	46.8	48.0	53.8	51.0	43.9	48.0	45.6	45.0
C-MASSECUITE																		
Cub. feet per ton of Brix‡	7.48	7.22	7.27	6 81	8.44	6.86	8.58	6 70	6.70	6 63	—	6 71	8.06	7.73	9.64	7.15	8.96	7.14
Brix of Massecuite	100.1	99 5	99.8	97.7	97.0	97.2	96.0	98.0	95 0	97.3	97.3	98.4	98.4	95.8	100.3	99.0	98.0	97.8
Purity of Massecuite	62.0	59.7	58.6	58.0	62.4	59.0	62.9	59 3	60.4	56 8	61.3	62.1	71.0	60.7	58 5	59.2	59.1	59.9
Purity of Molasses	41.8	37 5	36 8	38.8	41.7	37.6	39.3	37.5	38.2	39 7	39.2	38.5	46.5	39.3	38.5	37.6	38.5	38.6
Drop in Purity	20.2	22 2	21.8	19.2	20.7	21.4	23.6	21.7	25 8	17.1	22.2	23.6	24 5	21.4	20.0	21.6	20.6	21.3
Crystal per cent. Massecuite	34.7	35.4	34.4	30.6	34.4	33.3	37.4	34.1	39.7	28.4	35.4	37.7	45.1	33.8	32.6	34.3	32.8	33.9
TOTAL CUB. FEET OF ALL MASSECUITES																		
Per ton of Sugar Made	52.28	54.30	48.45	48.20	50 37	52.11	64.42	51.20	53 95	57.37	55.74	47.18	89.22	55.79	51.46	51.98	53.78	51.70
Per ton of Brix‡	39.87	41.94	38.10	36.86	39.15	41.40	48.65	40.70	42.97	45.86	43.86	37.69	67.88	45.04	39.96	41.53	42.45	40.85
FINAL MOLASSES																		
Brix	88 5	94 0	95.0	88.4	84 0	88.1	85.3	90.3	84.8	88 2	87.1	90.8	89.0	85 8	90.4	90.6	92.7	89.7
Gravity Purity	41.8	38.9	37.8	38.8	41.7*	38.9	39.3*	37.3	38.7	39.7	39.2	38 5	47.2	40 5	38.6*	36.8	38.5*	39.29
Reducing Sugars	—	16.47	12.73	12.33	—	14.47	—	14.25	11.34	12 68	—	12.20	8 41	13.07	—	—	—	—
Sulphated Ash	—	18.55	15.97	15.78	—	11 54	—	13.42	—	—	—	—	14.41	13 36	—	—	—	—
Reducing Sugars/Ash Ratio	—	0 89	0.80	0.78	—	1.25	—	1.06	—	—	—	—	0 58	0.98	—	—	—	—
Weight of Molasses (at 85 per cent. Brix) per cent. Cane	3.23	3.19	3.15	2.90	2.82	2.73	3.20	2.75	2.75	2 69	—	2.89	2.42	2 83	3.48	—	—	2.88
CONSUMPTION OF CHEMICALS																		
Lime—lbs. per ton of Cane	6.17	4 90	5.72	4.73	7.42	4.33	4.66	3.62	4 80	5 00	5.13	2.81	—	2.85	5 52	6.95	5.76	4 63
lbs. per ton of Sugar	51.37	48.44	50.73	45.84	69.01	38.70	45.21	33.32	43 02	44.63	47.28	23 30	—	24.35	47.56	59.65	48.32	41 14
parts per 1,000 parts of Brix‡	19.59	16.83	19.95	17.48	26.81	15.37	17.07	13.24	17.13	17.74	18 60	9 31	—	9.82	18.47	23.83	19.07	16.20
Sulphur—lbs. per ton of Cane	2.53	2.11	2.23	1.77	3.25	1.71	1.87	1.55	2 02	2.12	2.35	0 79	—	0.76	2.39	3.04	2.00	1.85
lbs. per ton of Sugar	21.11	18.77	19.76	17.11	30.22	15.27	18.17	14.29	18 06	18 94	21.65	6.54	—	6.46	20.57	26.11	16.78	16 48
parts per 1,000 parts of Brix‡	8.05	7.25	7.77	6.55	11.74	6.07	6.86	5.68	7.19	7.53	8.52	2.61	—	2.61	7.99	10.43	6.62	6.49
Phosphoric—lbs. per ton of Cane	0.45	0 25	0 66	0 56	0.69	0 50	1.21	0.31	0.84	0 50	1 00	0.79	—	0.43	0.67	0.96	0.77	0.57
lbs. per ton of Sugar	3.76	2.25	5 90	5.42	6.42	4.47	11.75	2 87	7.49	4.46	9.22	4.38	—	3.72	5.80	8.28	6.44	5.09
parts per 1,000 parts of Brix‡	1.44	0 87	2.32	2 07	2 49	1.78	4.43	1.14	2.98	1.77	3 63	1.75	—	1 50	2 25	3.31	2 54	2.00

