FIFTY-THIRD ANNUAL REVIEW OF THE MILLING SEASON IN SOUTHERN AFRICA (1977 - 1978)

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Introduction

This fifty-third annual review covers the 1977/78 sugar season in South Africa, Swaziland and Malawi. The results of only two Mozambique mills (BZ and IC) have been included as final data from the other factories had not been received at the time of writing this report.

Before 1950 the Annual Summary of the season was written by Dr. Dodds and co-authors from the S.A. Sugar Association Experiment Station. It contained both agricultural and factory information. The agricultural side has been gradually de-emphasised and during the past two decades the annual summary has reviewed almost exclusively factory work. In an attempt to give a more comprehensive picture of the season, contributions from specialists of the Experiment Station on the weather, cane varieties and cane transport have beeen included in this report.

The list of symbols used to designate each mill remains unchanged and a key to the symbols can be found in Table A.

All data listed have been calculated from figures as supplied by the mills. Sugar weights were obtained from the South African Sugar Association and cane varieties and cane transport tables from the Sugar Industry Central Board.

Highlights of the 1977/78 Season

South Africa

The eighteen mills in South Africa produced 2 083 877 tons of sugar from 19 009 030 tons of cane at a cane to sugar ratio of 9,12. Sugar production set a new record.

A slight improvement in cane quality is reflected in the cane to sugar ratio which was lower than for the previous season (9,41). Cane quality however remained very poor and was lower than the average for the previous ten seasons. Extraneous matter in cane was high and tests carried out during the season indicate that about ten percent of the raw material supplied to mills cannot be used for processing into sugar.

In spite of a slight improvement, time efficiency (75,89) was not in keeping with the technical performance of the mills. With most of the factories having completed their expansion programme, the industry should be capable of reducing factory stops which were mainly due to long scheduled stops (9,54%) and to high mechanical and operational stops (10,49%).

Mill extraction (95,87) was the highest on record since 1971 (95,91) in spite of an increase of 0,91 points in fibre content of cane and a drop of 0,14 points in pol content. The season marked a breakthrough in moisture content of bagasse (52,55) which was the lowest since 1963.

Severe boiling house difficulties were experienced in most mills during the last four months of 1977. High viscosities, elongated crystals and foaming massecuites were reported by a number of factories. Boiling house recovery was 88,62 and overall recovery 84,96.

Swaziland

The two mills in Swaziland (UR and MH) produced a total of 224 419 tons of sugar, over 16 000 tons more than during the previous season. Pol % cane was 13,30 at MH and 13,16 at UR and fibre % cane 15,21 and 13,40 respectively. The good cane quality was reflected in a cane to sugar ratio of 8,85 for MH and 8,90 for UR.

Although extraction was comparatively low (MH: 92,78, UR: 94,58), the boiling house recovery of both mills was higher than the South African average. It was exceptionally high at MH (90,27), a performance exceeded only by two mills in South Africa.

The time efficiency of MH (88,02) was by far the highest of all the mills listed in this review. The fact that this factory crushed 213 tons of cane per hour with six 1 676 mm mills while maintaining this efficiency makes for exceptionally good performance.

Malawi

NH again broke its previous record and produced 91 542 tons of sugar.

Cane quality was good with a pol % cane of 13,45 and a fibre content of 14,73. Cane to sugar ratio was 8,77.

There was an improvement in both extraction (milling tandem 93,58, diffusion 95,42) and in boiling house recovery (88,78) while time efficiency increased from 72 to 82 percent.

Mozambique

Available data from BZ and IC indicates a drop in sugar production of about 20% from these two mills.

Cane quality was very poor at IC with a pol % cane of only 11,82 and a low mixed juice purity of 81,72. Cane to sugar ratio was 9,59 at BZ and 9,96 at IC.

Extraction (93,14) and boiling house recovery (89,81) were better than for the previous season at IC but factory work was generally poor at BZ.

Weather conditions*

Rains during the first three months of the year were above the long term average for the industry, though they were sometimes poorly distributed north of Durban. In February bad flooding occurred on the Felixton and Umfolozi flats, causing severe damage to cane. Temperatures were also above average. Conditions for growth during these three months were good.

Following the good start to the year, the months from April to the end of July were very dry, with rainfall totals well below half of the long term average, particularly on the South Coast and in the Midlands. Light frost occurred in the Midlands and cane fires were widespread. Toward the end of this period there was a marked deterioration in the crop and some stalk mortality occurred. Sucrose levels, however, were well above average in most areas.

Rainfall improved from August onwards and temperatures were above average. Satisfactory rainfall and temperature conditions continued until the New Year, though it was only in December that the effects of the long dry winter months finally disappeared, with the cane looking particularly good in February 1978, and promising a good crop for the 1978/79 season.

* By R. H. Paxton, S.A.S.A. Experiment Station

Cane Varieties*

The percentages by weight of different varieties crushed are listed in Table G.

In South Africa the proportion of NCo 376 milled again increased and this variety accounted for 63,5% of all cane crushed. It is interesting to note that the last variety to achieve a similar popularity was NCo 310 which first made up 60% of milled cane in 1957. Previous to this, Co 281 accounted for more than 60% of the total crop during the war years. The popularity of NCo 376 is undoubtedly due to its ability to produce more sugar per unit area than NCo 310. However, the fall in sucrose percent cane of the South African crop from 13,5% when NCo 310 was popular, to 12,5% today, is at least partly due to this variety change.

In the Midlands NCo 376 accounted for a minority of the cane crushed (JB 18,3%, UC 11,8%), the major part of this area being planted to NCo 293. This may be considered surprising since many field trials in this area have shown that NCo 376 is generally the better yielder. However, NCo 376 suffers a severe yield loss when infected with Ratoon Stunting Disease (RSD), and it is known that much of the NCo 376 in this area has got the disease.

From its halcyon days of the late 1950's, NCo 310 has declined steadily and in 1977/78 contributed only 5% of the millable crop. The ominous threat of smut in this highly susceptible variety has been a major reason for the rapid fall in its popularity.

In the northern mills, as recently as 1972/73, NCo 310 accounted for more than 60% of the crop at UF, PG, MH and UR. Today the variety has disappeared from the Swaziland list and only represented 36,1% and 12,5% at the UF and PG mills respectively.

N 55/805, which has been increasing steadily over the past few years, now appears to have levelled off at about 10% of the total crop. N 55/805 outyields other varieties on sandy soils and the following data shows how the popularity of the variety tends to be related to the amount of sandy soil in a mill area.

TABLE 1

Distribution of N 55/805 on sandy soils

Mill	1977/78 Percentage of N55/805	Approximate percentage of area comprising recent sands
UF	18,4	29
FX	15,9	57
AK	11,8	13
DL	18,9	13
ME	19,8	19
GH	12,7	12
TS	15,1	19
Industrial average	10,4	8,7

The newly released variety N 52/219, which at present contributes a negligible amount to the total tonnage, is in great demand in the northern areas due to its resistance to smut. At MH in Swaziland, the variety already accounted for 6,6% of the cane milled, and it is apparent that the proportion of this variety will continue to increase rapidly in these areas, and indeed anywhere where smut is a problem.

NCo 382, a variety which was previously popular for sands, contributed only 2,2% of the cane milled in South Africa. However, it is still relatively popular in the Midlands where it was almost as widely grown as was NCo 376. Unfortunately, it is a low sucrose content variety and from this point of view does not help in an area where the generally low sucrose content of the crop is already a problem.

There are several other varieties which individually contributed less than 1% of the cane crushed, and specific mention is made of only one, the Brazilian variety CB 36/14, the proportion of which has increased slowly in the Midlands where it is being used primarily as a variety to cut annually in frost-prone areas.

* By R. F. Bond, S.A.S.A. Experiment Station

Cane Transport*

A summary of cane transport for South African mills is listed in Table H. There was very little change in 1977/78 compared with the previous year in terms of the proportion of cane transported by South African Railways and by road, with Hilo-type road transport currently accounting for 55,1% of all cane delivered. At JB a distinct swing of 5,2% away from SAR towards road transport occurred.

Although still only a small fraction (1,6%) of their total cane, chopped cane deliveries are shown for the first time at TS. The full quota of chopped cane is listed under chopped cane bins, but approximately 50% of this cane was, in fact, delivered by a canetainer system. Hi-lift infield chopped cane trailers filled the canetainers at the side of the fields. Special trucks, fitted with multi-lift pick-up systems, collected the canetainers and transported them to the mill where the cane was tipped on to the carrier.

An interesting change from the previous season is the decrease of 3,6% in chopped cane delivered at UF. This was possibly due to the flooding of the Umfolozi flats early in the season, severely restricting mechanical harvesting for a number of months.

Cane quality

Comparative cane quality data for the 1977/78, 1976/77 and 1975/76 seasons as well as the ten year average from 1965 to 1974 are listed in Table 2.

TABLE 2

Comparative cane quality data 1965 to 1977

	1977/78	1976/77	1975/76	Average 1965 to 1974
Pol % cane	12,83	12,43	12,60	13,16*
Fibre % cane	15,79	15,52	15,67	15,22
Mixed juice purity	84,39	84,47	84,70	84,80+
ERC % pol in cane	84,82	84,80	84,48	–
ERC % cane	10,89	10,55	10,69	–

* Sucrose % cane
\+ Spindle brix pty 1965-1971.

There has been a small increase in pol % cane from the previous season but the 1977/78 value of 12,83 was still lower than the 1965 to 1974 ten year average of 13,16. Fibre % cane also increased to 15,79, the highest season average since 1959, while the mixed juice purity of 84,39 was the lowest since 1969.

A slight improvement in recoverable sugar is indicated by erc % pol in cane (84,82) and erc % cane (10,89) which were higher than for the two previous seasons. This increase is due to the higher pol content of cane. The factors used in the erc formula for the season were

$a = 0{,}989025$; $b = 0{,}464710$; $c = 0{,}033540$.

