THIRTY-SEVENTH ANNUAL SUMMARY OF LABORATORY REPORTS OF SUGAR FACTORIES IN SOUTHERN AFRICA

SEASON 1961-1962

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A.—CANE AND SUGAR PRODUCTIONS IN RECENT YEARS

Restrictions are still enforced. This has been the second season that the sugar production of the South African mills has been restricted:

Cane and Sugar Productions by the eighteen South African Factories in recent years

Season	Cane	Sugar	Tons Cane Per ton Sugar
1957/58	8,954,618	959,872	8.95
1958/59	10,257,876	1,128,187	9.09
1959/60	9,123,395	1,043,301	8.74
1960/61	8,649,617	994,363	8.70
1961/62	9,384,090	1,098,812	8.54

Note.—Except when otherwise indicated, all sugars are "telquel" and all tonnages are (short) tons of 2,000 lbs.

In addition to the sugar produced by the eighteen South African mills, the following tonnages were manufactured by the two Swaziland factories:

7,236 tons in 1958-59; 18,750 tons in 1959-60; 57,156 tons in 1960-61 and 75,400* tons of sugar in 1961-62,

which brought the total production of sugar inclusive of Swaziland to:

1,135,423 tons for 1958-59; 1,062,051 tons for 1959-60; 1,051,519 tons for 1960-61 and 1,174,212* tons of sugar for 1961-62.

*Subject to confirmation by S.A.S.A.

All sugar tonnages so far mentioned are based on information received from the South African Sugar Association and the same can be said about the tonnages mentioned in Table 1, where the actually made sugars are classified into whites, cargo, etc. Comparison of the totals of Table I with those of Table 2 at the end of the text of this summary will reveal a discrepancy caused by the fact that Gledhow and Sezela do not record in their laboratory reports the actual tonnages of sugar produced, but the tonnages of raw sugar exchanged between their raw-houses and their refineries. However, the actual tonnages of sugar manufactured by these factories-cum-refineries can be found in Table 1, as can the tonnages of the other factories.

In order to comply with the resolution taken at the Third Congress of the I.S.S.C.T., quantities in metric tons of cane crushed and sugar manufactured during the past five years follow hereunder:

Season	Cane	Sugar
1957/58	7,796,917	870,792
1958/59	9,305,801	1,023,475
1959/60	8,276,617	946,468
1960/61	7,846,805	902,071
1961/62	8,513,085	996,826

B.—COMPARISON OF RESULTS BETWEEN CANE HARVESTED DURING THE OPTIMUM PERIOD AND CANE CRUSHED BEFORE JULY AND AFTER NOVEMBER, FOR THE PAST FIVE SEASONS

Season	Per cent of Crop	Per cent Cane		Mixed Juice Purity	Cane/ Sugar Ratio
		Sucrose	Fibre		
1957/58					
Optimum Period	60	13.73	15.24	85.86	8.44
Balance of Crop	40	12.18	15.59	84.24	9.77
Total Crop	100	13.11	15.38	85.10	8.93
1958/59					
Optimum Period	57	13.77	15.73	85.10	8.57
Balance of Crop	43	12.25	16.17	73.50	9.90
Total Crop	100	13.12	15.92	84 46	9.09
1959/60					
Optimum Period	65	13.99	15.76	86 06	8.47
Balance of Crop	35	13.05	16.22	84.68	9.19
Total Crop	100	13.66	15.92	85.52	8.74
1960/61					
Optimum Period	69	14.11	15.16	86.10	8.38
Balance of Crop	31	12.72	15.34	84.37	9.62
Total Crop	100	13.69	15.22	85.63	8.70
1961/62					
Optimum Period	69	14.11	14.46	86.69	8.23
Balance of Crop	31	12.98	14.63	84.52	9.18
Total Crop	100	13.75	14.52	86.04	8.51

Note.—This comparison is restricted to the results of the eighteen South African mills.

The review shows that the sucrose content of the cane during this year's optimum period was as high as last year and we have again to go as far back as 1955-56 to meet a higher sucrose percentage. However, this year's cane quality has been better than the previous season, notwithstanding the same sucrose content, because the juice purity was higher and the fibre content lower. This better quality is reflected in the improved cane to sugar ratio of the 1961-62 season, viz. 8.23 against 8.38. Again we have to go back to the 1955-56 season to find a better cane to sugar ratio for the optimum period.

As a result of the restriction, the percentage of cane crushed outside the optimum period is again low, comparing favourably with the 1955-56 and the 1958-59 season when more than 40 per cent of the cane was harvested outside the optimum period.

C.—THE CHANGING VARIETAL SCENE

Following the change in varieties harvested is always interesting. However, owing to the difficulties involved in printing a very large table, it is necessary to restrict the review of this change to a period covering the past six years.

Major Varieties Harvested as Percentages of Total Tonnage of Cane Crushed

Season	1956	1957	1958	1959	1960	1961
Co.301	12	7	5	2	1	—
Co.331	23	21	19	16	13	9
N:Co.310 ..	57	60	60	59	60	56
N:Co.292 ..	—	—	2	3	3	2
N:Co.293 ..	3	3	4	5	5	5
N:Co.339 ..	2	4	4	5	5	5
N:Co.376 ..	—	—	3	7	10	17

Note.—*Major Varieties* are varieties of 1 per cent or over of the total tonnage. The comparison is restricted to the 18 S.A. mills.

This season the old variety Co.301 has ceased to be a major variety as the percentage harvested dropped below 1 per cent. Also Co.331 is on the way out, replaced by newer varieties. Following the spectacular extension of N:Co.310, it has remained static since 1957. In Natal it has never reached the high percentages as for example in Taiwan and in Italian Somaliland where it attained percentages of 90 and 95 respectively. Though the percentage of N:Co.310 has dropped this season, it does not mean that this variety is on the way out; the drop being caused by its replacement with newer varieties in those districts where it has never been a success. In Zululand, as in Swaziland, N:Co.310 still forms the bulk of the cane supply.

D.—CANE AND JUICE QUALITIES

Actually there is not much to be reported about the quality of the juice, at least as far as the 18 South African factories are concerned. In general juice settled well and no reports of "sticky" masses cuites were received. However, better settling was not only due to improved juice quality compared with last year, technical improvements also played their part.

Scanning Table 2 for high and low juice purities, we again find Entumeni as the factory with the highest mixed juice purity (88.4°), closely followed by Doornkop (88.2°) and Umzimkulu (87.9°). At the other end of the scale, we find Umfolozi as the only factory with a mixed juice purity below 85°, viz. an average purity of 84.2°. These differences in purity do not only bring about different loads on the low grade stations, but they also affect such quantitative figures as boiling house recovery and overall recovery.

Regarding the sucrose content of the cane, it is Entumeni this time which recorded the highest percentage (14.40 per cent) for the South African mills, closely followed by Z.S.M. (14.32 per cent). The lowest sucrose percentage of the South African mills is recorded by Felixton, i.e. only 13.06 per cent. Again also taking into consideration the factories shown in Table 5, the lowest sucrose content of cane is recorded by Luabo and Marromeu with 12.56 and 12.65 per cent respectively. This is the more remarkable as in 1960 these factories showed the highest percentages, viz. 14.63 and 15.10 per cent respectively; rains, too long sustained, being the cause of this drop in richness. This drop was accompanied by a decrease in mixed juice purity of 3 units.

E.—TIME ACCOUNT OF SOUTH AFRICAN SUGAR FACTORIES

Season	1959/60	1960/61	1961/62
Number of Factories ..	18	18	18
Tons Cane Crushed ..	9,123,396	8,649,617	9,384,090
Total Hours Mills Open	93,989	83,364	85,053
Total Hours Actual Crushing	86,553	77,316	80,973
Average number of weeks, per mill, per season ..	36	32	33
Average number of days of 24 hours of actual crushing	200	179	187
Mean Crushing Rate ..	105	112	116
Mean Overall Time Efficiency	92	93	95
Hours Cane Shortage per cent Hours Mills Open	3	2	1

Notwithstanding the fact that more cane had to be crushed than in the 1959-60 season, the 1961-62 season was shorter, viz. 33 weeks compared with 36 weeks. The reasons are a higher average crushing rate (116 against 105 t.c.h.) and a higher time efficiency (95 compared with 92 per cent). A shorter season implies a smaller percentage of cane harvested outside the optimum period, viz. 31 instead of 35 per cent in the 1959-60 season. A shorter season also implies a longer off-crop. Hence more time for maintenance and repairs, for alterations and small improvements to the factory plant.

F.—B.T.U.'s AVAILABLE IN BAGASSE, WOOD, COAL AND FUEL-OIL, PER LB. OF BRIX TO BE PROCESSED

In the previous Annual Summary, it was pointed out why this section has been re-introduced. It was also stated that the fuel consumption depends on two main factors, to wit : the efficiency of the steam raising plant and the degree of steam economy of the factory. It is in particular the first factor which is often overlooked; blaming the boiling house for the excessive quantity of fuel used. However, where we were able to investigate the question, it was usually found that the CO_2-content of the flue gas was too low (figures as low as 5 per cent being no exception) or the quantity of steam raised per lb. of fuel pointed to a low boiler efficiency. At the other side, a too high CO_2-content of the flue gas can also lead to a low boiler efficiency, viz. when due to uncomplete combustion ($CO+H_2$) is present in the flue gas. In a recent investigation, it was found that a CO_2-content of 15.5 per cent was accompanied by 2.8 per cent unburnt gas, reducing the boiler efficiency (based on lower calorific value) by 7.6 per cent.

There are factories which have a high fibre content in the cane and a low percentage brix in mixed juice per 100 cane, but there are also factories which have more brix to be processed than there is fibre in cane. In the following table the fibre per cent cane and brix in mixed juice per cent cane are shown, together with the ratio between these two figures:

(*a*) fibre per cent cane
(*b*) brix in mixed juice per 100 cane
(*c*) ratio (*a*) to (*b*)

	a	b	a/b		a	b	a/b
PG	13.77	16.16	0.85	CK	13.78	14.81	0.93
UF	12.78	14.99	0.85	TS	14.41	14.90	0.97
ZM	14.92	15.56	0.96	NE	15.33	14.89	1.03
FX	15.38	14.34	1.07	IL	13.51	14.36	0.94
EN	13.63	15.36	0.89	RN	14.25	15.11	0.94
AK	15.37	15.04	1.02	SZ	15.18	15.05	1.01
DK	14.68	14.94	0.98	UK	14.73	14.80	1.00
GD	15.79	14.10	1.12	ML	12.67	15.65	0.81
DL	14.81	15.33	0.95	UR	13.83	15.63	0.88
GL	14.45	15.25	0.95	LB	16.18	14.48	1.12
MV	14.32	15.05	0.95	MR	16.07	13.82	1.16

The table above shows that there are factories such as Mhlume, Umfolozi and Pongola where the amount of natural fuel, i.e. fibre, is only 81 per cent and respectively 85 per cent for Umfolozi and Pongola of the quantity of Brix to be processed. Conversely, there are factories where the amount of fibre exceeds the quantity of brix to be processed; for example Marromeu (1.16), Luabo (1.12), Glendale (1.12), Felixton (1.07), Natal Estates (1.03), etc. Other conditions being the same, the latter factories should use less, or no additional fuel at all, compared with the first category of factories.