*Apparent Purity ‡Present in Mixed Juice

§NOTE.—All averages are exclusive of Natal Estates' figures, with the exception of the averages referring to Final Molasses

Table IV.—COMPARATIVE RESULTS OF FINAL DATA FOR RECENT YEARS.

COUNTRY	SOUTH AFRICA									
YEAR	1945.	1946.	1947.	1948.	1949.	1950.	1951.	1952.	1953.	1954.
CANE										
Sucrose per cent....	14.28	14.21	13.32	13.89	13.52	14.19	13.33	13.87	13.93	13.34
Fibre per cent.	15.99	16.21	15.80	15.90	16.19	15.80	16.28	16.10	16.31	16.03
JAVA RATIO	77.36	77.03	76.99	76.98	76.47	77.42	76.56	77.04	77.07	77.39
JUICE QUALITIES										
Purity of First Expressed Juice	88.36	88.22	88.48	88.12	88.64	88.70	87.60	88.60	87.48	87.94
Purity of Last Expressed Juice	75.9	75.1	75.0	75.5	67.2	75.8	74.5	76.2	76.46	76.81
Purity of Mixed Juice	86.23	85.9	86.24	85.92	86.22	86.40	84.92	86.25	85.61	85.86
Purity of Syrup	87.82	87.44	87.98	87.54	87.93	87.60	96.20	87.65	86.46	87.13
Purity Drop First to last Expressed Juice	12.42	13.08	13.45	12.58	12.48	12.90	13.10	12.40	11.02	11.13
Purity Drop First to Mixed Juice	2.13	2.36	2.24	2.20	2.42	2.30	2.68	2.35	1.87	2.08
Purity Drop First to Syrup	0.52	0.75	0.47	0.56	0.71	1.10	1.40	1.20	1.02	1.27
Purity Increase Mixed Juice to Syrup	1.61	1.60	1.75	1.64	1.71	1.30	1.30	1.40	0.85	0.81
Reducing Sugar/Sucrose Ratio of Mixed Juice	3.38	3.30	2.95	3.67	3.11	3.12	3.52	2.92	3.66	3.28
Reducing Sugar/Suctose Ratio of Syrup	2.84	2.80	2.62	3.07	2.55	2.81	3.25	2.66	3.31	3.01
EXTRACTION AND RECOVERIES										
Sucrose lost in manufacture % Cane	2.42	2.42	2.26	2.33	2.25	2.32	2.33	2.26	2.39	2.24
Sucrose in Sugar % Sucrose in Cane (Overall Rec.)	83.30	82.94	83.73	83.19	83.35	83.65	82.50	83.66	82.81	83.20
Sucrose in Mixed Juice % Sucrose in Cane (Extraction)	93.28	93.07	93.44	93.32	92.94	93.33	92.98	93.00	92.67	92.40
Sucrose in Sugar % Sucrose in Mixed Juice (B.H. Rec.)	89.29	89.12	89.61	89.14	89.68	89.63	88.72	89.96	89.36	90.04
Imbibition % Fibre	219	217	218	214	208	206	215	217	200	191
Imbibition % Cane	35.0	35.2	34.4	34.1	33.7	32.8	35.0	34.9	32.7	30.7
Lost Absolute Juice % Fibre in Bagasse	39.3	40.5	39.8	39.8	41.0	39.3	40.2	40.9	41.7	44.1
Boiling House Performance	96.4	96.7	96.8	96.5	96.9	96.88	96.66	97.2	96.91	97.43
BAGASSE										
Sucrose per cent....	2.77	2.79	2.54	2.67	2.66	2.72	2.57	2.65	2.75	2.75
Moisture per cent.	50.19	50.32	50.46	50.53	50.84	51.22	51.71	52.53	52.47	52.92
Lower Calorific Value	*3264*	*3252*	*3244*	*3236*	*3209*	*3176*	*3136*	*3063*	*3067*	*3028*
FILTER CAKE										
Sucrose per cent....	1.13	0.96	1.06	1.29	1.12	1.20	1.28	0.94	1.05	1.18
Weight % Cane	5.64	5.91	5.99	5.90	5.91	5.51	5.68	6.34	5.86	5.48
GRAVITY PURITY OF FINAL MOLASSES	41.98	41.75	41.10	41.53	41.39	40.50	40.28	39.33	39.46	39.29
Average Polarisation of All Sugars	98.73	98.70	98.83	98.93	98.84	98 77	98.80	98.63	98.66	98.51
YIELD										
Tons Cane per Ton Sugar	8.29	8.36	8.84	8.55	8.76	8.32	8.98	8.50	8.55	8.87
Tons Cane per Ton 96° Sugar	8.08	8.14	8.60	8.31	8.52	8.09	8.73	8.27	8.32	8.65
SUCROSE BALANCE										
Sucrose in Bagasse % Sucrose in Cane (A)	6.72	6.93	6.56	6.68	7.06	6.67	7.01	7.00	7.33	7.60
Sucrose in Filter Cake % Sucrose in Cane (B)	0.35	0.28	0.32	0.36	0.34	0.37	0.52	0.43	0.49	0.54
Sucrose in Molasses % Sucrose in Cane (C)	—	—	—	—	—	7.97	8.61	7.45	7.78	7.22
Undetermined Sucrose % Sucrose in Cane (D)	9.63	9.85	9.39	9.77	9.25	1.34	1.36	1.46	1.59	1.44
Boiling House Losses % Sucrose in Cane (B) + (C) + (D)	9.98	10.13	9.71	10.13	9.59	9.68	11.28	9.34	9.86	9.26
Total Losses % Sucrose in Cane (A) + (B) + (C) + (D)	16.70	17.06	16.27	16.81	16.65	16.35	17.50	16.34	17.19	16.80