The extent to which poor cane quality was due to extraneous matter supplied with the cane cannot be measured. It is however highly probable that the very high fibre content of cane was a result of trash and sand in cane which must also have had a depressing effect on both pol % cane and mixed juice purity.

Complaints of poor cane quality and high extraneous matter content were received from almost all mills. Particularly poor

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quality cane was supplied to FX, EM and UF as a result of floods in Zululand in February 1977. Average fibre content of cane at FX and EM was over 18% while suspended solids % mixed juice was 1,91% for the A tandem at FX. The amount of sand and mud in cane was such that, although FX had above average clarifier and filter capacities, the two tandems had to be stopped during the season for a total of 57 hours and 120 hours respectively because the clarifiers were full of mud.

A survey of extraneous matter in cane was carried out by the SMRI during the season. Lack of sampling and analytical facilities limited the number of mills which participated in the survey but the results obtained, even though incomplete, are impressive. Weekly mill average results ranged from 8,5% to 2,6% for trash and from 3,9% to 1,8% for tops. Average values for all reporting mills were: trash 6,8% and tops 2,2%. Ash % cane, which is a measure of sand and soil in cane ranged from 5,23 to 0,89 for weekly mill average results. As a percentage, these figures do not convey the magnitude of the problems created for the mills by extraneous matter in cane. The tonnages involved are however enormous. For example, at ML the weight of ash in cane processed per week was about 700 tons with peaks of over 1 000 tons.

A direct effect of the high extraneous matter content of cane was that about 10% of the crushing capacity of the industry was tied up in processing non-cane. Indirect effects are numerous and may be more important than the reduction in capacity. They range from a reduction in the weight of cane which can be loaded in lorries to long maintenance stops required to clean ash from boilers.

Sugar production

The tonnage of sugar produced (2 083 877) broke all previous records and was 42 000 tons higher than in 1976/77. Table A shows that the local market absorbed 1 085 366 tons or 52% of production and the balance was exported.

UF recommissioned its refinery which had not been in operation for a number of years. This refinery produced excellent quality white sugar by the melt sulphitation process. In addition to the central refinery in Durban which produced about 54% of all refined sugar, there were six refineries attached to mills in operation during the season. Four of these backend refineries (ML, PG, GH, SZ) and Huletts refinery used the carbonatation process while EN had a Talofloc clarification plant and UF used melt sulphitation. White sugar from the backend refineries accounted for 21% of all sugar produced during the season.

Time Efficiency, Crushing Rate and Crushing Capacity

Average time efficiency for the season was 75,89, a slight improvement over the 1976/77 figure of 75,22.

The best time efficiency of all mills listed in Tables B_1 and B_2 was reported by MH (88,02). UR in Swaziland and NH in Malawi also reported good efficiencies of 82,79 and 81,75 respectively. The low total stops of these mills is chiefly due to short stops for no cane and their time efficiency is higher than that of the majority of South African mills.

TABLE 3

Time Account

	MH	EM	ML	Ind. Average
Time efficiency	88,02	82,88	62,08	75,89
Hours scheduled stops % available hours	5,06	10,07	6,24	9,54
Hours lack of cane stops % available hours	0,60	1,43	15,80	4,08
Hours other stops % available hours	6,32	5,62	15,87	10,49

Four mills (EM, FX, ME and JB) in South Africa have reported time efficiencies of over 80 and three others (ML, UF, UC) efficiencies below 70. EM had the highest time efficiency of all South African mills (82,88) and ML the lowest (62,08). Comparative stops of MH, EM, ML and the industrial average are listed in Table 3.

The influence of regular cane delivery on the good time efficiency of MH and EM is very noticeable while the opposite is true of ML. Other stops are far lower than average at MH and EM and should be improved at ML.

Trends in factory stops are illustrated in Fig. I in which stops from 1969 to 1977 have been plotted.

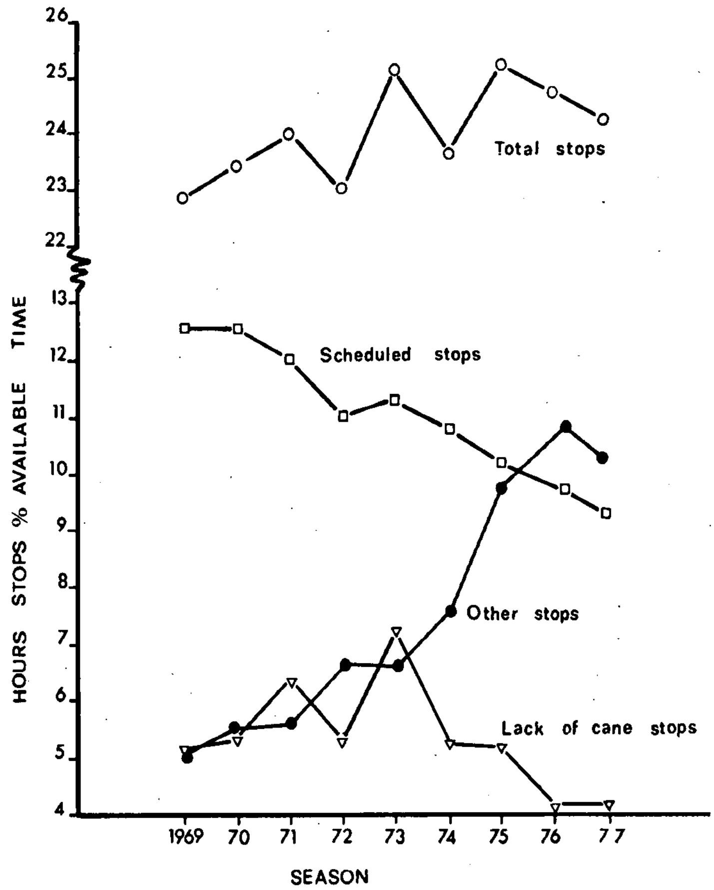

Figure 1: Factory stops 1969-1977

No cane stops have levelled off at about 4% of total stops and slight decreases in scheduled stops and other stops are noticeable. In spite of this decrease, other stops, which are mechanical and operational stops are still at a high level (10,5%) and approximately twice what they were in the 1969 to 1973 period. The steep increase in other stops during the past four seasons has been caused mainly by commissioning problems of new equipment. These long stops should not be accepted as normal now that major expansion work has been completed in most mills.

It is not out of place to comment here on the logging of stops. Although the figures reported by the mills have been used in the tables and comparisons, there is no doubt that they do not reflect the true situation in some cases. The main difficulty is the logging of short stops. In some factories, stops of less than five minutes are not logged while in others one minute may be considered to be the minimum time. A totalising clock installed on the cane carrier at JB during the past season has proved to be successful. It adds up all stops of more than thirty seconds during each shift and is coupled with a recorder which indicates graphically the duration of each stop.

Comparisons are also made more difficult by the interpretation of scheduled stops, which were too long at most factories. Some mills define the time allowed for scheduled stops and credit any excess time required for maintenance to other stops, while others set no time limit to their maintenance stops. A target scheduled stop for the industry would help solve this problem and would probably have a favourable effect on the time efficiency of a number of mills.

The average crushing rate has increased for the third year in succession. It now stands at 221,4 tons of cane per hour and 5 mills crushed at more than 300 tch during the past season.

The crushing capacity of the industry, which is obtained by adding the crushing rate of all 18 mills, was 3 951 tch, an increase of 220 tch over the previous season. This increase is equivalent to the crushing rate of one additional factory.

Crushing capacity is of course a theoretical figure and it must be multiplied by time efficiency to obtain actual crushing capacity. A simple exercise shows that last season's actual crushing capacity at 75,89 time efficiency was 2 998 tch. The same capacity could have been achieved with the 1976/77 season's theoretical capacity of 3 731 tch and a time efficiency of 80%. In view of the very high capital cost of increasing factory capacity, every effort should be made to achieve better time efficiency.

Cane preparation and extraction

Milling performance data of all mills are listed in decreasing order of Corrected Reduced Extraction (CRE) in Table 4.

TABLE 4

Milling Performance Data

(In decreasing order of Corrected Reduced Extraction)

Factory	Corrected Reduced Extraction	Extraction	Pol % Bagasse	Moisture % Bagasse	Imbibition % Fibre
SZ (B)	97,10	97,12	1,08	53,04	369
JB	96,81	97,05	1,21	51,20	331
ME	96,72	97,05	1,28	50,25	272
PG	96,58	96,72	1,37	49,40	378
EM	96,39	95,79	1,46	50,25	251
TS (B)	96,35	96,13	1,23	57,26	319
ML	96,26	96,19	1,39	53,42	340
GH (B)	96,21	95,98	1,30	56,82	331
DL	96,16	96,24	1,42	53,67	268
GH (A)	95,96	96,06	1,55	51,36	312
Industrial Average	95,81	95,87	1,56	52,55	302
FX(B)	95,73	95,17	1,65	51,98	290
TS (A)	95,68	95,54	1,53	54,53	262
UK	95,65	96,11	1,69	50,46	323
FX (A)	95,59	94,89	1,70	51,75	245
AK	95,51	95,68	1,67	51,84	311
SZ (A)	95,51	95,53	1,69	51,50	316
EN	95,14	95,76	1,70	55,18	289
MV	95,13	95,08	1,79	52,25	321
UC	94,95	95,58	1,71	54,77	288
IL	94,64	95,37	1,94	53,43	307
UF (B)	94,05	94,27	2,15	53,80	249
GD	92,44	93,42	2,80	50,96	270
UF (A)	92,31	92,77	2,71	54,30	301

For the second year in succession, the SZ(B) tandem (bagasse diffuser) led the field with an extraction of 97,12 and a CRE of 97,10. It was closely followed by two conventional milling factories (JB and ME) with 97,05 extraction.