This table shows too why we should not indicate steam or fuel consumption as a percentage ratio of cane; cane being a too variable material to be used as a base.

Continuing the practice inaugurated last year, we again show hereunder a table giving the data mentioned in the heading above this section. In addition to the columns a, b and c showing:

(*a*) b.t.u.'s in bagasse fired, per lb. of brix in mixed juice,

(*b*) b.t.u.'s in fuel oil, coal and wood, per lb. of brix, and

(*c*) b.t.u.'s in all fuel fired, per lb. of Brix,

we have given three other columns, showing:

(*d*) percentage of white sugar made; mill white or refined,

(*e*) degree brix of the syrup, and

(*f*) overall time efficiency.

Mill	a	b	c	d	e	f
PG	5,946	509	6,456	7.4	62	94.4
UF	5,871	2,229	8,101	55.7	58	94.8
ZM	6,588	669	7,256	Nil	62	96.0
FX	—	1,402	—	Nil	54	95.3
EN	6,284	409	6,694	55.3	63	97.6
AK	7,073	390	7,463	Nil	52	95.9
DK	6,886	378	7,265	55.8	57	95.1
GD	8,008	669	8,676	53.6	47	85.3
DL	6,558	19	6,577	Nil	62	94.0
GL	6,553	1,036	7,589	100.0	53	98.6
MV	6,631	663	7,295	Nil	56	93.9
CK	6,482	231	6,713	Nil	48	96.0
TS	6,764	743	7,507	Nil	56	97.2
NE	7,089	2,504	9,592	63.3	58	97.8
IL	6,603	1,904	8,507	54.2	68	92.2
RN	6,638	Nil	6,638	59.0	57	98.1
SZ	7,064	582	7,646	100.0	55	96.7
UK	6,994	9	7,003	Nil	60	97.0

Comparing this season's (1961-62) results with those published in the previous annual summary, we can say — generally speaking — that the number of b.t.u.'s in total fuel per lb. of brix is reduced. In some cases the reason for such a reduction is clear; for example: an improved time efficiency, or a higher density of the syrup, or a lower percentage of white sugar made. In other cases, the cause is less obvious. It can be due to a lower fibre content of the cane, because we all know that those factories with the lowest ratio between fibre and brix (ratio a/b of the previous table), fire their bagasse more carefully than those where there is an excess of bagasse. Perusing the figures for brix of Syrup, we ought to be careful when drawing conclusions about steam saving because there are a number of factories which arrive at a high density only at a cost of blowing vapour from the first vessel or from the vapour cell into the atmosphere. Such a manipulation may increase vacuum pan capacity, but it does not improve steam economy.

The lowest number of b.t.u.'s available in total fuel, i.e. in bagasse plus additional fuel, is shown by **Pongola**; the number being even lower than last year (1960). Time efficiency improved from 91 per cent to 94 per cent; brix syrup from 59° to 62°, but white sugar percentage dropped slightly, i.e. from 8 to 7 per cent. However, in connection with the fact that Pongola has the lowest number of available b.t.u.'s, we want to draw attention to the fact that Pongola has also one of the lowest number of b.t.u.'s in bagasse per lb. of brix. Scarcity of bagasse leads to careful firing; in addition Pongola is equipped with automatic stokers on all boilers.

Umfolozi has the lowest number of b.t.u.'s in bagasse per lb. of brix, which according to our statement should lead to more economical firing of the bagasse than where there is more bagasse at hand. However, this does not seem to hold for Umfolozi because the amount of b.t.u.'s in total fuel is one of the highest, though not as high as last year. B.t.u.'s available in total fuel per lb. brix dropped from 8,442 in 1960 to 8,101 in 1961; percentage of white sugar made dropped from 62 to 56 per cent; density of syrup improved slightly and so did time efficiency.

Z.S.M. & P. improved from 7,800 (1960) to 7,256 b.t.u.'s (1961); time efficiency increased from 90 to 96 per cent; syrup density from 59° to 62°; air preheaters were installed during the 1960-61 off-season, while half-way through the season vapour bleeding was extended to a couple of vacuum pans.

Since part of the bagasse of **Felixton** is not burned under the boilers but used for paper making, no commentary on this mill is possible

Entumeni shows a big reduction in b t u.'s available in total fuel viz. from 7,309 (1960) to 6,694 (1961); time efficiency improved from 96 to 98 per cent; white sugar made dropped from 60 to 55 per cent, while the syrup density remained the same. Entumeni's total b.t.u.'s is only beaten by that of Renishaw, also a white sugar-sulphitation mill. However, Entumeni remelts its A-sugar before bagging it as mill white.

Amatikulu dropped from 7,717 (1960) to 7,463 b.t.u.'s (1961) which we attribute to less b.t.u.'s in bagasse per lb. brix (see statement above); overall time efficiency and syrup density being the same.

Doornkop shows a big improvement: 9,077 b.t.u.'s in 1960 against 7,265 b.t.u.'s in 1961. The crushing rate increased and so did the time efficiency; white sugar percentage dropped slightly, but syrup density was reduced from 60° to 57° brix.

Glendale shows a high number of b.t.u.'s available in total fuel both years for two reasons: a low time efficiency and a low syrup brix. Improvement of these two items will reduce heat consumption considerably. In addition, we want to point out that the b.t.u.'s available in bagasse per lb. of brix processed is the highest of all mills.

Darnall reduced b.t.u.'s from 6,843 (1960) to 6,577 (1961); increased syrup brix from 59° to 62°; improved time efficiency from 91 to 94 per cent and increased crushing rate from 192 to 199 t.c.h.

Gledhow shows a considerable reduction in available b.t.u.'s in total fuel per lb. of brix processed; viz. 8,609 against 7,589 in 1961. Time efficiency increased from 93 to 99 per cent; crushing rate from 143 to 156 t.c.h. The big improvement in heat consumption brought Gledhow's b.t.u.'s available in total fuel down below those of Sezela; reversing last year's situation.

Tongaat has 7,507 b.t.u.'s in 1961 against 7,426 b.t.u.'s in 1960; crushing rate has gone up from 209 to 227 t.c.h.; time efficiency from 96 to 97 per cent; brix syrup remained the same.

Melville had 7,295 available in total fuel in 1961 against 7,290 b.t.u.'s per lb. of brix in 1960.

Chaka's Kraal cannot be compared since the figures for additional fuel in 1960 are not available.

Natal Estates' available b.t.u.'s in total fuel has gone up from 8,541 in 1960 to 9,592 per lb. of brix in 1961. Obviously, teething troubles with the newly introduced process will have been the main reason for this increase in heat consumption.

It has already been mentioned that **Renishaw** shows the lowest number of b.t.u.'s available in total fuel per lb. of brix of all the white sugar factories, closely followed by Entumeni which remelts its A-sugar before turning it into mill white sugar. Renishaw pushing its overall time efficiency up to 98.1 per cent is only beaten in this respect by Gledhow with 98.6 per cent time efficiency.

Sezela. This season 7,646 against previous season 8,123 b.t.u.'s available per lb. of brix; overall time efficiency improved from 94.6 to 96.7 per cent, but syrup density dropped from 57° to 55° brix.

Umzimkulu shows 7,003 b.t.u.'s this year against in 1960 to 7,792 b.t.u.'s available in total fuel per lb. of brix processed; a big reduction. Crushing rate remained the same, but time efficiency was improved from 92 to 97 per cent and syrup density from 58° to 60°.

Illovo had available in total fuel 8,507 b.t.u.'s in 1961-62 against 8,693 b.t.u.'s in 1960-61 season, a slight reduction of an otherwise high figure. Time efficiency increased from 84.7 to 92.2 per cent. Illovo's available b.t.u.'s in bagasse fuel is an average value; there are 7 factories with a lower number of b.t.u.'s and 9 with a higher.

G.—PERFORMANCE OF THE MILLING TANDEMS

Continuing the practice inaugurated with the 35th Summary, we submit hereunder a table showing the following data:

(*a*) Lost absolute juice per cent fibre in final bagasse as a yardstick for the evaluation of milling train performances.

(*b*) Feed rate in lbs. of fibre per hour, per cu.ft. of total roller volume as unit load to assess the degree of loading of the milling trains.

(*c*) Imbibition per cent fibre as indication of how far the squeezing action of the rollers has been supplemented by spraying of water and diluted juices on the layers of intermediate bagasse.

(*d*) Dilution ratio as an indicator of to what degree this spraying of water and diluted juices on top of the bagasses has led to intermixing with the juices retained in the bagasses.

(*e*) Number of imbibition steps.

Mill	a	b	c	d	e
PG	49.2	50.8	215	69	4
UF	46.2	24.1	273	72	5/5
ZM	41.2	52.9	342	77	5
FX	40.1	33.9	269	72	6/5
EN	40.0	46.6	220	69	5
AK	35.8	42.7	255	76	5
DK	40.7	39.4	219	71	5
GD	58.3	48.9	188	56	3/4
DL	30.6	48.6	372	81	5
GL	37.9	34.0	186	76	5
MV	45.3	52.0	239	70	5
CK	43.8	51.3	192	71	5
TS	31.4	35.7	205	79	5/6
NE	34.3	42.4	217	78	6
IL	43.2	33.8	222	67	4/5
RN	39.3	39.4	217	69	5
SZ	36.8	43.3	214	72	4
UK	50.8	49.3	245	64	4
ML	42.7	36.2	209	75	5
UR	44.3	43.3	218	64	4
LB	40.8	60.9	187	70	5
MR	55.9	66.4	168	62	4

For the calculations of the unit load (lbs. of fibre per hour, per cu.ft. T.R.V.) the following total roller volumes of the milling trains were used:

(In cu. ft.)

PG	588	DL	1,212	SZ	1040
UF	1,822	GL	1,330	UK	378
ZM	986	MV	304	ML	588
FX	1,435	CK	232	UR	489
EN	152	TS	1,829	LB	643
AK	745	NE	1,212	MR	636
DK	541	IL	625		
GD	176	RN	379		

Note.—For the significance of "Dilution Ratio", we refer to the article "Again, Imbibition" published in Quarterly Bulletin of the *S.M.R.I.* No. 17 (January, 1961).

Returning to the table showing the percentages of lost absolute juice per cent fibre, it appears that **Darnall** achieved the lowest lost juice percentage. Since the unit load was 48.6 lbs./h/cu. ft. T.R.V., the squeezing action of the mill rollers had to be assisted by plenty of imbibition water, i.e. 372 per cent fibre. This high imbibition ratio — assisted by good cane preparation, i.e. the shredder ahead of the squeezing units — lead to a high dilution factor, i.e. 81 per cent of the target requirement.