Table V.—AVERAGE MANUFACTURING RESULTS BY MONTHLY PERIODS FOR S.A. SUGAR FACTORIES REPORTING TO THE SUGAR MILLING RESEARCH INSTITUTE, SEASON 1954-1955.

Period ended		29 May, 1954	26 June, 1954	31 July, 1954	28 Aug., 1954	2 Oct., 1954	30 Oct., 1954	27 Nov., 1954	1 Jan., 1955	29 Jan., 1955	26 Feb., 1955	13 Mar., 1955
Tons of 2,000 lbs. Cane Crushed	This period	—	700,602	1,001,833	832,238	1,031,089	753,319	787,749	889,309	514,857	280,049	301,047
	To date	467,713	1,168,315	2,170,148	3,002,386	4,033,475	4,786,794	5,574,543	6,463,852	6,978,709	7,258,758	7,296,805
Tons of 2,000 lbs. Sugar Made and Estimated	This period	—	76,138	114,958	98,868	124,819	88,832	89,090	96,866	54,104	27,290	3,567
	To date	47,569	123,707	238,665	337,633	462,452	551,284	640,374	737,240	791,344	818,634	822,201
Tons of Cane per Ton of Sugar	This period	—	9.20	8.71	8.42	8.25	8.48	8.84	9.18	9.52	10.26	10.66
	To date	9.83	9.44	9.09	8.90	8.72	8.68	8.70	8.77	8.82	8.87	8.87
Sucrose per cent. Cane	This period	—	12.79	13.42	13.94	14.26	13.90	13.37	13.03	12.70	12.00	11.32
	To date	12.19	12.55	12.95	13.23	13.50	13.56	13.53	13.46	13.41	13.35	13.34
Fibre per cent. Cane	This period	—	15.97	15.90	15.84	16.01	15.95	16.09	16.38	16.05	16.00	16.11
	To date	16.03	16.00	15.95	15.92	15.95	15.95	15.97	16.03	16.03	16.03	16.03
Java Ratio	This period	—	78.05	78.32	76.74	77.27	77.23	76.81	76.70	77.53	77.56	78.07
	To date	78.22	78.12	78.22	77.78	77.65	77.58	77.47	77.37	77.38	77.39	77.39
Sucrose per cent. Bagasse	This period	—	2.55	2.68	2.79	2.87	2.81	2.78	2.73	2.97	2.95	2.76
	To date	2.32	2.46	2.56	2.62	2.69	2.71	2.72	2.72	2.74	2.75	2.75
Moisture per cent. Bagasse	This period	—	52.50	52.62	52.56	52.60	52.63	52.82	53.02	54.14	55.49	56.74
	To date	52.50	52.50	52.56	52.56	52.57	52.58	52.62	52.67	52.78	52.90	52.92
Imbibition per cent. Cane	This period	—	31	31	30	30	30	30	31	29	30	29.50
	To date	33	32	32	31	31	31	31	31	31	31	30.68
Extraction	This period	—	92.8	92.3	92.7	92.6	92.6	92.3	92.1	91.1	90.3	90.06
	To date	93.1	92.9	92.8	92.8	92.8	92.7	92.7	92.6	92.5	92.4	92.40
Boiling House Recovery	This period	—	90.1	90.6	90.7	90.3	89.9	90.6	89.5	89.6	88.3	90.29
	To date	88.2	89.4	90.0	90.2	90.2	90.2	90.2	90.1	90.1	90.0	90.04
Overall Recovery	This period	—	83.6	84.0	84.1	83.6	83.3	83.6	82.4	81.6	79.7	81.32
	To date	82.2	83.1	83.5	83.7	83.7	83.6	83.6	83.5	83.3	83.2	83.20
Purity of Mixed Juice	This period	—	85.4	86.1	86.1	86.7	86.8	86.4	85.4	84.8	83.7	83.43
	To date	84.3	85.0	85.5	85.7	86.0	86.1	86.1	86.0	85.9	85.9	85.86
Reducing Sugar/Sucrose Ratio of Mixed Juice	This period	—	3.49*	3.20*	3.13*	2.94*	2.69*	2.90*	3.63*	4.01*	4.50	5.83