Industrial average extraction has increased from 95,48 in 1976/77 to 95,87 for the season under review. The corresponding increase in CRE, from 95,40 to 95,81, indicates that the improvement in extraction is due to better milling work rather than to cane quality. In a few cases (TS(B), GH(B), DL) major modifications to the extraction plant may be responsible for good extraction. For the other above average mills, improved extraction must be credited to better operation.

The importance of good preparation was still evident and average preparation index (89) was the same as for last season. AK still reported the best preparation (94) and eleven mills had PI's of 90 or over. There seems to be little room for improvement left in cane preparation apart from more efficient use of the power required to obtain good preparation. The optimum preparation for diffusers, specially cane diffusers, is still debatable because of the adverse effect of fine preparation on percolation. A list of cane diffusers in decreasing order of extraction is listed below. Preparation index and imbibition % fibre, the two main parameters which may have affected extraction are also listed. The performance of AK does not appear to have benefited from the excellent preparation.

TABLE 5

Cane Diffusers

Factory	Corrected Reduced Extraction	Extraction	Preparation Index	Imbibition % Fibre
TS (B)	96,35	96,13	91	319
ML	96,26	96,19	91	340
GH (B)	96,21	95,98	90	331
AK	95,51	95,68	94	311
UC	94,95	95,58	90	288

Imbibition % fibre averaged 302% for the season with significant variations between mills. From the figures listed in Table 4 two interesting pairs of comparisons can be made.

First of all, if the milling tandem at JB and ME are compared, it will be noticed that their performance is almost exactly the same but that whereas JB had an imbibition % fibre of 331%, ME used only 272% water on fibre. The same comparison can be made of the results of PG and EM, both bagasse diffusers, one of which used 378% on fibre and the other 251% to obtain results which are comparable. From a strictly milling point of view and without taking into considerations other problems such as surplus bagasse disposal, there is no doubt that there is still room for more efficient use of imbibition by many mills.

The high moisture content of bagasse which in the last decade has traditionally been associated with milling in South Africa is gradually being lowered. Better roller maintenance resulting from improved roller surface welding and better mill feeding have enabled average bagasse moisture to be lowered to 52,55 for the season, an improvement of 0,7 points since the previous season. PG has reported a season average bagasse moisture content of 49,40 while four other tandems (ME, EM, UK and GD) had average moistures below 51. It must be noted that both PG and EM are diffuser factories and their results disprove the widely held belief that diffusers are always followed by high moisture in bagasse.

Some of the noteworthy improvements and modifications made to extraction plants in 1977 were:

New BMA cane diffusers were commissioned at TS and GH. Nominal capacity of the TS diffuser is 240 tch and that of the GH unit 120 tch. In both cases initial problems were rapidly resolved and the tandems were among the top performers during the season.

New turbines and gearing were fitted to three of the mills at DL. Problems were experienced with the turbine governors and both the capacity and performance of the DL mill were affected during the first weeks of the season.

An automatic thyristor controlled cane carrier drive at ML has enabled the complicated sequence of carriers to operate satisfactorily. An increase in cane crushing capacity from 270 to 320 tch is credited to the carrier control.

Excessive wear of conveyors and milling equipment because of sand in cane was still very much in evidence throughout the industry during the season. Failure of cane carrier chains was responsible for an important part of the lost time at TS and UF while an unusual number of roller shaft breakages were reported by SZ and UK.

Clarification and Filtration

In spite of the very poor quality cane processed during part of the season, there were few reports of clarification difficulties. Concern was however expressed on the purity drop between mixed and clarified juice which occurred in eight mills and was particularly severe (1,22 points) at PG. Experiments carried out in a laboratory clarifier at the SMRI indicated that, under controlled conditions, there should be no change in juice purity across clarifiers.

Two more SRI clarifiers were commissioned during the season. They were installed at GH which is now the fifth mill to rely entirely on this type of clarifier. Measurements carried out at SZ during the season on juice from SRI clarifiers agrees with work done at UF a few years ago and confirms that these clarifiers produce excellent quality clear juice. Apprehensions on the ability of SRI clarifiers to operate satisfactorily on hot limed juice have been dispelled by experiments carried out at SZ and all SRI clarifiers in South Africa are now processing juice after hot liming.

There has been a slight decrease in the use of flocculants which now averages 3,04 ppm mixed juice. High usage of flocculants appears to be more influenced by regional effects than by retention time in the clarifier. The Midlands mills (UC and JB) are the highest users with 11,28 and 10,19 ppm respectively.

Pol % filter cake has gradually increased over the past five seasons. Excellent filter work was reported by UK (0,74) but very high pol % cake at UC (4,35) and EN (4,54) have contributed to increasing the industrial average.

Average weight of filter cake % cane was 4,45. This weight is however uncertain for two reasons: Firstly, some mills do not weigh their filter cake (UF, GD, TS). They have been reporting 5% filter cake on cane for a number of years although the commissioning of diffusers at UF and TS must have reduced the weight of filter cake. Secondly, it has become the practice in a number of mills to mix smuts from the flue gas separators with filter cake before weighing the cake.

Losses in filter cake are comparatively low but they are not negligible. For an average mill processing one million tons of cane they amount to about 650 tons of sugar in a season and are worth over R100 000. The sum involved certainly justifies the installation of simple weighing devices on the mud carriers for better control of filter losses.

Boiling House

The 1977/78 season was notorious for boiling house problems and will probably be remembered by process managers for the massive occurrence of elongated crystals.

The first signs of abnormal processing conditions were noted in August and high viscosities, elongated grain and frothing massecuites were still in evidence late in October. At most mills the situation eased up slightly towards the end of the season.

No explanation can be offered for these difficulties but a few trends are apparent.

a) Frothing massecuites, which are probably caused by the Maillard reaction, were in particular evidence in factories which boil their massecuite hot because of low vacuum. They were absent in mills which were able to operate their pans under high vacuum.

b) The occurrences of elongated grains were more widespread. Their distribution seems to have been influenced by geographical considerations and they did not occur at UC and JB. Equipment limitations appear to have favoured needle grain formation in some mills. In at least one case, B molasses, which produced elongated grain at a factory, yielded normal crystals when boiled in a laboratory pan.

   A similar situation was observed at UK where the same B molasses boiled in two C pans consistently yielded elongated grain in one and not in the other.

One can speculate on the causes of these problems but the net results have been a decrease in boiling house recovery from 88,99 for the 1976/77 season to 88,62 during the past season.

Boiling house results of all factories are listed in decreasing order of boiling house recovery in Table 6. For the fifth year in succession MV still leads with 91,00 boiling house recovery. Both JB and TS report recoveries of over 90 and are closely followed by ME (89,73).

Inspection of Table J shows that industrial average mixed juice purity was lower by 0,08 points than during the previous season. This difference is not sufficient to account for the drop in boiling house recovery. The increase in undetermined losses (1,64) over the previous season was marginal but final molasses losses expressed as a percentage of pol in cane (8,77) were 0,27 points higher and were the main cause of the poorer boiling house performance.

A breakdown of the molasses losses shows that purity (38,31) was only 0,08 points higher but weight of final molasses % cane (3,83) was appreciably greater than in 1976/77 (3,60).

Molasses factor (54,84) and non-pol ratio (0,96) which should have been influenced by the increase in molasses production were both lower than for the previous season. This situation illustrates the limitations of existing factors and ratios when used to compare boiling house performance of factories.

The results of TS merit special consideration because this factory has almost the same relative position in Table 6 as it had during the previous season in spite of two adverse factors: a lower time efficiency and a longer season than other factories. A third factor, which has generally been regarded as adverse for boiling house performance, is that about half the juice at TS has been produced by a cane diffuser for the first time this season. The change in extraction process does not appear to have had a noticeable effect on boiling house recovery.

Table D_1 shows that industrial average massecuite volumes have remained practically unchanged. MV again reports impressive figures, with 19% less A massecuite boiled per ton of brix in mixed juice and a purity drop of 23,08 points from massecuite to molasses, compared to the industrial average of 16,70. The benefits that are obtained by good exhaustion of A massecuite are not limited to the boiling house. A reduction in volume of massecuite boiled is also reflected in lower steam demand and boiler capacity.

The trend from double to single curing of C massecuite has picked up momentum during the season and very few factories are now double curing. No apparent effect on sugar quality has been reported, even in factories which refine their own sugar.

As mentioned before, there was a slight increase in final molasses purity (from 38,23 to 38,31) from the previous season but this may have been due to the reduction in reducing sugars content of the molasses (18,18 to 17,17). Lowest purities were reported by JB (35,01), PG (36,26), MV (36,46) and ME (36,64). Both JB and MV bettered the target formula by 0,21 and 0,35 points respectively, while PG and ME were 0,93 and 1,80 points higher respectively.

There were no major modifications to the boiling house of factories for the past season, but the following points are worth mentioning:

ME ran for the whole season with completely automatic (conductivity) control of A and C boilings. The same factory also

TABLE 6
Boiling House Data
(In decreasing order of boiling house recovery)

Factory	Boiling house recovery	Final molasses (pol) losses % pol in cane	Undetermined losses (pol) % pol in cane	Molasses at 85 Bx % cane	Purity final molasses	Molasses factor (Sucrose in molasses % non pol in mixed juice)	Non pol ratio	Mixed juice purity
MV	91,00	7,53	0,68	3,45	36,46	48,69	0,92	84,58
JB	90,68	7,42	0,92	3,70	35,01	44,90	0,93	83,10
TS	90,04	8,59	0,29	3,69	38,34	55,20	0,97	84,76
ME	89,73	7,60	1,80	3,72	36,64	46,89	0,91	83,46
DL	89,59	8,56	0,95	3,87	37,90	58,34	1,03	85,58
IL	89,49	7,89	1,39	3,74	38,62	55,27	0,99	85,17
UK	89.16	8,30	1,81	3,54	38,45	52,12	0,89	85.10
Ind. Ave	88,62	8,77	1,64	3,83	38,31	54,84	0,96	84,39
FX	88,48	8,60	1,60	3,61	38,60	54,27	0,94	84,61
GH	88,45	9,25	1,49	3,84	39,88	59,71	0,96	84,96
EM	88,27	9,96	0,87	3,97	39,77	62,83	1,02	85,04
PG	88,15	9,14	2,03	4,33	36,26	53,85	1,03	83,19
SZ	88,07	8,94	2,09	3,85	37,93	52,06	0,91	83,76
AK	87,94	9,12	2,18	3,98	39,58	57,97	0,98	84,16
UC	87,62	9,84	1,69	3,85	39,43	52,66	0,85	82,81
GD	86,97	9,15	2,61	3,92	38,40	60,34	1,01	85,60
ML	86,85	9,48	2,75	4,32	37,04	54,48	0,99	83,09
UF	86,32	8,87	3,14	3,58	40,59	57,57	0,89	85,11
EN	85,44	9,97	2,91	3,82	40,81	66,43	0,98	86,39

reports good results with ultrasonic control of scale in evaporators.