Tongaat's unit load was only 35.7 lbs. and therefore nearly the same result (i.e. 31.4 per cent lost juice) could be achieved with much less water. **Natal Estates'** unit load was nearer to that of Darnall than that of Tongaat and 34.3 per cent lost juice was achieved with approximately the same imbibition ratio as Tongaat.

With the exception of the first two mills of the small tandem of Tongaat, all units of the milling trains of Darnall, Tongaat and Natal Estates are individually driven. This has to be kept in mind when comparing these results with those of other tandems where two or more units are driven by one motivator. **Amatikulu** obtained 35.8 per cent lost juice with a tandem composed of six units driven by three motivators only. The unit load was 42.7 lbs./h/cu. ft. and the imbibition applied 255 per cent on fibre. **Sezela** has two similar tandems, each train composed of five units per train, allowing for only four imbibition steps. Hence, a not too good dilution ratio might be expected. However, the cane was well prepared (the shredders heading the squeezing units) and a ratio of 72 per cent of target was achieved. The average lost juice was 36.8 per cent, imbibition 214 per cent on fibre and unit load 43.4 lbs. **Renishaw** has a 19-roller tandem and achieved 39.3 lost juice with 217 per cent imbibition; the unit load being 39.4 lbs./h/cu. ft. T.R.V. The six units are driven by three steam engines.

With regard to the affects of the number of imbibition steps and the magnitude of the imbibition ratio on "Dilution Ratio", a good illustration of the influence of these factors is shown by Glendale. Here dilution ratio is only 56 per cent of target as a result of a very short milling train (crusher and four mills), unsatisfactory cane preparation and a low imbibition ratio. The opposite is the case at Darnall, which recorded 81 per cent due to a high imbibition ratio, good cane preparation and more imbibition steps than Glendale owing to the longer milling train. Another example, however, recorded in the previous Annual Summary, is the low dilution ratio, i.e. 58 per cent, obtained during the season 1960 with Big Bend's old milling train. High unit load (61 lbs.); unsatisfactory cane preparation; low imbibition ratio, i.e. only 115 per cent, and last but not least two imbibition steps only, were the factors which led to the low dilution ratio.

Average Results of the 18 S.A. Mills in recent years: Even more interesting than the mutual comparison of the individual mills, are the comparative average results of recent years:

Lost Absolute Juice in Final Bagasse per cent Fibre

1955	1956	1957	1958	1959	1960	1961
45.5	42.1	40.9	42.3	43.0	42.0	39.0

A drop of 6.5 units compared with 1955 and a drop of 3 units compared with the previous season i.e. 1960. This year's figure is an all-time record, the nearest lowest being 39.3 per cent obtained in 1950. Due to the low fibre content, the sucrose extraction was also a record with 94.21 per cent extracted. As a result of this high extraction figure, the overall recovery was a record too, i.e. 84.53.

Note.—For comparison of figures obtained in previous years may we suggest to peruse Table 8 at the end of this summary?

A drop of three units achieved in one season and obtained at the level of 40 per cent lost absolute juice is such a noteworthy fact that we want to go further into it. In particular we want to know which part each mill played in the general drop of three units. The following table will reveal this:

Difference in Lost Absolute Juice Percentages Comparing the 1961 results with those of the 1960 Season

Mill	*Drop*	*Rise*	*Mill*	*Drop*	*Rise*
PG	—	1.0	GL	11.9	—
UF	2.3	—	MV	2.5	—
ZM	6.2	—	CK	—	0.1
FX	1.8	—	TS	—	0.8
EN	4.8	—	NE	0.8	—
AK	2.5	—	IL	1.0	—
DK	6.8	—	RN	—	2.4
GD	12.3	—	SZ	4.5	—
DL	6.4	—	UK	—	0.1

The table is self explanatory and we hope that we can anticipate a similar table after the 1962 season.

H.—PERFORMANCE OF THE BOILING HOUSE

The boiling house results will be discussed with the aid of the following table, showing Boiling House Performance, Undetermined Losses (per cent sucrose in cane) and Purity of Final Molasses.

Mill	B.H.P.	Undet. Loss	Purity Final Molasses
PG	98.8	0.28	38.4
UF..	95.9	1.03	39.9
ZM	96.1	1.85	40.8
FX	98.1	0.84	40.4
EN..	96.6	2.13	39.5
AK	96.6	1.76	41.3
DK	96.4	1.78	38.6
GS	95.6	n.a.	40.5
DL..	98.4	1.02	39.3
GL..	97.4	1.62	39.7
MV	98.6	0.56	40.9
CK	96.0	n.a.	39.7
TS	98.5	n.a.	39.9
NE..	93.2	3.50	39.6
IL	96.0	2.10	37.6
RN	98.5	0.76	37.6
SZ	98.6	0.33	37.5
UK	98.4	n.a.	36.6
LB	98.9	0.39	36.8
MR	94.0	1.12	43.8
MH	95.9	1.56	41.8
UR	92.8	4.33	34.4

The highest B.H.P. was recorded by **Luabo**, i.e. 98.9 per cent, closely followed by **Pongola** with 98.8 per cent. These high percentages were obtained by low undetermined losses accompanied by low final molasses purities. **Melville** and **Sezela** both achieved 98.6 per cent B.H.P.; the first factory due to its low undetermined losses, the second owing to the combination of low losses and low molasses purity. Also a good B.H.P. figure is recorded by **Tongaat**. Since the molasses weight was not available, we calculated the undetermined losses by assuming a factor of 0.81 for the non-sugars account. The undetermined losses obtained in this manner amounted to ½ per cent. Obviously, the good B.H.P. is therefore obtained by a low undetermined loss combined with a not too high molasses purity. **Renishaw** which also obtained a B.H.P. of 98.5 per cent achieved this by a low molasses purity combined with a low undetermined loss. **Darnall's** undetermined loss has an average value, molasses purity the same, which combination led to a B.H.P. of 98.4 per cent. Umzimkulu has the same B.H.P., i.e. 98.4 per cent. Since molasses weight was not available, we applied the same calculation as carried out for Tongaat, which resulted in a calculated undetermined loss of 1.64 per cent on sucrose in cane. Assuming a higher factor than 0.81 will increase the loss in molasses and reduce the undetermined loss proportionally. However, they will never become "low undetermined losses" by raising the factor to (say) 0.85. This is a good example of how essential the weighing of molasses is for a check on the undetermined losses. We carried out the same calculation for **Glendale** in order to obtain more insight into the low B.H.P. Again based on a factor of 0.81, the undetermined losses worked out at 2.42 per cent. Hence, the low B.H.P. is caused by high undetermined losses combined with a high molasses purity.

The effect of the magnitude of the undetermined losses is clear, 1 per cent more losses — provided they were lost mechanically — will reduce the B.H.P. by 1 unit. However, the effect of a lower final molasses purity is not so simple since it depends also on the mixed juice purity. Let us take as an example: Felixton with 85.29 gravity purity of mixed juice, 40.44 gravity purity of final molasses and a B.H.P. of 98.09 per cent. If we lower the molasses purity to 39.44 (keeping the quantity of non-sugars in weighed molasses the same), the B.H.P. will go up from 98.09 to 98.46 per cent. A further reduction in purity to 38.44 will increase the B.H.P. to 98.81 per cent, or another 1/3 of an unit.

Returning to the undetermined losses, this season there have been quite a number of factories with high undetermined losses. We do not want to discuss the possible causes again here, as the subject was exhaustively dealt with in our Quarterly Bulletin No. 21 (*S.A. Sugar Journal*, January, 1962 issue). However, we want to make an exception in the case of Big Bend, where the losses would have been much lower, if instead of the single pol, the sucrose content of the final molasses had been used for the calculations. Though the difference between apparent purity and gravity purity is usually less than one unit for Natal factories (according to the values shown in Table 4), this difference is much bigger in the case of Big Bend: average apparent purity as determined by Big Bend 34.42° against 40.77° (gravity) by the S.M.R.I. Substituting the latter value will bring the undetermined losses down from 4.33 to 2.67 per cent on sucrose in cane. This is therefore an example of how essential it is to determine the Clerget sucrose in the final molasses.

I.—PROCESSING

Clarification

The difficulties encountered during the previous season, i.e. 1960-61, were not repeated this season. The juices settled better, the filters ran satisfactorily. This improvement compared with the previous year was due to two factors, viz. a better quality of the juices and improvements carried out at the installations. Regarding the latter factor, the improvement carried out at the clear juice collecting pipes of a number of Rapidorr clarifiers has to be mentioned, while a number of other factories enlarged their bagacillo collecting plants.

Perusing the table showing the consumptions of clarifying agents (Table 4 at the end of this summary), it appears that a number of sulphitation-defecation factories have cut the use of a solution of phosphoric paste as an expedient to adjust the pH of the juice in the correcting tanks. This discontinuation of the use of an expensive chemical reduced the costs of clarifying agents.

Natal Estates, for years the only mixed juice carbonatation factory in Natal, this year changed over to the sulphitation-defecation process. We would like to congratulate the management of Natal Estates on the remarkable good planning and lay-out achieved. The manner in which the clarifiers and the rotary filters have been installed is the best we have ever seen.

Mixed Juice Purity versus Clarified Juice Purity: The difference in purities between mixed and clarified juices is often used to evaluate the clarification effect or to gauge the degree of removal of impurities from the juice. In accordance with an investigation by Clayton (Proc. 26th Conference of the A.S.S.C.T. (1959); pp. 131-7), we should not attach too much significance to this purity difference, nor should we draw too far reaching conclusions based on this difference. The question is that though the gravimetric brix of clarified juice does not differ much from the real dry-matter content, the brix reading of mixed juice *does*, as a result of suspended matter present in mixed juice. In this respect, we recall the phenomenon experienced at Umfolozi some years ago, i.e. after the cane fields had been flooded, covering the cane stalks with a layer of very fine silt. In samples of juice derived from this cane, the brix spindle could be "set" at any brix and remain in that position. This is an extreme example of the effect of suspended matter on the brix reading. However, in more normal cases also the suspended matter will impart a characteristic density to the mixture. It is therefore that not too much significance should be attached to the difference between mixed and clarified juices.

The pH of Syrup: A number of factories complained about the big pH drop between clarified juice and syrup. An investigation by the S.M.R.I. revealed the fact that it takes about half an hour before equilibrium is reached after immersion of the electrode into the syrup sample. Since the determination of the pH of juices and syrup is usually carried out once every hour, it is routine in the factory laboratories to read all pH's directly after immersing the electrodes in the samples. This should be discontinued in the case of syrup and other sugar solutions of high density; the reading should be taken after half an hour. A shorter time to reach the equilibrium will be required, if we dilute the syrup sample, but the final reading will be lower than the reading obtained in undiluted syrup after half an hour standing.

It shows once again that we should *not* try to increase the syrup pH by raising the pH of clarified juice. Moreover, this has often the opposite effect.