	To date	4.32*	3.67*	3.48*	3.36*	3.22*	3.11*	3.10*	3.12*	3.25*	3.26	3.28
Gravity Purity of Final Molasses*	This period	—	39.1*	38.7*	38.7*	40.0*	40.7*	40.5*	39.4	38.6*	39.0	37.05
	To date	38.7*	39.0*	38.8*	38.8*	39.1*	39.5*	39.7*	39.6	39.6*	39.3	39.29

*Arithmetical Average

Table VI—COMPARATIVE RESULTS FROM OTHER COUNTRIES FOR RECENT YEARS.

COUNTRIES	British Guiana		Jamaica		Mauritius		Philippines		South Africa	
YEARS	1952	1953	1953	1954	1952	1953	1951/52	1952/53	1953/54	1954/55
CANE										
Sucrose per cent.	10.88	10.54	12.18	11.94	13.26	12.96	12.67	12.63	13.93	13.34
Fibre per cent....	14.82	15.13	14.31	14.04	11.84	11.65	11.71	11.58	16.31	16.03
JUICES										
Brix % of First Expressed Juice	17.45	17.02	18.38	17.97	18.69	18.42	18.69	18.66	20.56	19.61
Purity of First Expressed Juice	82.5	82.0	84.0	83.8	88.3	87.2	83.9	84.4	87.5	87.9
Purity of Last Expressed Juice	75.7	74.7	76.4	75.9	74.5	74.3	76.5	77.0	76.5	76.0
Gravity Purity of Mixed Juice	80.3*	79.7*	82.2*	82.0*	85.9	85.1	83.3	83.9	85.6	85.9
Reducing Sugar/Sucrose Ratio	8.70	8.85	7.95	8.20	4.0	5.1	—	—	3.66	3.28
MILLING FIGURES										
Imbition per cent. Fibre	159	156	134	140	184	167	115	100	200	191
Lost Absolute Juice per cent. Fibre	**49.7**	**48.3**	**33.4**	**35.9**	**42.5**	**44.8**	**60.3**	**62.5**	**41.7**	**44.1**
Imbition per cent. cane	23.6	23.7	19.2	19.6	21.8	19.5	13.5	11.6	32.7	30.7
Sucrose Extraction	91.4	91.4	94.4	94.5	95.0	94.8	92.5	92.5	92.7	92.4
Sucrose per cent. Bagasse	3.10	2.93	2.38	2.33	2.77	2.80	3.70	3.74	2.75	2.75
Moisture per cent. Bagasse	46.68	47.24	45.46	47.30	46.30	47.20	48.90	49.32	52.47	52.92
Lower Calorific Value of Bagasse	**3561**	**3516**	**3684**	**3521**	**3556**	**3525**	**3358**	**3321**	**3067**	**3028**
BOILINGHOUSE FIGURES										
Boiling House Performance	98.0	97.8	97.9	98.2	97.0	96.2	102.0	99.1	96 9	97.4
Boiling House Recovery	88.6	87.8	89.1	89.3	89.7	88.5	91.2	91.1	89.4	90.0
Undetermined Losses per cent. Sucrose in Cane	1.35	1.83	1.54	1.52	—	—	−0.43	0.48	1.59	1.44
AVERAGE POLARIÉATION OF ALL SUGARS	96.68	96.79	96.91	96.91	98.5	98.6	97.32	97.39	98.66	98.51
FILTER CAKE										
Sucrose per cent. Cake	1.81	1.83	2.46	2.02	6.2	6.1	3.41	2.83	1.05	1.18
Weight per cent. Cane	2.78	2.85	2.28	2.29	1.89	1.94	1.87	1.83	6.50	6.11
FINAL MOLASSES										
Gravity Purity	31.0*	31.0*	33.2*	32.4*	37.8	37.6	36.6	36.2	39.5	39.3
OVERALL RECOVERY	81.0	80.3	84.1	84.3	84.9	83.7	84.4	84.3	82.8	83.2
TONS CANE PER TON 96° SUGAR	10.91	11.35	9.37	9.53	8.52	8.83	9.12	9.08	8.32	8.65