All the C massecuite at TS was boiled in a continuous vacuum pan.

A new type of fluidised bed sugar dryer was successfully used on refined sugar at GH.

Overall Factory Performance

The factory performance index (FPI) of all South African mills during the past season is listed in Table 7.

TABLE 7
Factory Performance Index (1977/78)
(Decreasing Order)

JB	104,11	FX	99,78
MV	102,22	UC	99,77
ME	102,18	UK	99,72
TS	101,64	ML	99,64
PG	100,72	EM	99,50
SZ	100,45	AK	99,01
GH	100,29	IL	98,97
DL	100,20	UF	94,81
		GD	94,52
		EN	94,37
Ind. Average	100,00		

For the second year in succession JB (104,11) heads the list followed by MV (102,18). TS (101,64) is in the same position as last season but PG and GH which were below industrial average last season have now moved up while EM has dropped to thirteenth position.

The number of above average mills has increased from 6 in 1976/77 to 8 during the past season. This is a healthy trend which indicates a general improvement in factory efficiency in the industry. ML and UK, although below average, show good progress from last season. Unfortunately the last three mills on the list (UF, GD and EN) report FPI values ranging from 94,81 to 94,37 whereas the lowest FPI recorded during the previous season was 96,31.

Boilers and Fuel

Additional fuel used by the mills is listed in Tables D_1 and D_2. This table must be used with caution as a number of mills sell bagasse to other industries, while others supply steam and power to backend refineries, irrigation pumping stations, etc. In fact it is only at EM, DL, ME, JB and UK that fuel is used solely in raw sugar manufacture. ME and DL report exceptionally good fuel economy with only 1,12 and 0,71 tons of additional fuel converted into bagasse per 1 000 tc. This fuel was used for start up and during breakdowns and DL had such a bagasse surplus during part of the season that they operated their quadruple effect evaporator as a triple to reduce thermal efficiency.

New boilers were commissioned during the season at TS, JB and DL and two new turbo-alternators of 7,25 MW each were installed at TS. Sand in bagasse was still the major problem in boiler operation. The amount of sand introduced into the furnaces with bagasse is enormous and the removal of several hundred tons of ash from under the boilers every week is a major operation with important safety implications. The use of slow speed induced draught fans in the new TS boiler has been successful in reducing fan wear due to abrasion.

The effect of ash content of bagasse on its calorific value has been discussed in last season's review[1]. It has not been possible to apply the new formula to calculate the calorific values listed in Tables C_1 and C_2 because average ash % bagasse values were not available for most mills. A number of ash determinations carried out during the season have shown that ash content of bagasse is not negligible, specially in bagasse from cane diffusers where 5 or 6 percent ash is normal. At this level the effect of ash on the thermal balance of a factory is appreciable. It would amount to a reduction of about 13% in the calorific value of bagasse.

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1. Lamusse, J. P. (1977) Fifty-second annual review of the milling season in Southern Africa (1976/77) SASTA Proc **51** : 72-91.

TABLE A

SOUTH AFRICAN SUGAR ASSOCIATION FINAL SUGAR PRODUCTION 1977/78 SEASON

(Metric tons)

Mill	Local Market			Export Market			Total
	White	Refinery Raws	Brown	Very High Pol	Sugar for H.T. Molasses Production	Raws for Refined Export	
Malelane . . . . (ML)	128 643	–	558				129 201
Pongola . . . . (PG)	59 484	–	27 324	–	–	–	86 808
Umfolozi . . . . (UF)	41 849	73	5 266	51 937	–	–	99 125
Entumeni . . . . (EN)	13 250	3 098	2 027	10 338	–	–	28 713
Empangeni . . . . (EM)	–	101 245	195	16 389	9 623	1 100	128 552
Felixton . . . . (FX)	–	31 073	100	69 250	–	–	100 423
Amatikulu . . . . (AK)	–	49 023	180	164 131	–	–	213 334
Darnall . . . . (DL)	–	79 188	200	81 132	–	–	160 520
Mount Edgecombe . . . . (ME)	–	51 562	63 647	10 465	–	–	125 674
Glendale . . . . (GD)	–	22 866	34	3 377	–	–	26 277
Melville . . . . (MV)	–	13 050	68	28 118	–	–	41 236
Gledhow . . . . (GH)	133 522	17 170	–	6 721	–	–	157 413
Jaagbaan . . . . (JB)	–	112	–	110 129	–	–	110 241
Union Co-op . . . . (UC)	–	37 872	93	6 522	–	–	44 487
Tongaat . . . . (TS)	–	95 016	557	115 825	–	–	211 398
Illovo . . . . (IL)	–	588	21 917	68 902	–	–	91 407
Sezela . . . . (SZ)	62 444	1 869	36	139 965	–	–	204 314
Umzimkulu . . . . (UK)	–	6 502	13 665	104 587	–	–	124 754
Total	439 192	510 307	135 867	987 788	9 623	1 100	2 083 877

TABLE B1

CANE CRUSHED AND SUGAR MADE, CANE COMPOSITION, SOUTH AFRICAN MILLS

SYMBOLS OF FACTORIES	ML	PG	UF A	UF B	EN	EM	FX A	FX B	AK	DL
Tons sugar made*	129 201	86 808	99 125		28 713	128 552	100 423		213 334	160 520
Percentage of white sugar made	99,57	68,52	42,26		46,11	–	–		–	–
Average pol of sugars	99,89	99,53	99,55		99,65	99,32	99,25		99,34	99,43
Tons crystal made in raw house	129 845	86 578	98 743		28 689	127 213	99 248		210 297	159 748
Tons of cane crushed – Total	1 211 972	799 188	932 302		264 353	1 190 188	939 801		1 961 998	1 407 459
Tons of cane crushed – Per tandem			279 565	652 737			596 343	343 458		
Season started on	9.5.77	27.4.77	9.5.77		21.4.77	29.4.77	30.4.77		22.4.77	22.4.77
Season completed on	18.1.78	17.12.77	14.1.78		8.2.78	29.1.78	22.1.78		15.1.78	18.1.78
Number of crushing days	255	235	251		294	276	268		269	272
Time account										
Hours crushing % available hours	62,08	74,10	53,29	65,32	70,11	82,88	83,46	77,94	79,97	79,58
Hours scheduled stops % available hours	6,24	12,44	2,19	3,02	10,46	10,07	10,19	10,17	9,89	9,67
Hours lack of cane % available hours	15,80	3,86	5,80	1,10	3,27	1,43	0,27	2,97	1,77	4,59
Hours other stops % available hours	15,87	9,59	38,72	39,56	16,16	5,62	6,07	8,92	8,37	6,16
Throughputs per hour actual crushing										
Tons of cane crushed	319,92	192,24	87,15	166,00	53,55	217,83	111,12	70,42	379,44	270,82
Tons of fibre milled	49,58	28,25	12,79	24,62	7,42	37,61	18,69	11,93	56,31	41,28
Tons of brix processed	47,21	28,34	36,49		7,86	31,14	25,76		55,26	40,15
Tons of sugar produced	34,11	20,88	26,91		5,82	23,54	19,40		41,16	30,96
Composition of cane crushed										
Pol % cane	12,75	12,68	13,26	12,99	13,24	12,69	12,44	12,93	12,81	13,18
Fibre % cane	16,10	15,16	15,92	16,01	14,34	18,08	18,80	18,00	15,13	15,89
Brix % cane	15,58	15,43	15,99	15,57	15,63	15,29	15,09	15,84	15,68	15,72
Tons cane per ton sugar	9,36	9,21	9,41		9,20	9,25	9,36		9,22	8,75
Tons cane per ton 96 sugar	9,02	8,88	9,08		8,86	8,94	9,05		8,91	8,45
ERC% pol in cane	84,35	84,83	85,31	85,53	86,87	84,63	83,94	83,76	84,52	85,92
ERC % cane	10,75	10,76	11,31	11,11	11,50	10,74	10,44	10,83	10,83	11,33
Performance										
Imbibition % cane	52,64	55,49	44,23	36,97	40,03	43,40	41,22	49,12	46,10	40,87
Imbibition % fibre	340	378	301	249	289	251	245	290	311	268
Extraction	96,19	96,72	92,77	94,27	95,76	95,79	94,89	95,17	95,68	96,24
Corrected reduced extraction	96,26	96,58	92,31	94,05	95,14	96,39	95,59	95,73	95,51	96,16
Preparation index	91	91	84	83	89	84	86	86	94	93
Pol factor	99,48	99,70	100,65		99,56	100,52	99,56		98,27	99,35
Brix factor	100,85	100,49	102,58		100,49	101,61	100,91		100,27	99,66
Pol % fibre in bagasse	3,13	2,83	5,47		4,05	3,10	3,75		3,72	3,25
Boiling house recovery	86,85	88,15	86,32		85,44	88,27	88,48		87,94	89,59
Overall recovery	83,54	85,26	80,98		81,82	84,55	84,05		84,14	86,22
Factory performance index	99,64	100,72	94,81		94,37	99,50	99,78		99,01	100,20
Pol balance										
Lost in bagasse (a)	3,81	3,28	6,19		4,24	4,21	5,01		4,32	3,76
Lost in filter cake (b)	0,42	0,29	0,82		1,06	0,41	0,74		0,24	0,51
Lost in final molasses (c)	9,48	9,14	8,87		9,97	9,96	8,60		9,12	8,79
Undetermined losses (d)	2,75	2,03	3,22		2,91	0,87	1,60		2,18	0,73
Boiling house losses (b+c+d)	12,65	11,46	12,91		13,94	11,24	10,94		11,54	10,03
Sum of all losses (a+b+c+d)	16,46	14,74	19,10		18,18	15,45	15,95		15,86	13,79