When determining the pH in refinery liquors, we should also wait till the equilibrium is reached before taking the reading of the pH-meter.

Non-Sugars and Reducing Sugars Accounts

It is routine to compare the quantity of non-sugars present in total final molasses with the amount originally present in mixed juice. Here, again, we should not overlook the fact that there is a material difference between dry-matter as determined by drying and the brix-reading obtained in a diluted molasses sample. A second fact that we have to keep in mind is the question that the non-sugars present in total final molasses differ in composition from those originally present in mixed juice, as a result of the treatment of the juice by heat and clarifying agents. The figures shown in the next table have therefore only *statistical* value, but they do not indicate that from 100 lbs. of non-sugars originally present in mixed juice there are (for example) 81 lbs. still present in total final molasses.

Note.—We used the term "*non-sugars*" to indicate the value obtained when subtracting pol (or sucrose) per cent from degrees brix. The term "*non-sucrose*" should be restricted to the difference between dry-matter and sucrose content.

Note.—Total final molasses is the final molasses spun off by the C-m.c. centrifugals plus the final molasses present in the molasses film around the sugar crystals of the bagged sugar.

Non-sugars in Total Final Molasses as a percentage of the Non-sugars present in Mixed Juice

Mill	Per cent	Mill	Per cent	Mill	Per cent
PG	81	DL	79	RN	86
UF	83	GL	71	SZ	88
ZM	84	MV	75	UK	n.a.
FX	74	CK	n.a.	LB	80
EN	80	TS	n.a.	MR	79
AK	77	NE	87	ML	83
DK	92	IL	90	UR	105
GS	n.a.				

The average figure for Natal is approximately 81 per cent. If the percentage differs materially from this average, it is advisable to check the final molasses scale. Inversion will raise the percentage.

The second table shows an account of the reducing sugars, based on the amount of reducing sugars originally present, i.e. in mixed juice=100. It shows how the amount of R.S. is reduced due to hot liming and increases again during the further course through the boiling house.

Reducing Sugars Account

(Red. Sug. in Mixed Juice=100)

Mill	Clarified Juice	Syrup	Total Final Molasses	Mill	Clarified Juice	Syrup	Total Final Molasses
PG	97.8	88.9	n.a.	CK	n.a.	n.a.	n.a.
UF	96.6	94.6	118.4	TS	96.3	n.a.	95.8
ZM	100.0	93.1	101.3	NE	92.4	92.1	114.8
FX	86.9	82.3	93.0	IL	99.4	89.2	100.0
EN	102.2	85.6	n.a.	UR	94.0	98.7	n.a.
AK	91.5	84.0	90.8	RN	91.8	84.2	104.8
DK	n.a.	93.9	89.2	SZ	n.a.	n.a.	n.a.
GS	n.a.	n.a.	n.a.	UK	89.1	87.8	72.5
DL	92.0	86.3	85.8	LB	99.8	76.4	n.a.
GL	n.a.	104.5	81.5	MR	107.4	78.5	n.a.
MV	90.3	81.0	88.1	ML	n.a.	87.5	n.a.

The percentage of reducing sugars in clarified juice is usually lower than 100 due to destruction of these sugars during the preliming process. However, this effect can be covered by the formation of new reducing sugars owing to inversion. This will occur if the clarifier capacity is too big or, in general, when the residence time of the juice between juice scales and evaporator is too long. A poor time efficiency will lead to a too long retention time of the juice. (A higher figure than 100 can also be caused by an analytical error.)

Usually the quantity of reducing sugars rises again during further processing. However, if the quantity in total final molasses is more than 100, i.e. more than originally present in mixed juice, inversion must have been higher than normal. Remelting of sugars (inclusive of rejected sugars, etc.) can be one of the causes and is actually one of the most common ones. In this respect we think again of too long residence times of melt liquors, due to over big tank capacities (storing as well as *carbonatation* tank capacities and and also over big melters).

Sugar End

The following table shows that, with few exceptions, a good exhaustion was obtained in all the A-masses cuites. **Luabo** recovered 77 per cent of the sucrose present in the A-masse cuite as crystal in the foreworkers (double curing). Under the same circumstances (foreworkers; double curing), **Glendale** obtained 68 per cent. With single curing, high exhaustions were obtained by **Umfolozi** (66), **Tongaat** (67) and **Umzimkulu** (66 per cent crystal recovered). **Renishaw** shows the best overall picture; the exhaustions of all three masses cuites being well above the 60 per cent level, and so are Umzimkulu's.

Recovered Crystal per 100 Sucrose in Masses Cuites

Mill	A-m.c.	B-m.c.	C-m.c.	Mill	A-m.c.	B-m.c.	C-m.c.
PG	62	60	58	CK	57	63	57
UF	66	50	59	TS	67	62	56
ZM	61	62	56	NE	63	54	58
FX	58	60	54	IL	60	60	62
EN	61	66	52	RN	64	67	64
AK	64	60	56	SZ	61	51	62
DK	60	63	61	UK	66	62	62
GS	68	62	57	LB	77	58	58
DL	51	65	59	MR	n.a.	n.a.	n.a.
GL	57	60	57	ML	57	59	61
MV	62	61	54	UR	59	48	71
				UR -2	59	48	61

Note.—UR-2 shows exhaustion and crystal content of C-m.c. calculated with the aid of the gravity purity of molasses as determined by the S.M.R.I., while UR's figures are based on apparent purity as determined by UR's laboratory.

The following table provides more information on the low grade boilings.

Mill	Exhaustion	Crystal Content	Purities	
			C-m.c.	Final Molasses
PG	58	34	59.7	38.4
UF	59	36	61.5	39.5
ZM	56	33	59.1	38.8
FX	54	31	59.7	40.4
EN	52	30	57.8	39.5
AK	56	32	60.8	40.8
DK	61	37	62.0	38.6
GS	57	34	61.4	40.5
DL	59	35	61.0	39.3
GL	57	33	60.6	39.6
MV	54	32	60.0	40.9
CK	57	33	60.6	39.7
TS	56	32	58.3	39.0
NE	58	35	60.9	39.9
IL	62	35	59.2	37.6
RN	64	39	62.4	37.6
SZ	62	37	60.6	37.0
UK	62	35	58.5	35.0
ML	61	38	61.4	41.8
UR -2	61	38	64.6	40.8
LB	58	32	54.9	36.8
MR	n.a.	n.a.	n.a.	n.a.

Although the two expressions are closely related, "exhaustion" and "crystal content" are both shown in the table. Exhaustion (crystal per cent sucrose in masse cuite) indicates more of what we understand by "yield", while crystal content is used to obtain an insight into the question of whether there has been sufficient crystal surface area in the strike, important for good exhaustion. However, they are so closely related, due to the manner in which they are calculated, that a satisfactory exhaustion will always be accompanied by a satisfactory crystal content, and vice versa. For example, **Renishaw** obtained 64 per cent exhaustion and has 39 per cent crystal content (35 per cent usually being sufficient to provide a satisfactory big crystal surface area). **Entumeni** — on the other hand — has only 30 per cent crystal content and therefore only 52 per cent exhaustion. Notwithstanding the low C-m.c. purity of 57.8 per cent, the molasses purity is high because the crystal surface area was insufficiently large (30 crystal content).

The factors affecting the purity of the final molasses are great in number. Firstly, a sufficient number of seed grains should be present in the strike; secondly, the purity of the strike should be low, i.e. below 60° purity. Thirdly, the strike should be tightened up as much as possible and should not be diluted immediately afterwards by its own steamings. Fourthly, the massecuite should be cooled slowly and afterwards reheated to saturation temperature. The strictest attention to all these points will, however, be of *no avail* if the massecuite has to be diluted because the C-m.c. pump cannot handle a stiff massecuite. Therefore, the C-m.c. crystallizers should be placed above the C-m.c. centrifugals, thereby eliminating the necessity of using a pump at all. Only when we can gravitate the C-m.c. from crystallizers to mixer above the C-m.c. centrifugals, will it be possible to obtain the same actual final molasses purity as the Nutsch purity. At many a factory there is too big a difference between these two purities; the C-m.c. pump being the stumbling-block in reducing this difference.

To achieve an insight into the circulation of non-sugars within the system C-m.c. vacuum pan and C-m.c. centrifugals, the quantity of non-sugars as a percentage of non-sugars present in total molasses is shown in the following table.

Non-sugar Circulation within the System C-Massecuite and Total Final Molasses

Mill	Per cent	Mill	Per cent	Mill	Per cent
PG	114	DL	118	SZ	127
UF	105	GL	144	UK	n.a.
ZM	125	MV	111	LB	144
FX	135	CK	n.a.	MR	n.a.
EN	124	TS	n.a.	UR	98
AK	119	NE	140	UR-2	108
DK	129	IL	137	ML	102
GS	n.a.	RN	114		

In general it can be said that a high degree of N.S. circulation is the result of unsatisfactory curing by the (foreworkers of the) C-m.c. centrifugals. In general this is caused by not sufficient capacity in this department. Related to this question is the boiling of too coarse a C-strike in order to raise the throughput of the C-m.c. centrifugals.

We want to stress here that the N.S. circulation is correlated to the quality of the fore-cured C-sugar; double curing will not reduce the N.S. circulation inside the system C-m.c. pan and C-m.c. centrifugals. Double curing *can*, however, limite the circulation of final molasses to the above mentioned system, while in the event of single curing of the C-massecuite, the final molasses adhering to the C-sugar will circulate as far back as the A-massecuite. This holds in the case where the single cured C-sugar is remelted as well as where the single cured C-sugar is used as footings for A- and B-massecuites. As mentioned, in the event of double curing, the final molasses circulation will be restricted to the system C-m.c. pan and C-m.c. centrifugals, *if* the C-wash is returned to the C-massecuite. However, if the C-wash is used for the B-massecuite, the final molasses will be returned to the latter massecuite. This fact is sometimes overlooked, reducing the beneficial effect of double curing.