**Apparent Purity*

Table VII—COMPARATIVE DATA OF REPORTING S.A. FACTORIES FROM 1925 TO 1954 INCLUSIVE.

	Per cent. Cane		Tons of Cane per ton of		Extraction	Boiling House Recovery	Overall Recovery	Imbibition		Bagasse		Lost Absolute Juice per cent. Fibre	Mixed Juice		Purity Final Molasses	Boiling House Performance	Number of factories reporting of factories in operation	Percentage of crop covered
	Sucrose	Fibre	Sugar	96° Sugar				Per cent. Cane	Per cent. Fibre	Per cent. Sucrose	Per cent. Moisture		Purity	Reducing Sugar Ratio				
1925	12.55	15.88	10.77	10.46	89.30	81.98	73.28	—	—	4.03	49.38	60.7	84.47	—	44.5	89.4	11 of 25	60.4
1926	12.23	16.01	9.92	9.74	90.86	81.97	74.48	—	—	3.53	**49.33**	52.8	84.65	—	45.3	88.8	13 of 23	73.3
1927	13.66	16.27	9.69	9.48	89.30	83.01	74.13	—	—	4.06	49.89	58.3	85.47	—	46.1	89.6	14 of 21	81.0
1928	13.75	15.88	9.49	9.30	89.47	83.90	75.06	26.3	166	4.10	50.01	59.8	84.90	3.86	45.3	90.8	14 of 25	83.3
1929	12.95	15.52	10.06	9.87	89.02	84.39	75.13	25.5	164	4.07	50.69	63.2	86.04	3.35	45.1	90.7	16 of 25	91.0
1930	13.66	15.82	9.59	9.40	89.78	83.80	74.77	26.6	168	4.20	50.66	57.4	85.88	3.35	45.9	90.2	17 of 23	94.9
1931	13.84	15.75	9.53	9.33	89.40	83.27	74.39	27.9	177	4.22	50.09	60.0	85.27	3.55	45.0	90.0	16 of 22	94.5
1932	13.48	15.65	9.61	9.40	89.86	84.27	75.73	29.7	190	3.83	51.89	58.4	85.30	3.09	45.1	91.1	16 of 23	94.4
1933	13.88	15.78	9.28	9.03	90.28	84.88	76.63	30.4	193	3.71	51.62	55.9	84.92	4.01	44.9	92.2	15 of 23	90.0
1934	11.88	15.24	10.67	10.40	91.07	85.20	77.59	30.2	198	3.05	52.11	57.7	84.02	4.21	45.6	92.9	17 of 23	96.5
Average ...	13.19	15.78	9.86	9.64	89.83	83.67	75.12	27.6	175	3.88	50.57	58.4	85.09	3.65	45.3	90.6	15 of 23	85.9
1935	13.65	15.92	19.19	8.96	90.64	86.52	78.40	33.0	208	3.48	51.93	54.2	86.49	**2.65**	46.6	93.0	17 of 23	97.1
1936	13.30	15.01	9.29	9.06	91.08	87.44	79.64	32.4	216	3.40	52.76	55.6	85.43	3.04	43.9	94.6	17 of 23	96.2
1937	13.92	15.14	8.80	8.58	91.53	87.85	80.41	31.8	210	3.40	52.01	52.4	85.60	3.23	43.7	95.0	17 of 23	96.4
1938	13.64	**14.51**	8.89	8.66	91.90	88.48	81.31	31.7	218	3.30	52.17	53.1	86.36	3.08	43.1	95.4	17 of 23	96.6
1939	13.41	14.85	8.95	8.73	92.24	88.88	81.98	31.3	211	3.11	51.79	49.6	86.46	3.27	42.7	95.7	19 of 22	98.5
1940	13.19	15.56	9.26	9.03	91.91	87.98	80.86	32.6	209	3.02	51.60	48.9	85.34	3.81	42.9	95.3	19 of 22	99.0