* Figures supplied by S.A. Sugar Association

THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCE AND LOSSES
(Season 1977 - 1978)

ME	GD	MV	GH		JB	UC	TS		IL	SZ		UK	TOTALS AND AVERAGES
			A	B			A	B		A	B		
125 674	26 277	41 236	157 413		110 241	44 487	211 398		91 407	204 314		124 754	2 083 877
—	—	—	84,85		—	—	—		—	30,56		—	21,08
99,17	99,47	99,50	99,87		99,38	99,58	99,41		99,28	99,56		99,37	99,47
124 031	26 061	40 913	157 945		109 219	44 204	209 424		90 403	203 358		123 607	2 069 526
1 113 083	238 513	374 058	1 444 270		1 001 628	428 861	1 927 336		795 496	1 881 563		1 096 961	19 009 030
			1 019 002	425 268			1 039 970	887 366		1 307 936	573 627		
13.4.77	24.5.77	16.4.77	15.4.77		27.4.77	9.5.77	28.4.77		17.4.77	18.4.77		2.5.77	13.4.77
15.1.78	15.2.78	23.12.77	3.1.78		23.12.77	18.12.77	25.2.78		16.1.78	28.1.78		1.2.78	25.2.78
278	268	252	264		241	224	304		275	286		276	266
81,72	77,04	79,47	81,14	73,56	81,11	69,48	75,27	74,09	78,85	81,14	76,43	76,26	75,89
11,05	9,95	9,08	11,60	12,33	6,88	12,32	3,60	5,42	9,93	10,74	11,66	13,27	9,54
3,73	3,02	5,63	0,43	0,17	6,02	7,48	5,47	1,04	3,54	1,93	4,97	2,27	4,08
3,50	9,99	5,82	6,83	13,94	5,99	10,71	15,65	19,45	7,68	6,19	6,93	8,21	10,49
205,14	49,08	78,47	198,55	107,86	214,10	115,09	197,10	200,57	153,47	234,78	110,20	217,85	221,40
28,70	6,86	12,06	29,67	17,28	30,01	15,35	30,71	32,05	21,10	35,67	16,83	30,67	33,41
30,67	7,23	11,18	44,34		31,09	16,39	56,86		22,98	50,59		32,46	32,28
23,16	5,41	8,65	33,38		23,57	11,94	43,62		17,64	37,47		24,79	24,28
12,86	13,49	12,68	12,85	12,72	12,43	12,34	12,62	12,66	13,37	12,74	12,90	13,19	12,83
14,64	14,39	15,86	15,75	16,49	15,08	14,28	16,22	16,41	14,56	15,82	15,64	14,88	15,79
15,70	16,28	15,49	15,50	15,35	15,27	15,33	15,34	15,38	16,07	15,65	15,83	15,89	15,58
8,86	9,08	9,07	9,18		9,08	9,64	9,12		8,70	9,21		8,79	9,12
8,57	8,76	8,75	8,82		8,77	9,29	8,80		8,41	8,88		8,49	8,80
84,82	85,70	84,40	85,20	84,95	84,24	83,74	84,59	84,56	85,88	84,10	84,27	85,64	84,82
10,90	11,56	10,70	10,95	10,81	10,47	10,33	10,68	10,70	11,48	10,71	10,87	11,30	10,89
38,06	37,72	49,36	46,68	52,98	46,45	38,43	40,82	50,94	42,28	47,97	56,34	45,41	45,57
272	270	321	312	331	331	288	262	319	307	316	369	323	302
97,05	93,42	95,08	96,06	95,98	97,05	95,58	95,54	96,13	95,37	95,53	97,12	96,11	95,87
96,72	92,44	95,13	95,96	96,21	96,81	94,95	95,68	96,35	94,64	95,51	97,10	95,65	95,81
91	88	83	86	90	88	90	91	91	90	90	87	91	89
98,65	99,72	99,77	99,02		99,16	96,90	99,67		98,85	100,05		99,78	99,40
99,56	100,38	100,80	99,99		100,29	100,64	100,94		100,23	100,78		101,09	100,62
2,71	6,35	4,06	3,33		2,62	4,09	3,36		4,50	3,35		3,64	3,51
89,73	86,97	91,00	88.45		90,68	87,62	90,04		89,49	88,07		89,16	88,62
87,08	81,24	86,52	84,94		88,01	83,73	86,27		85,35	84,57		85,70	84,96
102,18	94,52	102,22	100,29		104,11	99,77	101,64		98,97	100,45		99,72	100,00
2,95	6,58	4,92	3,96		2,95	4,42	4,19		4,63	3,98		3,89	4,13
0,57	0,41	0,35	0,36		0,70	0,31	0,67		0,75	0,43		0,31	0,49
7,60	9,15	7,53	9,25		7,42	9,84	8,59		7,89	8,94		8,30	8,77
1,80	2,61	0,68	1,49		0,92	1,70	0,29		1,39	2,09		1,81	1,64
9,97	12,17	8,56	11,10		9,04	11,85	9,55		10,03	11,46		10,42	10,90
12,92	18,75	13,48	15,06		11,99	16,27	13,74		14,66	15,44		14,31	15,03

TABLE C1

ANALYSIS OF BAGASSE, JUICES, FILTER SOUTH AFRICAN MILLS

SYMBOLS OF FACTORIES	ML	PG	UF A	UF B	EN	EM	FX A	FX B	AK	DL
Final bagasse										
Pol % bagasse	1,39	1,37	2,71	2,15	1,70	1,46	1,70	1,65	1,67	1,42
Moisture % bagasse	53,42	49,40	54,30	53,80	55,18	50,25	51,75	51,98	51,84	53,67
Fibre % bagasse	44,24	48,35	41,44	42,76	41,92	47,05	45,04	44,89	44,79	43,77
Bagasse % cane	35,03	30,39	35,41	34,69	33,04	36,70	37,34	37,75	33,13	34,83
LCV in kJ per kg bagasse	6 999	7 809	6 766	6 891	6 632	7 633	7 323	7 277	7 306	6 948
Residual juice										
Apparent purity	59,24	60,79	63,63	62,31	57,51	53,95	52,97	52,84	49,43	55,44
Mixed juice										
Mixed juice % cane	117,61	125,10	108,81	102,28	106,99	106,71	103,88	111,37	112,97	106,04
Brix	12,55	11,78	13,31	14,05	13,72	13,40	13,37	13,17	12,89	13,98
Apparent purity	83,09	83,19	84,94	85,18	86,39	85,04	85,00	83,93	84,16	85,58
Reducing sugars/pol ratio	9,10	6,77	3,98		3,83	4,35	4,44		4,25	4,94
Suspended solids % mixed juice	0,51	0,37	1,14	1,16	0,46	0,76	1,91	0,95	0,26	0,61
Clarified juice										
Brix	12,41	11,39	14,34		14,14	13,10	12,50		12,56	12,67
Apparent purity	82,99	81,97	85,92		85,67	84,32	83,84		84,00	86,07
Reducing sugars/pol ratio	9,31	6,99	4,26		3,73	4,44	4,25		4,20	4,83
Average pH	7,14	7,44	7,05		7,16	7,01	7,20		7,00	7,10
Filter cake										
Pol % filter cake	2,29	1,20	2,14		4,54	1,25	1,42		1,17	1,02
Filter cake % cane	2,34	3,10	5,00		3,09	4,16	6,53		2,66	6,51
Syrup										
Brix	61,70	67,73	66,51		57,08	66,36	65,67		68,25	67,21
Apparent purity	82,75	83,00	86,10		86,36	84,50	85,40		84,27	86,23
Reducing sugars/pol ratio	9,77	5,31	4,51		4,98	4,30	3,09		4,06	4,59
Average pH	6,18	6,52	6,13		6,80	6,36	6,30		6,30	6,30
Final molasses										
Refracto brix	82,19	84,09	79,90		81,43	81,48	79,76		82,29	84,89
Pol/refracto brix purity	32,92	31,51	38,08		40,83	37,39	35,40		39,74	34,38
Sucrose/refracto brix purity	37,04	36,26	40,59		40,81	39,77	38,60		39,58	37,88
Percentage reducing sugars	23,83	15,29	14,84		13,47	15,77	16,68		17,19	15,65
Percentage sulphated ash	12,63	14,90	14,61		12,31	14,16	14,05		13,52	14,64
Reducing sugars/ash ratio	1,89	1,08	1,02		1,09	1,07	1,19		1,27	1,07
Molasses at 85 refracto brix % cane	4,32	4,33	3,58		3,82	3,97	3,61		3,98	3,96
Sucrose lost in molasses % pol in cane	10,66	10,52	9,45		10,02	10,58	9,39		10,44	9,68

CAKE, SYRUP AND FINAL MOLASSES
(Season 1977 - 1978)