TABLE 1

FINAL PRODUCTION OF SUGAR

(In tons of 2,000 lbs.—Season 1961-62)

	White	Cargo Refining	Cargo Export	Golden Brown	TOTAL
Darnall	—	81,054.905	34,764.530	328.000	116,147.435
Amatikulu	—	19,266.040	44,640.035	344.500	64,250.575
Felixton	—	41,557.510	41,844.600	180.000	83,582.110
Zululand	—	58,162.100	6,793.500	29,415.850	94,371.450
Tongaat	—	67,670.104	55,556.063	285.950	123,512.117
Melville	370.500	9,576.780	17,687.925	3,270.000	30,905.205
Natal Estates	57,436.400	—	23,554.440	9,729.500	90,720.340
Sezela	64,362.000	—	8,980.650	168.350	73,511.000
Renishaw..	14,169.250	—	7,213.845	2,642.500	24,025.595
Pongola	4,003.000	—	35,854.350	14,034.000	53,891.350
Gledhow	71,651.200	—	3,578.400	—	75,229.600
Chaka's Kraal	—	—	17,262.945	3,919.300	21,182.245
Umzimkulu	—	—	22,544.025	8,028.450	30,572.475
Illovo	27,556.006	—	17,831.941	5,449.384	50,837.331
Umfolozi..	60,223.8055	—	39,166.305	12,032.554	111,422.6645
Doornkop	16,600.000	—	9,867.100	3,260.000	29,727.100
Entumeni..	7,383.950	—	4,499.040	1,466.550	13,349.540
Glendale	6,189.700	—	4,042.605	1,310.700	11,543.005
	329,945.8115	277,287.439	395,682.299	95,865.588	1,098,781.1375

Table 2.—CANE CRUSHED, SUGAR MADE, VARIETIES AND THROUGHPUT

FACTORY	PG	UF	ZM	FX	EN	AK	DK	GD	DL	GL‡	MV	CK	TS	NE	IL	RN	SZ‡	UK	Totals and Weighted Means
CRUSHING PERIOD FROM	**1.6.61**	**2.5.61**	**29.5.61**	**4.5.61**	**8.6.61**	**1.5.61**	**30.5.61**	**1.6.61**	**4.5.61**	**31.5.61**	**16.5.61**	**18.5.61**	**24.5.61**	**7.6.61**	**4.5.61**	**30.5.61**	**29.5.61**	**2.6.61**	**1.5.61**
END OF SEASON..	**23.12.61**	**15.1.62**	**13.1.62**	**31.12.61**	**1.1.62**	**24.1.62**	**26.11.61**	**28.1.62**	**4.1.62**	**14.12.62**	**11.1.62**	**16.12.61**	**14.12.61**	**10.2.62**	**27.2.62**	**8.12.61**	**26.12.61**	**20.12.61**	**27.2.62**
TONS CANE CRUSHED ..	424,932	1,001,806	782,055	745,922	108,370	553,324	252,295	106,479	942,558	634,584	256,942	183,203	1,025,167	825,795	466,345	200,923	620,902	252,488	9,384,090
CANE QUALITY																			
Sucrose per cent	14.24	13.41	14.29	13.06	14.40	13.70	14.01	13.56	14.03	14.04	13.88	13.74	13.60	13.45	13.06	13.83	13.81	14.16	13.75
Fibre per cent	13.77	12.78	14.92	15.38	13.63	15.37	14.68	15.79	14.81	14.45	14.32	13.78	14.41	15.33	13.51	14.25	15.18	14.73	14.52
Java Ratio	81.67	80.22	79.24	79.11	80.90	79.22	78.95	76.90	80.19	80.90	79.00	79.52	79.51	78.61	80.48	80.41	79.92	80.00	79.78
Tons Cane per ton Sugar ..	7.88	9.00	8.28	8.92	8.12	8.61	8.45	9.22	8.11	8.23	8.31	8.65	8.30	9.10	9.17	8.36	8.21	8.26	8.51
Ditto per ton 96° Sugar ..	7.65	8.69	8.06	8.69	7.83	8.36	8.16	8.93	7.88	8.01	8.11	8.37	8.08	8.80	8.86	8.08	8.00	8.02	8.26
CANE VARIETIES																			
Percentage Co.301	0.03	0.15	0.22	0.37	Nil	0.02	Nil	1.33	0.29	0.28	1.08	0.57	2.22	0.52	Nil	2.56	0.87	0.73	0.59
,, Co.331	0.28	3.14	0.92	7.51	8.05	6.78	5.58	28.06	9.29	4.08	12.45	17.84	8.22	7.17	31.60	9.09	23.33	10.93	9.01
,, N:Co.310	88.20	85.31	89.28	59.61	24.39	89.92	32.88	31.04	58.80	50.58	52.42	48.49	41.64	37.89	29.30	29.37	24.73	39.76	56.48
,, N:Co.292	0.41	0.42	0.34	2.85	2.78	0.29	1.74	0.06	0.81	1.32	1.10	1.31	2.98	8.18	0.20	7.50	7.12	1.51	2.37
,, N:Co.293	2.00	0.42	0.26	0.05	47.47	0.03	41.39	6.02	1.88	6.71	2.11	4.69	3.46	2.75	30.03	2.99	4.06	6.85	5.31
,, N:Co.339	0.60	3.38	2.10	4.70	3.08	0.21	1.74	1.12	4.64	4.07	8.31	5.42	13.68	7.85	3.05	3.95	2.91	2.21	4.79
,, N:Co.376	8.20	6.57	6.68	16.31	14.24	2.74	15.51	4.54	16.22	0.58	21.61	19.56	23.17	27.28	5.11	41.12	28.97	37.90	16.98
Other Varieties	0.28	0.61	0.20	8.60	Nil	0.01	1.16	27.83	8.07	8.48	0.92	2.12	4.63	8.36	0.71	3.42	8.01	0.11	4.46
TOTAL RAINFALL (ins.) ..	22.97	38.82	48.36	57.56	43.97	41.61	36.06	29.79	43.30	42.51	39.66	39.43	41.64	42.07	40.47	43.97	42.74	39.45	41.54
TONS SUGAR MADE* ..	53,891	111,378	94,488	83,588	13,350	63,910	29,848	11,543	116,160	77,060	30,907	21,182	123,523	90,720	50,818	24,026	75,603	30,572	†
Percentage of White Sugars..	7.43	55.69	Nil	Nil	55.30	Nil	55.84	53.60	Nil	*†‡	Nil	Nil	Nil	63.31	54.20	58.98	*†‡	Nil	31.20
Average Pol of All Sugars ..	98.92	99.38	98.62	98.59	99.51	98.89	99.42	99.14	98.79	98.75	98.39	99.16	98.58	99.34	99.37	99.39	99.76	98.84	98.90
TIME ACCOUNT																			
Overall Time Efficiency ..	94.37	94.80	95.95	95.33	97.61	95.93	95.06	85.34	94.04	98.57	93.92	96.04	97.25	97.74	92.20	98.09	96.74	97.03	95.20
Stoppages due to Cane Shortage	0.25	0.52	0.51	1.88	0.77	1.87	2.10	1.69	2.50	0.58	2.91	0.39	0.37	0.52	1.86	0.23	0.39	0.14	1.11
Other Stoppages per cent Hours Mills Open	5.38	3.22	3.54	2.79	1.62	1.20	2.84	12.97	3.46	0.85	3.17	3.57	2.38	0.87	5.94	1.68	2.87	2.83	3.69
THROUGHPUTS (per hour actual crushing)																			
Tons of Cane Crushed ..	108.54	171.81	174.89	158.14	25.96	103.43	72.56	27.22	199.03	156.32	55.15	43.17	226.89	167.71	78.13	52.41	148.48	63.20	115.89
Tons of Fibre Milled	14.95	21.96	26.09	24.32	3.54	15.90	10.66	4.30	29.48	22.58	7.90	5.95	32.69	25.71	10.56	7.47	22.54	9.31	16.82
Tons of Brix Processed ..	17.54	25.76	27.20	22.68	3.99	15.56	10.84	3.84	30.90	23.84	8.30	6.39	33.81	24.97	11.22	7.92	22.34	9.35	17.45
Tons of Sugars Bagged ..	13.77	19.10	21.13	17.72	3.20	12.01	8.58	2.95	24.53	18.98	6.63	4.99	27.33	18.42	8.51	6.27	18.08	7.65	13.62

* Tons of Sugars according to Laboratory Reports.

† For actual tonnages manufactured see Table 1.

‡ All data of Gledhow and Sezela refer only to the rawhouse side.