1941	14.00	15.66	8.62	8.39	92.37	88.40	81.66	34.8	222	3.03	51.50	45.1	85.67	3.35	43.4	95.6	19 of 22	98.5
1942	13.40	15.24	8.93	8.69	92.69	88.98	82.48	32.8	215	2.88	51.24	45.1	85.96	3.07	43.2	96.2	19 of 22	98.4
1943	13.14	15.26	8.98	8.74	92.97	88.84	83.52	31.6	207	2.76	50.80	43.8	**86.56**	3.18	41.8	96.7	19 of 22	98.6
1944	13.67	15.83	8.67	8.44	93.13	89.27	83.14	33.7	213	2.73	50.23	41.1	86.19	3.49	42.4	96.4	19 of 22	98.4
Average ...	13.53	15.30	8.96	8.73	92.05	88.36	81.34	32.6	213	3.11	51.60	48.9	86.01	3.22	43.3	95.4	18 of 22	97.8
1945	**14.28**	15.99	**8.29**	**8.08**	93.28	89.29	83.30	35.0	219	2.77	50.19	39.3	86.23	3.38	42.0	96.4	19 of 21	99.0
1946	14.21	15.21	8.36	8.14	93.07	89.12	82.94	**35.2**	217	2.79	50.32	40.5	85.86	3.30	41.8	96.7	19 of 21	99.2
1947	13.32	15.80	8.84	8.60	**93.44**	89.61	**83.73**	34.4	218	**2.54**	50.46	39.8	86.24	2.95	41.1	96.8	18 of 20	99.8
1948	13.89	15.90	8.55	8.31	93.32	89.14	83.19	34.1	214	2.67	50.53	39.8	85.92	3.67	41.5	96.5	18 of 20	99.1
1949	13.52	16.19	8.76	8.52	92.94	89.68	83.35	33.7	208	2.66	50.84	41.0	86.22	3.11	41.4	96.9	18 of 20	99.2
1950	14.19	15.80	8.32	8.09	93.33	89.63	83.65	32.8	206	2.72	51.22	**39.3**	86.40	3.12	40.5	96.9	17 of 19	99.2
1951	13.33	16.29	8.98	8.73	92.98	88.72	82.50	35.0	215	2.57	51.71	40.2	84.92	3.52	40.3	96.7	17 of 19	99.5
1952	13.87	16.10	8.50	8.27	93.00	89.96	83.66	34.9	217	2.65	52.53	40.8	86.25	2.92	**39.3**	**97.2**	17 of 19	99.3
1953	13.93	16.31	8.55	8.24	92.67	89.36	82.81	32.7	200	2.75	52.47	41.7	85.61	3.66	39.5	96.9	16 of 18	99.3
1954	13.34	16.03	8.87	8.65	92.40	**90.04**	83.20	30.7	191	2.75	52.92	44.1	85.86	3.28	**39.3**	97.4	17 of 19	99.2
Average ...	13.79	15.96	8.60	8.36	93.04	89.46	83.23	33.8	210	2.69	51.32	40.6	85.95	3.29	40.7	96.8	18 of 20	99.3

Mr. Perk: The time lapse between the last mill completing its crushing season and the beginning of the Annual Congress is becoming smaller and smaller each year. This year the last mill finished crushing on 13th March and within a fortnight the Annual Congress started. For this reason I want to thank all those Chief Chemists who sent us their final figures so promptly; in particular I want to again thank Mr. Odendaal of Darnall, which factory closed on Monday and whose final figures—Final Weekly, Final Monthly and Additional Final Figures—I received on Wednesday morning, so that Wednesday afternoon the draft could be sent to the printers.