ME	GD	MV	GH		JB	UC	TS		IL	SZ		UK	AVERAGES
			A	B			A	B		A	B		
1,28	2,80	1,79	1,55	1,30	1,21	1,71	1,53	1,23	1,94	1,69	1,08	1,69	1,56
50,25	50,96	52,25	51,36	56,82	51,20	54,77	54,53	57,26	53,43	51,50	53,04	50,46	52,55
47,22	44,11	44,19	45,66	40,69	46,33	41,81	42,40	40,21	43,13	45,06	44,64	46,30	44,50
29,63	31,67	34,79	32,72	39,38	30,25	31,89	36,75	39,74	31,88	33,72	34,21	30,41	33,90
7 640	7 434	7 217	7 406	6 320	7 453	6 715	6 769	6 235	6 974	7 373	7 088	7 582	7 167
50,86	56,80	50,38	52,19	52,21	49,07	50,00	48,69	50,06	56,42	49,13	46,55	52,16	53,59
108,43	106,05	114,57	113,95	113,60	116,20	106,54	104,07	111,21	110,40	114,25	122,13	115,00	111,62
13,79	13,88	12,44	12,75	12,65	12,50	13,37	13,66	12,92	13,56	12,68	12,31	12,96	13,06
83,46	85,60	84,58	84,96	84,96	83,10	82,81	84,84	84,66	85,17	83,96	83,30	85,10	84,39
6,70	5,31	5,33	5,36		7,15	5,17	5,86		7,01	5,73		5,85	5,67
0,60	0,40	0,43	0,71	0,41	0,91	0,89	0,61	0,39	0,73	0,55	0,30	0,69	0,63
12,93	13,48	11,81	12,29		12,01	13,36	12,53		12,76	12,13		12,55	12,72
83,58	85,81	84,18	85,08		83,53	83,23	84,18		85,16	84,34		86,14	84,45
6,65	5,52	5,05	5,16		6,49	5,20	5,60		6,58	5,40		5,49	5,48
7,10	7,14	7,08	7,12		7,00	7,60	7,27		7,10	7,00		7,04	7,14
1,43	1,12	1,12	1,16		1,62	4,35	1,69		1,94	1,17		0,74	1,43
5,10	5,00	4,00	3,98		5,36	0,88	5,00		5,13	4,69		5,50	4,45
68,21	68,10	68,62	69,33		63,85	62,31	67,84		68,04	67,55		68,51	66,26
84,48	86,29	85,09	85,01		84,26	83,92	84,36		85,07	84,97		86,18	84,94
6,70	4,82	5,50	4,98		5,57	5,11	5,32		6,19	5,15		5,36	5,29
5,90	6,61	6,40	6,13		6,40	6,70	6,26		6,30	6,20		6,16	6,33
80,64	80,98	83,70	80,63		79,75	86,47	87,47		82,04	80,71		81,40	82,09
30,86	37,05	32,52	36,33		29,31	37,02	34,62		33,22	34,60		36,26	34,54
36,64	38,40	36,46	39,88		35,01	39,43	38,34		38,62	37,93		38,45	38,31
19,81	17,85	16,49	16,33		17,93	15,91	16,72		19,68	16,23		15,96	17,17
13,46	15,00	14,91	13,49		13,36	13,59	14,23		13,06	13,01		12,71	13,72
1,47	1,19	1,11	1,21		1,34	1,17	1,18		1,51	1,25		1,26	1,25
3,72	3,92	3,45	3,84		3,70	3,86	3,69		3,74	3,85		3,54	3,83
9,02	9,48	8,44	10,15		8,86	10,45	9,51		9,18	9,70		8,77	9,73

TABLE D_1

MASSECUITES, EXHAUSTIONS, CLARIFYING AGENTS AND ADDITIONAL FUELS SOUTH AFRICAN MILLS (Season 1977-1978)

SYMBOLS OF FACTORIES	ML	PG	UF	EN	EM	FX	AK	DL	ME	GD	MV	GH	JB	UC	TS	IL	SZ	UK	Aver-ages
Brix in mixed juice % cane	14,76	14,74	14,41	14,67	14,30	14,17	14,56	14,83	14,95	14,72	14,25	14,48	14,52	14,24	14,29	14,97	14,66	14,90	14,58
A-massecuite																			
m^3 per ton brix in mixed juice	1,22	1,15	0,98	1,49	1,08	0,98	0,99	1,00	1,02	1,02	0,85	1,07	1,09	1,01	1,06	1,11	1,07	0,94	1,05
Brix of massecuite	92,56	92,18	92,11	90,96	92,83	92,23	91,89	92,98	92,65	91,72	93,12	92,60	92,04	92,80	92,90	93,37	92,25	92,36	92,42
Purity of massecuite	82,69	85,31	86,66	85,89	84,84	85,30	85,75	86,31	84,79	87,10	85,91	88,28	83,91	84,06	84,24	86,54	86,26	85,37	85,44
Purity of A-molasses	68,74	68,64	71,22	73,75	70,90	69,60	66,89	68,78	68,45	73,66	62,83	68,60	67,21	68,22	67,81	69,84	68,97	68,12	68,74
Purity drop	13,95	16,67	15,44	12,14	13,94	15,70	18,86	17,53	16,34	13,44	23,08	19,68	16,70	15,84	16,43	16,70	17,29	17,25	16,70
Exhaustion*	53,97	62,31	61,91	53,85	56,46	60,54	66,43	65,06	61,08	58,58	72,28	71,00	60,70	59,29	60,59	63,98	64,60	63,38	62,54
Purity A-massecuite — purity syrup	–0,06	2,31	0,56	–0,47	0,34	–0,10	1,48	0,08	0,31	0,81	0,82	3,27	–0,35	1,24	–0,12	1,75	1,35	1,01	0,50
B-massecuite																			
m^3 per ton brix in mixed juice	0,52	0,42	0,42	0,64	0,46	0,42	0,36	0,37	0,41	0,47	0,25	0,37	0,43	0,39	0,41	0,44	0,40	0,35	0,41
Brix of massecuite	94,52	93,80	94,07	95,79	93,87	94,53	94,26	93,83	93,32	93,41	94,70	94,42	93,95	94,04	93,18	93,19	93,60	93,81	94,02
Purity of massecuite	69,82	69,20	70,60	73,06	70,38	70,10	68,66	68,88	68,40	71,54	62,66	68,82	66,70	68,30	67,73	70,06	69,22	68,70	69,06
Purity of B-molasses	44,46	45,74	48,73	50,91	51,05	49,60	44,50	45,00	46,84	49,40	41,90	46,75	42,43	52,00	47,28	46,40	45,87	45,10	46,55
Purity drop	25,36	23,46	21,87	22,15	19,33	20,50	24,16	23,88	21,56	21,94	20,76	22,07	24,27	16,30	20,45	23,66	23,35	23,60	22,51
Exhaustion	65,40	62,48	60,42	61,76	56,11	58,02	63,40	63,03	59,29	60,85	57,02	60,22	63,20	49,72	57,27	63,01	62,32	62,57	60,98
C-massecuite																			
m^3 per ton brix in mixed juice	0,35	0,31	0,24	0,28	0,27	0,25	0,26	0,24	0,28	0,20	0,18	0,27	0,22	0,30	—	0,24	0,28	0,25	0,26
Brix of massecuite	97,25	95,99	95,77	97,24	97,10	97,12	96,91	96,99	96,35	95,68	97,29	96,44	95,51	95,05	95,87	95,47	96,42	96,09	96,36
Purity of massecuite	56,03	52,91	52,06	54,72	53,83	53,00	53,01	52,03	53,70	52,31	46,83	51,78	45,16	55,60	52,92	50,39	51,77	53,05	52,53
Purity of C-molasses	32,92	31,51	38,08	40,83	37,39	35,40	34,55	34,38	30,86	37,05	32,52	36,33	29,31	37,02	34,62	33,22	34,60	36,26	34,54
Purity drop	23,11	21,40	13,98	13,89	16,44	17,60	18,46	17,65	22,84	15,26	14,31	15,45	15,85	18,58	18,30	17,17	17,17	16,79	17,99
Crystal content**	33,50	29,99	21,62	22,83	25,50	26,46	27,33	26,09	31,83	23,19	20,63	23,40	21,42	28,04	26,83	24,55	25,31	25,31	26,48
Exhaustion*	61,49	59,05	43,37	42,90	48,78	51,40	53,21	51,70	61,52	46,34	45,28	46,86	49,65	53,06	52,89	51,02	50,71	49,65	52,32
White sugar massecuites																			
Kg sugar per m^3 white massecuite	681	542	—	534	—	—	—	—	—	—	—	693	—	—	—	—	516	—	669
Total volume all raw massecuites																			
m^3 per ton brix in mixed juice	2,09	1,88	1,64	2,41	1,81	1,65	1,61	1,61	1,71	1,69	1,28	1,71	1,74	1,70	1,47	1,79	1,75	1,54	1,72
Clarifying agents																			
Tons limestone per 1000 TC	—	4,49	—	—	—	—	—	—	—	—	—	4,14	—	—	—	—	2,15	—	—
Tons coke per 1000 TC	—	0,46	—	—	—	—	—	—	—	—	—	0,47	—	—	—	—	0,31	—	—
Tons lime per 1000 TC	2,54	1,55	1,37‡	1,21‡	0,92	0,87	0,79	0,76	0,60	0,73	0,55	1,31‡	0,73	0,67	0,32	0,71	1,63‡	0,64	0,81
Tons sulphur per 1000 tons white sugar	0,23	0,10	9,16	—	—	—	—	—	—	—	—	0,06	—	—	—	—	0,12	—	1,02
Phos. acid ppm mixed juice	—	—	—	43,84+	—	—	—	—	—	—	—	—	48,12	6,89	—	—	—	—	—
Flocculant ppm mixed juice	1,54	4,50	5,89	6,01	2,58	3,12	0,59	1,32	2,90	1,28	2,24	3,69	10,19	11,28	0,41	7,12	2,42	0,39	3,04
Enzymes kg per 100 tons sugar	—	0,97	4,13	3,27	2,93	3,29	1,07	1,73	2,18	19,64	3,25	2,31	2,37	—	1,15	3,54	1,07	1,66	2,27
Additional fuels per 1000 TC																			
Tons of fuel oil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Tons of coal	42,74	18,10	30,10	25,53	1,84	54,46	4,37	—	0,15	11,42	3,16	53,81	0,22	11,03	9,33	1,73	11,96	0,37	—
Tons of wood	—	—	—	8,76	2,20	—	—	0,98	0,09	0,97	1,30	0,72	2,93	0,35	0,01	0,18	0,35	0,65	—
Converted into bagasse***	170,96†	72,40	120,40	112,65	10,00	217,84†	17,48†	1,12	0,71	46,84	14,20†	216,10†	4,40	44,54	37,33†	7,14	48,26†	2,26	67,52

$$\text{* Exhaustion} = \frac{10\,000\ (\text{Pty massecuite} - \text{Pty run off})}{\text{Pty massecuite}\ (100 - \text{Pty run off})}$$

$$\text{** Crystal Content} = \frac{(\text{Pty massecuite} - \text{Pty run off})}{(100 - \text{Pty run off})} \times \text{Bx massecuite}$$