Table 3.—SUCROSE BALANCE, RECOVERIES, ANALYSIS OF BAGASSE, JUICES, CAKE AND SYRUP

	PG	UF	ZM	FX	EN	AK	DK	GD	DL	GL	MV	CK	TS	NE	IL	RN	SZ	UK	Weighted Means
SUCROSE BALANCE																			
Lost in Bagasse (A)	6.62	5.88	6.31	6.33	5.79	6.01	6.41	10.37	4.71	5.48	6.75	6.34	4.73	5.24	5.99	5.84	5.33	8.12	5.79
Lost in Filter Cake (B)	0.57	1.22	0.35	0.57	0.58	0.37	0.97	0.25	0.19	0.92	0.33	0.32	0.87	1.17	0.40	0.30	0.47	0.30	0.64
Lost in Final Molasses (C)	7.58	9.48	8.13	7.67	6.26	8.07	6.88	—	7.33	6.56	7.09	—	—	8.90	8.56	7.43	6.97	—	7.72
Undetermined Losses (D)	0.28	1.03	1.85	0.84	2.13	1.76	1.78	—	1.02	1.62	0.56	—	—	3.56	2.10	0.76	0.33	—	1.32
Lost in Boiling House (B)+(C)+(D)	8.43	11.73	10.33	9.08	8.97	9.20	9.63	10.44	8.54	8.10	7.99	11.22	7.93	13.63	11.06	8.49	7.77	7.37	9.68
Total of All Losses (A)+(B)+(C)+(D)	15.05	17.61	16.64	15.41	14.76	15.21	16.04	20.77	13.25	14.58	14.74	16.56	12.66	18.87	17.05	14.33	13.10	15.49	15.47
OVERALL RECOVERY	84.95	82.39	83.36	84.59	85.24	84.79	83.99	79.23	86.75	85.42	85.26	83.44	87.34	81.13	82.95	85.67	86.90	84.51	84.53
BOILING HOUSE PERFORMANCE	98.8	95.9	96.1	98.1	96.6	96.6	96.4	95.6	98.4	97.4	98.6	96.0	98.5	93.2	96.0	98.5	98.6	98.4	97.10
BOILING HOUSE RECOVERY	91.0	87.5	89.0	90.3	90.5	89.2	89.7	88.4	91.0	90.4	91.4	89.1	91.7	85.6	88.2	91.0	91.8	92.0	89.72
LOST ABSOLUTE JUICE PER CENT FIBRE	49.2	46.2	41.2	40.1	40.0	35.8	40.7	58.3	30.6	37.9	45.3	43.8	31.4	34.3	43.2	39.3	36.8	50.8	38.96
IMBIBITION PER CENT FIBRE	215	273	342	269	220	255	219	188	372	186	239	192	205	217	223	217	214	245	252.92
Lbs. Fibre, per hour, per cu. ft. T.R.V.	51	24	53	34	47	43	39	49	49	34	52	51	36	42	34	39	43	49	—
SUCROSE EXTRACTION	93.4	94.1	93.7	93.7	94.2	94.0	93.6	89.6	95.3	94.5	93.2	93.7	95.3	94.8	94.0	94.5	94.7	91.0	94.21
IMBIBITION PER CENT CANE	29.6	34.8	51.1	41.4	29.9	39.2	32.2	29.7	55.2	26.9	34.2	26.5	29.7	33.2	30.1	30.9	32.5	36.1	36.72
FINAL BAGASSE																			
Sucrose per cent Bagasse	2.93	2.57	2.53	2.40	2.88	2.40	2.76	3.88	2.02	2.34	2.81	2.77	2.08	2.04	2.62	2.62	2.22	3.35	2.43
Moisture per cent Bagasse	54.56	54.82	54.72	52.12	49.44	52.17	51.29	51.64	52.12	52.87	53.25	52.63	50.71	52.69	51.19	50.43	50.79	52.97	52.54
Fibre per cent Bagasse	41.31	41.63	41.88	44.61	46.99	44.78	45.24	43.58	45.22	43.95	43.05	43.82	46.60	44.46	45.32	46.15	46.01	42.88	44.21
Bagasse per cent Cane	33.34	30.70	35.62	34.48	29.01	34.32	32.46	36.22	32.74	32.87	33.28	31.44	30.92	34.48	29.82	30.90	32.98	34.36	32.84
*Lower Calorific Value (btu per lb.)	**2883**	**2867**	**2877**	**3108**	**3327**	**3099**	**3169**	**3118**	**3110**	**3040**	**2999**	**3053**	**3231**	**3061**	**3180**	**3247**	**3223**	**3013**	**3067**
FIRST EXPRESSED JUICE																			
Degree Brix	20.79	19.24	20.52	18.87	19.82	19.64	19.88	19.98	19.83	19.69	19.87	19.58	19.35	19.51	18.61	19.60	19.38	19.70	19.59
Apparent Purity	86.96	86.86	87.92	87.50	89.81	88.08	89.24	88.20	88.23	87.70	88.40	88.52	88.30	87.70	87.16	88.00	89.16	89.85	87.96
LAST EXPRESSED JUICE																			
Degree Brix	2.86	3.07	3.27	2.60	1.96	2.59	3.69	4.88	1.86	2.88	3.02	3.23	2.56	2.52	3.10	2.90	2.63	3.69	2.78
Apparent Purity	70.98	72.40	74.41	73.29	81.12	78.76	79.96	81.20	75.76	73.60	76.40	78.58	77.50	71.53	75.08	76.20	68.58	80.76	74.71
MIXED JUICE																			
Degree Brix	16.69	14.40	13.47	13.42	15.22	14.35	14.98	15.09	12.68	16.22	14.91	15.59	14.99	15.07	14.32	15.11	15.13	14.55	14.50
Apparent Purity	85.29	84.14	—	—	—	—	87.76	86.20	—	—	86.00	—	—	—	84.60	86.43	86.86	87.90 }	} 86.04
Gravity Purity	85.41	—	86.09	85.29	88.37	85.63	88.21	—	86.13	87.00	—	86.90	86.93	85.67	85.48	—	—	— }	
Reducing Sugars/Sucrose Ratio	2.49	3.33	3.04	3.73	2.45	3.82	2.53	—	3.55	2.69	3.20	3.93	3.24	3.41	5.29	2.09	3.11	—	3.31
CLARIFIED JUICE																			
Degree Brix	16.89	14.30	12.79	12.58	15.17	13.93	16.18	14.00	12.04	15.16	13.74	14.59	14.43	15.02	15.02	15.88	15.76	15.29	14.31
Apparent Purity	86.15	85.60	86.88	85.99	88.93	86.14	88.26	86.80	87.02	87.90	87.60	87.67	88.20	86.76	86.22	87.60	87.18	88.75	86.96
Reducing Sugars/Sucrose Ratio	2.42	3.26	3.05	3.26	2.59	3.51	—	—	3.09	—	2.90	—	3.15	3.18	5.28	1.97	2.87	—	3.21
Average pH	6.81	7.12	7.07	7.2	7.85	7.3	7.1	7.0	—	7.22	7.3	—	7.21	7.14	7.39	7.00	6.81	7.18	7.15
FILTER CAKE																			
Per cent Sucrose	1.98	2.98	0.87	1.07	1.67	0.76	2.71	0.68	0.59	2.30	0.93	0.86	2.40	2.20	1.38	0.79	1.29	1.07	1.63
Filter Cake per cent Cane	4.28	5.50	5.68	6.80	5.70	6.70	5.00	5.00	4.50	5.65	5.00	5.12	4.95	7.16	3.95	5.28	5.00	4.00	5.43
SYRUP																			
Degree Brix	61.68	58.48	62.07	54.12	63.49	52.15	57.11	47.33	61.86	53.16	56.25	48.48	56.38	57.75	68.17	57.37	54.72	60.17	57.80
Apparent Purity	86.15	86.13	86.82	86.20	88.71	86.50	88.64	87.40	87.31	88.00	87.60	88.32	88.20	86.83	85.62	87.30	87.13	88.62	87.08
Reducing Sugars/Sucrose Ratio	2.20	3.19	2.84	3.09	2.11	3.22	2.40	—	2.90	2.84	2.60	—	—	3.18	4.74	2.07	2.63	—	3.00
Average pH	6.96	6.61	6.43	6.7	7.81	6.9	6.6	6.7	—	7.06	7.0	—	—	6.76	6.47	6.8	6.78	6.80	—

* L.C.V. of Bagasse=7650—18S—86.4W btu/lb. in which formula "S" stands for sucrose per cent bagasse and "W" for moisture per cent bagasse.

Table 4.—MASSECUITES AND MOLASSES: LIME, SULPHUR AND PHOSPHORIC PASTE CONSUMPTIONS

FACTORIES	PG	UF	ZM	FX	EN	AK	DK	GD	DL	GL	MV	CK	TS	NE	IL	RN	SZ	UK	Means	
Brix* per cent Cane	16.16	14.99	15.56	14.34	15.36	15.04	14.94	14.10	15.53	15.25	15.05	14.81	14.90	14.89	14.36	15.11	15.05	14.80		
A-MASSECUITE																				
Cubic feet per ton Brix*	24.23	26.48	27.65	21.89	32.63	23.13	28.66	26.27	24.93	27.58	27.69	23.90	21.26	23.74	36.12	22.98	24.94	23.70	25.36	
Brix of Massecuite	92.42	93.10	93.60	92.51	91.66	92.12	91.09	92.91	94.0	89.49	91.77	90.81	92.2	93.71	90.26	92.23	91.93	91.73	92.09	
Purity of Massecuite	84.78	84.82	83.64	84.68	85.75	84.45	88.81	88.70	85.0	87.4	83.5	88.81	87.4	86.56	85.41	87.3	86.28	88.54	86.21	
Purity of Molasses	67.94	65.80	66.49	69.88	70.16	66.45	75.92	71.59	67.6	75.0	66.0	71.76	69.7	70.43	70.23	70.7	71.10	72.66	69.97	
Drop in Purity	16.84	19.02	17.15	14.80	15.59	18.00	12.89	17.11	17.4	12.4	17.5	17.05	17.7	16.13	15.18	16.6	15.18	15.88	16.24	
Exhaustion†	61.96	65.57	61.19	58.02	60.93	63.53	60.27	67.89	51.4	56.8	61.6	56.72	66.8	63.02	59.70	64.9	60.88	65.60	62.73	
B-MASSECUITE																				
Cubic feet per ton Brix*	8.61	8.24	11.06	11.62	9.91	11.92	11.87	10.56	8.97	12.47	15.40	10.23	11.05	18.00	14.52	12.79	12.80	18.39‡	12.54	
Brix of Massecuite	95.00	95.44	96.46	93.53	95.08	94.40	94.91	96.33	96.4	93.68	94.38	95.68	94.9	95.60	92.07	95.57	95.65	93.53	94.92	
Purity of Massecuite	73.36	73.12	71.16	74.60	71.60	71.77	77.62	75.05	72.4	74.9	72.1	73.84	74.9	72.58	75.49	76.0	72.55	77.21	73.73	
Purity of Molasses	52.59	53.03	48.11	54.29	49.60	50.15	56.37	53.03	47.8	54.6	50.0	51.02	53.4	55.13	54.20	51.1	52.70	56.60	52.43	
Drop in Purity	20.77	20.09	23.05	20.31	22.00	21.62	21.25	22.02	24.6	20.3	22.1	22.82	21.5	17.45	21.29	24.9	19.85	20.61	21.30	
Exhaustion†	59.72	58.49	62.42	59.56	65.64	60.43	62.75	62.46	65.1	59.7	61.3	63.10	61.6	53.58	61.58	67.0	57.84	61.50	60.73	
C-MASSECUITE																				
Cubic feet per ton Brix*	7.06	7.67	7.58	7.96	5.77	7.44	8.18	7.94	7.01	7.40	6.36	6.43	6.83	9.41	9.71	7.57	7.75	6.35	7.61	
Brix of Massecuite	99.48	98.95	98.03	95.88	99.10	95.93	97.65	97.94	99.0	95.59	96.43	96.28	97.7	99.00	96.26	98.55	99.36	97.89	67.72	
Purity of Massecuite	59.74	61.50	59.13	59.69	57.76	60.84	61.98	61.39	61.0	60.6	60.0	60.61	58.3	60.87	59.17	62.4	60.60	58.47	60.22	
Purity of Molasses	38.38	39.48	38.77	40.44	39.50	40.80	38.61	40.52	39.27	39.6	40.9	39.68	39.0	39.29	32.35	37.6	37.05	34.96	38.68	
Drop in Purity	21.36	22.02	20.36	19.25	18.26	20.04	23.37	20.87	21.7	21.0	19.1	20.93	20.3	21.58	26.82	24.8	23.55	23.51	21.54	
Exhaustion†	58.02	59.16	56.23	54.15	52.25	55.64	61.42	57.15	58.7	57.4	53.9	57.25	56.1	58.40	62.27	63.7	61.73	61.82	58.33	
Crystal per cent M.C.	34.48	36.00	32.60	30.99	29.91	32.47	37.17	34.36	35.4	33.2	32.3	33.41	32.5	35.19	35.47	39.2	37.17	35.38	34.33	
TOTAL CUBIC FEET OF MASSECUITES																				
Per ton of Sugar Made	50.85	57.16	59.60	53.09	60.45	55.05	61.50	58.89	51.54	59.58	61.86	51.95	48.42	69.32	79.55	54.73	56.22	59.21	58.31	
Per ton of Brix*	39.90	42.39	46.30	41.47	48.31	42.50	48.70	44.79	40.90	47.45	49.45	40.56	39.15	51.15	60.36	43.34	45.50	48.44	45.51	
FINAL MOLASSES																				
Degree Brix	92.32	91.64	89.64	87.68	90.79	89.28	91.61	87.46	93.19	89.31	88.49	88.54	88.11	90.42	88.39	95.47	93.72	95.49	92.47	
Apparent Purity	38.38	39.48	38.77	—	39.50	40.80	38.61	40.52	—	39.6	—	—	39.0	—	32.30	37.55	37.08	34.96	—	
Gravity Purity	—	39.92	40.78	40.44	—	41.32	—	—	39.27	39.72	40.93	39.68	39.90	39.56	37.63	—	37.52	36.65	39.51	
Per cent Reducing Sugars	—	14.41	12.84	14.91	—	14.78	10.08	—	13.56	11.11	13.30	—	14.39	14.91	19.33	—	14.75	—	14.03	
Per cent Sulph. Ash	—	15.96	14.82	13.88	—	11.71	12.79	—	12.94	—	—	—	—	13.06	12.23	—	14.19	—	13.49	
Red. Sug./Ash Ratio	—	0.90	0.87	1.07	—	1.26	0.87	—	1.05	—	—	—	—	1.14	1.58	—	1.04	—	1.04	
Molasses of 85° Brix per cent Cane	3.43	3.74	3.35	2.91	2.97	3.15	2.93	—	3.08	2.60	2.83	—	—	3.56	3.49	3.23	3.18	n.a.	3.16	
CONSUMPTION OF LIME, ETC.																			Def.	Sulph
LIME—lb. per ton Cane	1.46	1.22	1.48	1.10	3.78	1.09	4.78	4.28	0.98	5.75	1.35	5.23	1.29	n.a.	1.16	4.90	5.06	0.78	1.23	4.86
lb. per ton Sugar	11.50	10.95	12.24	9.86	30.71	9.37	40.40	39.50	7.95	47.36	11.26	45.23	10.69	n.a.	10.63	40.96	41.53	6.47	10.43	40.75
lb. per ton Brix	9.03	8.12	9.51	7.70	24.63	7.23	32.00	30.04	6.31	37.72	9.00	35.31	8.64	n.a.	8.06	32.44	33.60	5.30	8.14	34.02
SULPHUR—lb. per ton Cane	Nil	Nil	Nil	Nil	1.65	Nil	2.08	2.07	Nil	1.54	Nil	1.62	Nil	n.a.	Nil	2.04	1.97	Nil	Nil	1.79
lb. per ton Sugar	Nil	Nil	Nil	Nil	13.41	Nil	17.55	19.06	Nil	12.65	Nil	14.02	Nil	n.a.	Nil	17.06	16.18	Nil	Nil	12.72
lb. per ton Brix	Nil	Nil	Nil	Nil	10.75	Nil	13.90	14.39	Nil	10.07	Nil	10.94	Nil	n.a.	Nil	13.52	13.09	Nil	Nil	12.52
PHOSPHORIC—lb. per ton Cane	Nil	Nil	Nil	Nil	0.00	Nil	0.91	0.58	Nil	Nil	Nil	Nil	Nil	n.a.	0.01	0.67	Nil	0.19	0.006	0.26
lb. per ton Sugar	Nil	Nil	Nil	Nil	0.002	Nil	7.70	5.39	Nil	Nil	Nil	Nil	Nil	n.a.	0.87	5.62	Nil	1.60	0.05	2.22
lb. per ton Brix	Nil	Nil	Nil	Nil	0.002	Nil	6.10	4.10	Nil	Nil	Nil	Nil	Nil	n.a.	0.66	4.45	Nil	1.31	0.04	1.85