Note 1—*Table B:* When we compare the 1928-34 mean with the mean 1935-44 mean, we must appreciate that there is a difference of 81-75 or 6 over 75 equals 5 per cent. between the Overall Recoveries of those two periods. The difference between the first period and the present one is 83–75 or 8 over 75 or nearly 10 per cent. This implies that to compare cane qualities with the aid of cane/sugar ratios, 10 per cent. has to be subtracted from the first period ratios. For this reason I suggest dispensing with the showing of cane/sugar ratios in this Table, which is in the first place a Table showing agricultural results.

Mr. du Toit (Chairman), said that merely to congratulate an author did not necessarily add to the value of the discussion, but he could not help but compliment him in this case. The author stated that thanks to Mr. Odendaal's assistance he was able to complete the Summary in time for the Congress. Mr. du Toit felt that Mr. Perk was to be congratulated on completing the Summary in so short a time —two days after the last mill stopped crushing.

The way in which the Tables had been presented and explained was also a matter of which Mr. Perk could justly be proud. The introduction of the figures shown in Table B was a great advantage now that the milling season was being more and more extended. This Table shows markedly how the new varieties indicate a rise in sucrose per cent. cane as well as purities when the optimum periods only are compared. Mr. Perk's Tables show that while the increase in fibre would account for the decrease in extraction, there were other reasons, such as reduction in imbibition per cent. fibre and the increase in crushing rate. The change in varieties was also to be considered. The effect of improved agricultural methods is also reflected. Mr. Perk had pointed out that most factories used too much phosphoric acid. In the past, sugarcane received too little phosphatic fertilizers and the juice was then deficient in phosphoric acid. There has now been a change, however, and at least some areas now have sufficient phosphate which would in turn affect the phosphoric acid present in the juice. Mr. Perk had mentioned three factories in particular which had increased their imbibition efficiency in a remarkable way. Mr. du Toit would like to know from Mr. Perk the reason for the enormous increase in the level attained by Chaka's Kraal as far as this figure was concerned. He thought the Natal Estates figure for non-sucrose elimination compared excellently with the Javan figures.

Dr. Dodds said that he also thought the paper an admirable one and Mr. Perk was to be congratulated on the interesting way he had presented his Tables and the great pains he had taken to introduce new angles from which to judge the figures. The Annual Summary had steadily improved in scope over the years. He thought Table 7 the most interesting Table in the Summary for it showed a steady progress in practically every department, when compared over ten-year periods.

Mr. Bax asked if the reduced extraction had any value for South African conditions. In Mauritius this figure was found to be most valuable.

Mr. Perk said that some years ago he came to the conclusion that lost absolute juice per cent. fibre was the best possible figure to use as this made allowance for so many factors which the reduced extraction could not cover.

Mr. du Toit said that in the past we used to calculate both figures. Absolute juice lost per cent. fibre was the basic figure in calculating the reduced extraction, so to give the latter figure was really superfluous. Similarly with reduced boiling house recovery, virtual gravity purity of molasses was an integral part of the reduced figure. In this case, however, the purity of the mixed juice had a big effect on the purity of the molasses and virtual purity of molasses, making both virtual purity of molasses and reduced recovery unsuitable for assessing the relative efficiency of the boiling house operation.

Mr. Bax agreed with the information given by Mr. du Toit and said that in Mauritius both absolute juice per cent. fibre and reduced mill extraction were used.

Mr. Perk pointed out that the mills extracted juice and therefore to express a loss it was better to use a juice loss. It was bad policy to look at high extraction figures and to be satisfied with them; it is far better to examine the losses still remaining.

Mr. Walsh referred to Table H. He said that these figures did not show all the factors affecting the crushing rate and he thought it would be useful to set down the extraction figures on this Table as well. It did appear from an examination of the figures and the extraction obtained by the various factories that the Royston formula for capacity was not necessarily the best economic yardstick.