*** 1 m^3 fuel oil is equivalent to 5,5 tons of bagasse of 6 978 kJ/kg
1 ton fuel oil is equivalent to 6 tons of bagasse of 6 978 kJ/kg
1 ton coal is equivalent to 4 tons of bagasse of 6 978 kJ/kg
1 ton firewood is equivalent to 1,2 tons of bagasse of 6 978 kJ/kg

\+ Used for refining
† Factory exported bagasse
‡ Includes lime used in refinery

TABLE B_2

CANE CRUSHED AND SUGAR MADE, CANE COMPOSITION, THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCES AND LOSSES
MOZAMBIQUE, SWAZILAND AND MALAWI MILLS
(Season 1977 - 1978)

SYMBOLS OF FACTORIES	BZ	IC	MH	UR	NH A	NH B
Tons sugar made	19 943	29 170	109 890	114 529	91 542	
Percentage of white sugar made	20,62	12,64	—	11,49	22,76	
Average pol of all sugars made	98,32	98,46	98,59	98,58	98,57	
Tons crystal made in raw house	19 448	28 494	107 481	112 080	89 637	
Tons of cane crushed – Total	191 311	290 453	972 827	1 019 448	802 430	
Tons of cane crushed – Per tandem					317 929	484 501
Season started on	1.6.77	23.6.77	2.5.77	28.4.77	14.4.77	
Season completed on	29.10.77	20.12.77	4.12.77	21.12.77	24.11.77	
Number of crushing days	151	181	217	238	225	
Time account						
Hours crushing % available hours	68,97	62,74	88,02	82,79	81,72	81,83
Hours scheduled stops % available hours	17,66	14,13	5,06	7,15	8,00	7,88
Hours lack of cane % available hours	7,32	8,64	0,60	1,80	2,43	0,93
Hours other stops % available hours	6,04	14,49	6,32	8,26	7,85	9,36
Throughputs per hour actual crushing						
Tons of cane crushed	79,43	107,52	213,52	217,07	73,85	112,35
Tons of fibre milled	12,81	13,65	31,27	29,10	10,98	16,42
Tons of brix processed	11,07	14,49	31,68	32,09	28,18	
Tons of sugar produced	8,28	10,80	24,12	24,39	21,24	
Composition of cane crushed						
Pol % cane	12,83	11,82	13,30	13,16	13,50	13,39
Fibre % cane	16,12	13,22	15,21	13,40	14,87	14,62
Brix % cane	15,50	14,57	16,15	15,77	16,18	16,21
Tons cane per ton sugar	9,59	9,96	8,85	8,90	8,77	
Tons cane per ton 96° sugar	9,37	9,71	8,62	8,67	8,54	
ERC % pol in cane	84,99	84,33	85,10	86,26	85,97	85,43
ERC % cane	10,90	9,97	11,32	11,35	11,60	11,44
Performance						
Imbibition % cane	33,76	28,01	24,88	23,07	32,62	37,88
Imbibition % fibre	209	221	170	172	219	259
Extraction	90,79	93,14	92,78	94,58	95,42	93,58
Corrected reduced extraction	91,28	91,87	92,23	93,53	95,08	93,00
Preparation index	—	—	85	—	69	81
Pol % fibre in bagasse	7,33	6,39	6,55	5,32	5,19	
Boiling house recovery	88,02	89,81	90,27	88,97	88,78	
Overall recovery	79,91	83,65	83,75	84,15	83,72	
Factory performance index	93,25	98,41	97,64	96,84	97,11	
Pol balance						
Lost in bagasse (a)	9,21	6,86	7,22	5,42	5,69	
Lost in filter cake (b)	0,54	0,26	0,54	0,48	0,75	
Lost in final molasses (c)	8,03	8,47	7,40	9,57	9,08	
Undetermined losses (d)	2,31	0,76	1,08	0,39	0,76	
Boiling house losses (b+c+d)	10,88	9,49	9,02	10,44	10,59	
Sum of all losses (a+b+c+d)	20,09	16,35	16,24	15,86	16,28	

TABLE C2

ANALYSIS OF BAGASSE, JUICES, FILTER CAKE, SYRUP AND FINAL MOLASSES MOZAMBIQUE, SWAZILAND AND MALAWI MILLS (Season 1977 - 1978)

SYMBOLS OF FACTORIES	BZ	IC	MH	UR	NH A	NH B
Final bagasse						
Pol % bagasse	3,30	2,92	2,85	2,26	1,76	2,51
Moisture % bagasse	50,56	50,31	52,53	54,27	55,30	53,79
Fibre % bagasse	45,05	45,72	43,56	42,58	42,32	42,65
Bagasse % cane	35,79	27,76	33,62	31,48	35,12	34,27
LCV in kJ per kg bagasse	7 494	7 559	7 116	6 792	6 606	7 878
Last expressed juice						
Apparent purity	–	73,66	73,10	72,20	74,64	70,78
Mixed juice						
Mixed juice % cane	97,97	100,25	91,26	91,60	97,50	103,61
Brix	14,22	13,44	16,26	16,14	15,74	14,47
Apparent purity	83,59	81,72	83,16	84,21	83,92	83,55
Reducing sugars/pol ratio	11,11	6,77	6,53	6,25	6,80	
Suspended solids % mixed juice	–	0,53	0,61	–	–	
Clarified juice						
Brix	13,40	13,42	S15,75	15,81	14,38	
Apparent purity	84,48	83,98	85,63	85,00	86,51	
Reducing sugars/pol ratio	10,76	5,85	6,09	4,91	4,90	
Average pH	6,70	7,17	7,10	6,90	7,00	
Filter cake						
Pol % filter cake	1,41	0,95	2,57	1,25	3,01	
Filter cake % cane	4,86	3,27	2,80	5,02	3,34	
Syrup						
Brix	53,94	61,28	65,02	65,50	59,83	
Apparent purity	86,10	84,35	85,51	85,10	85,39	
Reducing sugars/pol ratio	9,03	6,39	5,43	4,86	5,38	
Average pH	6,50	6,88	6,20	6,40	6,50	
Final molasses						
Refracto brix	87,06	S93,35	85,49	86,85	80,16	
Pol/refracto brix purity	41,12	S36,36	35,81	40,50	37,88	
Sucrose/refracto brix purity	42,42	S37,38	36,82	40,47	38,81	
Percentage reducing sugars	17,93	18,52	20,94	16,34	13,92	
Percentage sulphated ash	–	13,23	14,35	14,44	16,58	
Reducing sugars/ash ratio	–	1,40	1,46	1,13	0,84	
Molasses at 85 refracto brix % cane	2,93	S3,24	3,23	3,90	3,79	
Sucrose lost in molasses % pol in cane	8,25	8,71	7,61	10,20	9,30	

S = Spindle brix

TABLE D_2

MASSECUITES, EXHAUSTIONS, CLARIFYING AGENTS AND ADDITIONAL FUELS MOZAMBIQUE, SWAZILAND AND MALAWI MILLS (Season 1977-1978)

SYMBOLS OF FACTORIES	BZ	IC	MH	UR	NH
Brix in mixed juice % cane	13,93	13,47	14,84	14,78	15,13
A — massecuite					
m^3 per ton brix in mixed juice	0,76	1,02	1,07	0,84	0,85
Brix of massecuite	90,74	92,27	92,67	92,60	91,75
Purity of massecuite	85,34	85,74	84,66	84,80	85,57
Purity of A-molasses	70,82	69,16	67,99	67,30	69,75
Purity drop	14,52	16,58	16,67	17,50	15,82
Exhaustion	58,31	62,70	61,51	63,11	61,12
Purity A-massecuite — purity syrup	−0,76	1,39	−0,85	−0,30	0,18
B - massecuite					
m^3 per ton brix in mixed juice	0,45	0,33	0,34	0,41	0,39
Brix of massecuite	91,04	94,67	93,78	95,10	94,36
Purity of massecuite	76,22	73,33	72,13	71,90	74,25
Purity of B-molasses	59,33	51,68	48,47	50,80	51,37
Purity drop	16,89	21,65	23,66	21,10	22,88
Exhaustion	54,49	61,10	63,66	59,65	63,37
C — massecuite					
m^3 per ton brix in mixed juice	0,29	0,24	0,23	0,31	0,27
Brix of massecuite	93,59	97,08	97,42	99,90	97,31
Purity of massecuite	63,41	59,49	58,31	54,10	58,73
Purity of C-molasses	41,12	36,36	35,81	37,97	37,88
Purity drop	22,29	23,13	22,50	16,13	20,85
Crystal content	35,43	35,28	34,15	25,98	32,66
Exhaustion	59,70	61,09	60,11	48,07	57,15
White sugar massecuites					
Kg sugar per m^3 white massecuite	543	532	—	470	535
Total volume all raw massecuites					
m^3 per ton brix in mixed juice	1,50	1,59	1,64	1,56	1,51
Clarifying agents					
Tons limestone per 1000 TC	—	—	—	—	—
Tons coke per 1000 TC	—	—	—	—	—
Tons lime per 1000 TC	1,65	1,03	0,70	1,15	1,32
Tons sulphur per 1000 tons white sugar	3,23	5,15	—	0,03	—
Phos. acid ppm mixed juice	—	—	—	—	—
Flocculant ppm mixed juice	1,07	0,69	0,59	1,42	6,98
Enzymes kg per 100 tons sugar	—	3,60	1,18	—	—
Additional fuels per 1000 TC					
Tons of fuel oil	—	—	—	—	0,19
Tons of coal	—	—	1,60	2,84	0,15
Tons of wood	36,59	—	—	—	6,32
Converted into bagasse	43,91	—	6,40	11,36	9,32