* Brix in Mixed Juice. †Recovered crystal as percentage of all sucrose present in massecuite.

‡ Four Boiling System; average of B_1 and B_2.

Table 5.—FINAL DATA OF MHLUME, UBOMBO RANCHES, LUABO AND MARROMEU†

FACTORY	Mhlume	Ubombo Ranches	Luabo	Marromeu
TONS CANE CRUSHED	357,536	215,647	452,903	471,914
TONS SUGAR MADE	42,502	24,624	47,827	46,430
Tons Cane per hour	84	76	121	131
Percentage of White Sugar	44	47	70	28
SUCROSE PER CENT CANE	14.20	14.18	12.56	12.65
FIBRE PER CENT CANE	12.67	13.83	16.18	16.07
Tons Cane/Ton Sugar	8.41	8.76	9.77	10.16
Java Ratio	79.55	79.94	77.92	76.36
Brix of 1st Expressed Juice	20.28	20.04	18.9	19.6
Purity of 1st Expressed Juice	87.98	88.51	85.3	84.5
Tons fibre per hour	10.63	10.58	19.54	21.11
Imbibition per cent Fibre	209	218	187	168
LOST ABSOLUTE JUICE per cent Fibre	42.7	44.3	40.8	55.9
Imbibition per cent Cane	26.60	30.10	30.23	26.91
SUCROSE EXTRACTION	94.20	93.90	92.88	90.21
Sucrose of Bagasse	2.73	2.84	2.59	3.40
Moisture of Bagasse	54.43	50.59	49.40	51.28
BOILING HOUSE PERFORMANCE	95.9	92.8	98.9	94.0
Boiling House Recovery	88.2	85.1	89.8	85.3
Overall Recovery	83.1	79.9	83.4	77.0
PURITY OF MIXED JUICE	85.5	85.2	83.1	82.5
Red. Sugars/Sucrose Ratios:				
—of Mixed Juice	4.40	5.11	4.27	3.42
—of Clarified Juice	4.03	5.53	3.92	3.45
—of Syrup	3.88	4.04	3.86	2.64
Filter Cake per cent Cane	3.88	5.00	4.08	4.00
Sucrose of Filter Cake	2.42	1.91	1.72	2.95
BRIX PER CENT SYRUP	50.5	63.0	58.8	64.6
PURITY OF FINAL MOLASSES	41.8	34.4*	36.8	43.8
Brix of Final Molasses	91.6	91.5	92.3	91.8
Molasses of 85° Brix per cent Cane	3.35	4.35	3.25	3.81
SUCROSE BALANCE				
Lost in Bagasse	5.80	6.09	7.07	9.79
Lost in Filter Cake	0.66	0.69	0.60	0.93
Lost in Final Molasses	8.89	8.98	8.51	11.22
Undetermined Losses	1.56	4.33	0.39	1.12
Total of All Losses	16.91	20.09	16.57	23.05
TOTAL RAINFALL (1961)	23.64"	—	55.42"	48.52"
Percentage N:Co.310	95	90	66.4	67.8

†Affiliated Members of the S.M.R.I.
* Apparent Purity.

Table 6.—AVERAGE MANUFACTURING RETURNS BY MONTHLY PERIODS FOR SOUTH AFRICAN SUGAR FACTORIES (SEASON 1961 - 1962)

MONTHLY PERIOD ENDED:		May 27 1961	July 1 1961	July 29 1961	Sept. 2 1961	Sept. 30 1961	Oct. 28 1961	Dec. 2 1961	Dec. 30 1961	Jan. 27 1962	Feb. 1962
TONS CANE CRUSHED	This period	360,060	1,366,914	1,178,658	1,491,891	1,155,078	1,179,379	1,431,741	838,484	297,760	84,137
	To date	—	1,726,974	2,905,632	4,397,523	5,552,601	6,731,968	8,163,709	9,002,193	9,299,953	9,384,090
TONS SUGAR MADE	This period	36,188	146,697	134,545	180,590	142,641	147,570	173,951	99,650	32,553	8,523
	To date	—	182,885	317,430	498,020	640,661	788,235	962,186	1,061,836	1,094,389	1,102,912
TONS CANE/TON SUGAR	This period	9.95	9.32	8.76	8.26	8.10	7.99	8.23	8.51	9.15	9.87
	To date	—	9.58	9.15	8.83	8.67	8.54	8.48	8.48	8.50	8.51
SUCROSE PER CENT CANE	This period	12.14	12.64	13.34	14.05	14.45	14.55	14.14	13.82	13.28	12.50
	To date	—	12.54	12.87	13.27	13.52	13.70	13.78	13.78	13.76	13.75
FIBRE PER CENT CANE	This period	14.27	14.29	14.29	14.34	14.46	14.55	14.67	15.16	15.08	14.94
	To date	—	14.28	14.28	14.30	14.34	14.37	14.43	14.49	14.51	14.52
LOST ABSOLUTE JUICE % FIBRE	This period	40.4	39.9	42.4	39.9	38.8	37.7	37.9	37.8	38.1	—
	To date	—	40.0	40.2	40.1	39.8	39.4	39.1	39.0	39.0	39.5
BOILING HOUSE PERFORMANCE	This period	95.8	97.1	97.5	97.8	96.0	98.2	97.9	97.2	94.5	—
	To date	—	96.8	97.2	97.4	97.1	97.2	97.2	97.2	97.1	97.1
SUCROSE EXTRACTION BY MILLS	This period	94.04	94.16	94.06	94.13	94.22	94.43	94.36	94.10	93.93	—
	To date	—	94.13	94.10	94.11	94.14	94.19	94.22	94.21	94.20	94.21
RECOVERY ON MIXED JUICE	This period	86.96	88.79	90.33	90.50	88.98	90.72	90.05	89.85	86.75	—
	To date	—	88.42	89.23	89.68	89.52	89.75	89.80	89.85	89.76	89.72
OVERALL RECOVERY	This period	81.78	83.60	84.97	85.19	83.84	85.67	84.98	85.07	81.49	—
	To date	—	83.23	83.96	84.40	84.28	84.54	84.62	84.66	84.56	84.53
PURITY OF MIXED JUICE	This period	82.87	83.86	86.97	86.80	86.07	86.69	86.86	86.22	84.47	84.31
	To date	—	83.66	85.02	85.97	85.71	85.92	86.09	86.10	86.05	86.04
RED. SUGARS RATIO OF MIXED JUICE	This period	4.10	4.01	3.11	2.90	3.25	2.84	2.93	3.15	4.37	—
	To date	—	4.09	3.50	3.40	3.30	3.22	3.21	3.20	3.22	3.31
GRAVITY PURITY OF FINAL MOLASSES	This period	37.4	37.4	39.6	37.07	38.87	40.71	39.62	37.75	40.17	—
	To date	—	37.4	38.4	37.96	38.72	39.07	39.17	39.03	39.50	39.51
MOLASSES OF 85° BRIX % CANE	This period	3.45	2.84	3.55	3.19	3.00	3.10	3.14	3.35	3.55	—
	To date	—	2.97	3.20	3.20	3.15	3.14	2.98	3.19	3.16	3.16
MONTHLY RAINFALL IN INCHES		0.99	3.76	1.11	0.80	3.20	3.61	4.31	2.73	4.08	2.73
TOTAL RAINFALL FROM 1st JANUARY		22.04	25.82	26.92	27.72	30.90	34.50	38.81	41.54	4.08	6.80

Table 7.—COMPARISON OF FINAL RESULTS FOR S.A. SUGAR FACTORIES
(Season 1952 to Season 1961 inclusive)