Mr. Rault thought that the rated capacity table must be arbitrary and not quite a yardstick to

appreciate its repercussions on extraction of any individual mill.

For example, Natal Estates mill with a 115 per cent. performance above rated capacity, is showing but a very small drop in extraction, when compared with the highest extraction results mill, with only 75 per cent. rated capacity.

Mr. Perk though the reason for Natal Estates not suffering a loss in extraction because of this high actual crushing rate was due to the use of more imbibition water.

Mr. Rault said that the larger elimination of non-sugars characteristic of the carbonatation process, as indicated by the reduction in weight of molasses, was strangely not confirmed by a superior recovery at that factory. He would volunteer some explanations. They were firstly the unduly high undetermined losses, through remelting and over-processing when turning out a very fine crystal and very white refined sugar, and secondly an incompletely exhausted final molasses through shortage of equipment and possibly the glucose to ash ratio.

It is interesting to note that in this case the 8 degrees higher purity of exhaust molasses represented only 1.7 per cent. as a fall on the recovery when compared with the better exhaustion of other factories.

Mr. Perk's Table also shows that low exhaustion is not necessarily connected with the highest density brix of the "C" massecuite.

Mr. Perk replied that it was better to increase the purity of the juice and decrease the purity of the final molasses as well. To decrease the purity of the final molasses might require more than merely three boilings.

Dr. Douwes Dekker thought that a reasonable explanation for the excellent results due to carbonatation was the high amount of magnesium salts present in Natal juice.

Mr. Rault, referring to Mr. du Toit's remarks that the use of larger amounts of superphosphate in the fields had increased the P_2O_5 content of cane juices, with beneficial effect on clarification, asked whether a more balanced dose of potash suggested by the fertilizer research, would not likewise increase the K_2O content of juices, and be detrimental to molasses quantity and purity.

Mr. du Toit pointed out that a high magnesium intake is often a result of potash deficiency, so it would be possible that if more molasses were used in the fields, less magnesium would be present in the juice.

Mr. Hendry said that with the high third massecuite purity at Natal Estates, high molasses purities were inevitable.

Mr. Main said that many years ago Noel Deerr investigated the formulae available for milling plant capacity calculations and he came to the conclusion that any formula which was effected by performance or extraction could not serve for pure capacity comparisons, owing to the fact that additional compressions in some mills, for instance, could be more offset in others by better milling technique.

At that time in India, certain mills were able to do enormous capacities and still complete the season with sucrose per cent. bagasse averages of 1.9 per cent. for twelve or fourteen-roller tandems and 1.5 per cent. for seventeen-roller tandems, while the moisture per cent. bagasse was usually below 48 per cent. This was accomplished in the same mills by the same personnel and with the same cane varieties which had previously rarely been able to give below 2.5 per cent. sucrose in bagasse.

The term "fibre per cent." was perhaps not sufficiently specific to serve as an accurate measure in capacity calculations as some canes have a very tough outer rind which can pull in a larger feed into a mill than another cane variety where a thinner or softer rind is balanced by a larger pith content to give the same fibre per cent.

This problem had been investigated in a series of tests carried out by himself at the Natal Technical College when the tensile stresses of certain canes were recorded. The cross sectional area and the age of the cane variety was taken into consideration. Cane varieties varied considerably in their tensile strengths and to bring them all to a common basis, the "fibre stress ratio" was adopted as a measure of the tensile strength, the fibre content and the cross sectional area. A significant result was that the cane which gave the highest fibre stress ratios in these tests in Durban were also the cane varieties which had given the best extraction and capacities in India.

He was convinced that the Noel Deerr formula for milling capacity, viz. "lbs. fibre per cubic foot roller/hour" was the best measure for milling plant capacities.

Mr. Perk pointed out that all such formulae were based upon the same capacities, and the speed of the roller had also to be taken into consideration as well as the number of squeezes. He did not see that the Noel Deerr figure would be any improvement.

Mr. Bax stated that the relationship between non-sugars in mixed juice and the final molasses was not exact when one took into consideration the effect of non-sugars on the brix hydrometers when the latter were used for determining total solids. He thought that because of this the non-sugars eliminated were actually lower than shown, and that the factor of 83 must be low as compared with the real figure.

Mr. Perk pointed out that the ratio of 83 was only a mathematical form. Naturally these factors depended upon how they were calculated and in this case it was meant just as a means of calculating the amount of molasses.