SEASON	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Cane										
Sucrose per cent	13.87	13.93	13.34	13.87	13.35	13.11	13.12	13.66	13.69	13.75
Fibre per cent	16.10	16.31	16.03	15.74	15.81	15.38	15.92	15.92	15.22	14.52
JUICE										
Brix per cent First Expressed Juice	20.4	20.6	19.6	19.8	20.3	19.6	19.2	19.6	20.1	19.6
Purity of First Expressed Juice	88.6	87.5	87.9	88.0	87.3	87.3	86.7	87.7	87.8	88.0
Purity of Last Expressed Juice	76.2	76.5	76.8	76.7	75.8	76.1	74.4	75.0	75.6	74.7
Purity of Mixed Juice	86.2	85.6	85.9	86.0	85.5	85.1	84.5	85.5	85.6	86.0
Reducing Sugars/Sucrose Ratio	2.9	3.7	3.3	3.4	3.3	3.7	4.3	3.5	3.3	3.3
MILLING DATA										
Imbibition per cent Fibre	217	200	191	204	222	224	207	210	238	253
Lost Absolute Juice per cent Fibre	40.8	41.7	44.1	45.5	42.1	40.9	42.3	43.0	42.0	39.0
Imbibition per cent Cane	34.9	32.7	30.7	32.1	35.2	34.5	32.9	34.6	36.2	36.7
Sucrose Extraction	93.0	92.7	92.4	92.3	92.9	93.4	92.9	92.9	93.4	94.2
Sucrose per cent Bagasse	2.65	2.75	2.75	2.91	2.60	2.47	2.55	2.66	2.60	2.43
Moisture per cent Bagasse	52.53	52.47	52.92	53.18	53.12	53.06	53.28	53.26	53.01	52.54
Lower Calorific Value	**3036**	**3067**	**3028**	**3003**	**3014**	**3021**	**3000**	**3000**	**3023**	**3067**
RECOVERIES										
Overall Recovery	83.7	82.8	83.2	83.6	83.4	84.4	83.1	83.0	83.4	84.5
Boiling House Recovery	90.6	89.4	90.0	90.5	89.8	90.4	89.5	89.4	89.4	89.7
Boiling House Performance	97.2	96.9	97.4	97.9	97.4	98.5	97.8	97.1	96.9	97.0
Tons Cane per ton of 96° Sugar	8.27	8.32	8.65	8.28	8.68	8.67	8.82	8.48	8.41	8.26
FILTER CAKE										
Sucrose per cent Cake	0.94	1.05	1.18	1.18	1.12	1.03	1.30	1.57	1.66	1.63
Cake per cent Cane	6.34	5.86	5.48	5.28	5.08	5.76	5.70	5.95	6.10	5.43
FINAL MOLASSES										
Gravity Purity	39.3	39.5	39.3	39.6	39.9	38.5	39.1	40.3	40.3	39.5
Brix per cent	90.3	90.0	89.7	90.0	89.9	90.3	90.2	90.6	90.9	92.5
Weight per cent Cane	3.09	3.44	2.88	2.95	3.02	2.98	3.24	3.13	3.22	3.16
UNDETERMINED LOSSES										
Per cent Sucrose in Cane	1.46	1.59	1.44	1.21	1.44	1.04	0.99	1.28	0.97	1.32
AVERAGE POLARIZATION										
Of all Sugars	98.63	98.66	98.51	98.65	98.83	98.83	98.92	98.98	98.88	98.90

Table 8—COMPARATIVE DATA OF REPORTING S.A. FACTORIES FROM 1925 TO 1961 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	72.38	—	—	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	49.49	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	16.52	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	15 of 22	94.5
1932..	13.48	15.65	9.61	9.40	89.86	84.27	74.73	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	51.32	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	9.19	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	16.21	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	92.24	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	16.06	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
1955..	13.87	15.74	8.51	8.28	92.32	**90.51**	83.56	32.1	204	2.91	53.18	45.5	85.96	3.40	39.6	97.9	17 of 19	99.1
1956..	13.35	15.81	8.87	8.62	92.93	89.79	83.44	35.2	222	2.60	53.12	42.1	85.49	3.32	39.9	97.4	17 of 18	99.2
1957..	13.11	15.38	8.93	8.67	93.36	90.43	84.42	34.5	224	2.47	53.06	40.9	85.10	3.69	**38.5**	**98.5**	17 of 18	99.2
1958..	13.12	15.92	9.09	8.82	92.87	89.49	83.11	32.9	207	2.55	52.38	42.3	84.46	4.30	39.1	97.8	18 of 18	100.0
1959..	13.66	15.92	8.74	8.44	92.86	89.42	83.04	34.6	218	2.66	53.26	43.0	85.52	3.51	40.3	97.1	18 of 18	100.0
1960..	13.69	15.22	8.70	8.41	93.35	89.40	83.45	36.2	238	2.60	53.01	42.0	85.63	3.31	40.3	96.8	18 of 18	100.0
1961..	13.75	14.52	8.51	8.26	**94.21**	89.72	**84.53**	**36.7**	**253**	**2.43**	52.54	**39.0**	86.04	3.31	39.5	97.1	18 of 18	100.0

Table 9.—COMPARATIVE RESULTS FROM OTHER COUNTRIES FOR RECENT YEARS

COUNTRIES	South Africa 1960-61	South Africa 1961-62	Jamaica 1958	Jamaica 1959	British Guiana 1959	British Guiana 1960	Philippines 1958-1959	Mauritius 1960	Trinidad 1960	Trinidad 1961	India 1957-58
CANE											
Per cent Sucrose	13.69	13.75	12.15	11.76	10.93	10.99	13.14	11.83	11.71	11.97	12.55
Per cent Fibre	15.22	14.52	14.21	14.20	15.06	15.08	11.72	14.38	13.22	13.68	15.57
FIRST EXPRESSED JUICE											
°Brix	19.88	19.55	18.51	18.01	17.35	17.36	19.52	17.51	18.26	18.99	19.34
Purity	87.8	88.0	83.0	82.1	81.1	81.4	85.10	85.90	80.80	80.64	83.60
MILLING											
Imbibition per cent Fibre ..	238	253	128	131	187	196	98	210	159	140	131
Lost Abs. Juice per cent Fibre	42	39	35	37	49	49	55	40	53	57	66
Imbibition per cent cane	36.2	36.7	18.1	18.6	28.2	29.5	11.5	30.2	21.1	19.1	20.4
Sucrose Extraction	93.4	94.2	94.2	93.8	91.4	91.2	92.4	94.4	92.5	91.6	91.5
Sucrose per cent Bagasse ..	2.60	2.43	2.60	2.48	2.91	3.05	3.86	2.21	3.03	3.28	3.25
Moisture per cent Bagasse ..	53.01	52.54	48.17	48.31	49.61	49.61	49.60	49.79	50.32	50.61	48.46
Lower Calorific Value	3023	3069	3442	3431	3311	3309	3295	3308	3248	3218	3405
BOILING HOUSE PERFORMANCE	96.9	97.1	98.7	97.2	96.0	97.7	98.9	95.6	98.1	97.4	97.0
RECOVERIES AND AFFECTING QUALITATIVE DATA											
Purity of Mixed Juice	85.6	86.0	81.8	80.5	78.8	79.1	84.6	83.5	78.9	78.9	81.7
Purity of Final Molasses ..	40.3	39.5	32.8	32.4	32.5	31.4	37.7	37.2	31.5*	32.0*	35.8*
Average Pol. of Sugars	98.88	80.90	97.2	97.0	97.3	97.7	97.95	98.73	96.67	96.91	99.8
Undetermined Losses	0.97	1.32	1.82	2.05	1.51	1.26	0.44	2.81	0.74	0.64	0.87
Boiling House Recovery ..	89.4	89.7	89.5	87.7	86.6	87.6	90.9	87.1	87.9	87.6	87.1
Overall Recovery	83.4	84.5	82.7	82.3	79.2	80.0	84.0	82.2	81.3	80.2	79.7
Tons Cane/Ton 96° Sugar ..	8.41	8.26	9.50	9.89	11.10	10.91	8.77	10.16	9.85	9.99	9.70
FILTER CAKE											
Per cent sucrose	1.66	1.63	2.27	2.01	1.21	1.35	2.41	3.00	1.86	1.64	2.66
Weight per cent cane	6.10	5.43	2.49	2.60	3.14	3.14	2.00	2.70	2.91	2.64	4.17

*Apparent Purity.

Mr. J. L. du Toit, in the chair, said that last year Mr. Perk was awarded the Talbot Crosbie Prize for his Annual Summary, but this year his contribution contained even more information.

Dr. Dodds pointed out that on page 34 was shown the progress that had taken place since these reports were first published in 1925. When he was first made Director of the Experiment Station he considered adopting the idea of publishing reports of this kind, as he had just come from Cuba, where they published a very good report, but he did not see how one could publish at that time one to compare with that standard here, for he found at first a certain amount of opposition to the publication of factory results.

He noticed from the report that N:Co.310 was still planted extensively in Taiwan and in Somalia. In America the only foreign variety now grown was also N:Co.310 and in Australia in many districts it was the most popular variety.

Mr. Fourmond, in connection with the final molasses brix figures shown in Table 4, said he had determined and noted the brix of the final molasses on a 50 per cent dilution, but then he had found other factories were using a 20 per cent dilution, thus recording a lower purity.

Mr. Perk answered that the Recommended Methods dilution should be followed.

Mr. Rault considered the new chapter on the fuel position at the various factories to be a wonderful new innovation.

On the purity of final molasses, the differences found between the various factories, which ranged from 34 to 40 degrees was upsetting, for this was unusual in South Africa. He asked if this was due to the difference in reducing sugar content of the molasses. He did not think we found a big difference in this country when processing ripe, as against unripe, cane.

Mr. Perk remarked in reply to Mr. Rault's question, that it was a pity that not all factories recorded the reducing sugars and the sulfated ash contents of their molasses, nor did they always give both purities of their molasses. However, most high molasses are not a result of unfavourable composition, but lack of centrifugal capacities and other technical shortcomings. Too much C-massecuites have to be boiled too coarse, because of insufficient capacity of the C-m.c. centrifugals.

Mr. Covas said he had found a 4 degree difference in the final molasses from ripe as compared with unripe canes, but a further point was the difference between apparent and Clerget purity, the former being 33 degrees when the latter was 36.8. That amount of difference was found whether purities were high as in 1960 or low as in 1961. He explained that he used a dilution of 50 per cent for the determination of brix in all his analyses of molasses.

Mr. Phipson asked if there was any quick method of ascertaining the sufficiency of crystal in a massecuite.

Dr. Graham replied that there was a quick method which consisted in placing the sample of massecuite in a cylinder fitted with a plunger on top and a supported wire gauge on the bottom and applying pressure on the plunger which forces the "lubricating fraction" of the molasses through the wire gauge. The crystals together with adhering molasses remain in the cylinder. The contraction in volume is measured and may be related to the crystal content.

Mr. Rault remarked on the Darnall figure for imbibition per cent fibre which was the highest in the Industry. This was accompanied by the highest efficiency. It had always been considered in the past that application of over a certain amount of water did not lead to better extraction, but this seemed now to be disproved.

Dr. Douwes Dekker said that the figure quoted did not prove that the application of such a large quantity of water would lead to higher efficiency. If the amount of water had been reduced the efficiency might have remained the same.

Mr. van Hengel related that during a period when the imbibition at Darnall had been reduced from 380 to 280 per cent on fibre the lost absolute juice per cent fibre was hardly altered and still remained very low.