TABLE E

COMPARATIVE MANUFACTURING DATA OF RECENT YEARS
(South African Mills)

SEASON	1977/78	1976/77	1975/76	1974/75	1973/74
Cane					
Pol % cane	12,83	12,43	12,60	13,08	13,08
Fibre % cane	15,79	15,52	15,67	15,59	15,64
Juice					
Purity of mixed juice	84,39	84,47	84,70	85,01	85,66
Reducing sugars/pol ratio (mixed juice)	5,67	5,58	5,31	5,05	4,70
Milling					
Imbibition % fibre	302	281	279	286	288
Imbibition % cane	45,5	41,7	43,7	42,8	45,0
Extraction	95,87	95,48	95,38	95,49	95,55
Pol % bagasse	1,56	1,66	1,68	1,73	1,69
Moisture % bagasse	52,55	53,20	53,52	53,10	53,19
Bagasse % cane	33,90	33,96	34,59	34,18	34,33
LCV bagasse kJ/kg	7 167	7 032	6 967	7 049	7 033
Available kJ in bagasse/kg Bx mixed juice	16 665	16 984	16 983	16 348	16 537
Recoveries					
Boiling house recovery	88,62	88,99	88,68	88,76	89,13
Overall recovery	84,96	84,97	84,58	84,76	85,17
Tons cane per ton sugar	9,12	9,41	9,33	8,97	8,93
Filter cake					
Pol % filter cake	1,43	1,39	1,33	1,28	1,30
Filter cake % cane	4,45	4,27	4,62	4,70	4,85
Final molasses					
Gravity purity	38,31	38,23	38,75	38,39	39,16
Weight @ 85 Bx % cane	3,83	3,60	3,64	3,71	3,52
Average sugar polarisation	99,47	99,42	99,49	99,50	99,45
Sucrose balance*					
Lost in filter cake	0,49	0,48	0,49	0,46	0,48
Lost in final molasses	8,77	8,45	9,52	9,26	8,96
Undetermined losses	1,64	1,58	0,79	1,01	0,94
Lost in boiling house	10,90	10,51	10,80	10,73	10,39
Lost in bagasse	4,13	4,52	4,62	4,51	4,45
Total losses	15,03	15,03	15,42	15,24	14,83
m^3 Massecuite per ton brix mixed juice					
A-massecuite	1,05	1,06	1,05	1,04	1,04
B-massecuite	0,41	0,40	0,38	0,36	0,36
C-massecuite	0,26	0,24	0,28	0,27	0,27
Total	1,72	1,70	1,71	1,67	1,67
Exhaustion of Massecuites					
A-massecuite	62,54	62,16	62,74	63,59	64,43
B-massecuite	60,98	61,84	61,44	62,09	60,48
C-massecuite	51,21	54,00	54,32	56,08	56,00
Purity rise					
A-massecuite purity	85,44	85,93	86,30	86,83	87,61
Syrup purity	84,94	85,02	85,06	85,82	86,82
Rise	0,50	0,91	1,24	1,01	0,79
Brix of syrup	66,26	65,52	64,51	64,72	64,20

*1976/77 and 1977/78 Pol Balance

TABLE F

AVERAGE MANUFACTURING RESULTS BY MONTHLY PERIODS FOR SOUTH AFRICAN MILLS (Season 1977 - 1978)

END OF MONTHLY PERIOD		April 30 1977	May 28 1977	July 2 1977	July 30 1977	Aug. 27 1977	Oct. 1 1977	Oct. 29 1977	Nov. 26 1977	Dec. 31 1977	Jan. 28 1978	Feb. 28 1978
Tons sugar made and estimated	Month	37 574	194 048	300 399	257 378	247 506	293 361	221 458	220 215	206 863	87 063	18 012
	To-date	37 574	231 622	532 021	789 399	1 036 905	1 330 266	1 551 724	1 771 939	1 978 802	2 065 865	2 083 877
Tons cane crushed	Month	392 632	1 877 388	2 667 508	2 178 205	2 086 907	2 524 930	2 001 983	2 070 927	2 059 470	954 639	194 441
	To-date	392 632	2 270 020	4 937 528	7 115 733	9 202 640	11 727 570	13 729 553	15 800 480	17 859 950	18 814 589	19 009 030
Tons cane crushed per hour actual crushing	Month	209,55	225,01	225,43	224,91	223,22	217,01	215,86	219,86	224,65	222,00	208,33
	To-date	209,55	222,18	223,92	224,22	224,00	222,45	221,47	221,26	221,64	221,54	221,40
Pol % cane	Month	11,38	12,07	13,00	13,61	13,75	13,57	13,03	12,51	12,02	11,18	10,87
	To-date	11,38	11,95	12,52	12,85	13,06	13,17	13,15	13,06	12,94	12,85	12,83
Fibre % cane	Month	15,01	15,16	15,16	15,09	15,36	15,73	16,30	16,53	16,71	17,05	16,72
	To-date	15,01	15,13	15,15	15,13	15,18	15,30	15,45	15,59	15,72	15,79	15,79
Tons cane per ton 96° sugar	Month	10,09	9,33	8,57	8,16	8,13	8,31	8,73	9,07	9,63	10,65	10,38
	To-date	10,09	9,46	8,96	8,69	8,57	8,51	8,54	8,61	8,71	8,79	8,80
Corrected reduced extraction	Month	95,44	95,57	95,54	95,56	95,64	95,95	96,05	96,07	96,00	95,87	96,38
	To-date	95,44	95,55	95,54	95,55	95,57	95,66	95,72	95,77	95,80	95,80	95,81
Imbibition % fibre	Month	298	284	292	302	306	316	306	302	305	298	301
	To-date	298	286	290	293	296	301	301	302	302	302	302
Pol extraction	Month	95,42	95,68	95,85	95,99	96,01	96,17	96,01	95,87	95,63	95,17	95,73
	To-date	95,42	95,64	95,76	95,83	95,87	95,94	95,95	95,94	95,91	95,87	95,87
Pol % bagasse	Month	1,58	1,60	1,66	1,67	1,66	1,56	1,51	1,47	1,47	1,46	1,18
	Todate	1,58	1,59	1,63	1,64	1,64	1,62	1,61	1,59	1,57	1,57	1,56
Moisture % bagasse	Month	53,28	52,65	52,61	52,64	52,44	52,22	52,02	52,40	52,65	53,14	55,92
	To-date	53,28	52,76	52,68	52,67	52,61	52,53	52,45	52,45	52,47	52,51	52,55
Boiling house recovery	Month	87,59	89,02	89,90	89,99	89,39	88,59	87,88	88,19	86,93	84,75	88,87
	To-date	87,59	88,78	89,41	89,60	89,55	89,33	89,12	89,02	88,79	88,62	88,62
Overall recovery	Month	83,58	85,17	86,17	86,38	85,82	85,19	84,38	84,55	83,13	80,65	85,07
	To-date	83,58	84,91	85,61	85,86	85,85	85,71	85,51	85,40	85,16	84,96	84,96
Mixed juice purity	Month	82,21	83,06	84,02	84,79	84,38	85,22	85,57	85,20	83,49	83,28	82,42
	To-date	82,21	82,92	83,53	83,94	84,04	84,30	84,48	84,57	84,45	84,40	84,39
RS/pol ratio in mixed juice	Month	7,20	6,53	6,01	5,65	5,93	5,21	4,93	4,98	5,65	6,12	7,26
	To-date	7,20	6,64	6,29	6,08	6,04	5,86	5,72	5,63	5,63	5,65	5,67
Purity final molasses	Month	36,65	37,17	36,43	36,78	37,39	38,54	41,09	40,11	39,16	40,17	39,71
	To-date	36,65	36,84	36,62	36,67	36,84	37,22	37,77	38,06	38,19	38,29	38,31
Pol lost in final molasses % pol in cane	Month	9,29	8,30	7,96	7,88	8,18	8,82	9,33	9,15	9,97	11,26	9,63
	To-date	9,29	8,46	8,18	8,08	8,11	8,27	8,42	8,51	8,67	8,78	8,77
Undetermined lost pol % pol in cane	Month	2,10	1,73	1,30	1,29	1,52	1,68	1,77	1,64	1,98	2,63	0,29
	To-date	2,10	1,79	1,51	1,44	1,46	1,51	1,55	1,55	1,59	1,64	1,64

TABLE G

CANE VARIETIES AND RAINFALL
(Season 1977-1978)

SYMBOLS OF FACTORIES	CANE VARIETIES CRUSHED (Percentage by weight)																					RAINFALL During 1977 mm.
	NCo 376	NCo 310	NCo 293	N 50/211	NCo 382	CO 331	NCo 339	NCo 292	NCo 334	N 51/168	N 53/216	CB 36/14	CB 38/22	N 55/805	N 6	N 52/219	N 7	N 8	Co 301	Mixed Vari's	Un-known	
ML	90,1	0,6							5,7												3,3	722
PG	77,5	12,5					0,1		1,6					0,1		0,5				3,0	4,4	618
UF	15,1	36,1			7,1		0,4					0,8		18,4				0,1	0,4	20,8		1 183
EN	84,1	0,8	8,6								0,7	0,9	0,3	4,1								1 481
EM	42,0	11,0		11,8	1,2		0,2			0,4	0,8			8,1			0,1			0,5	34,8	1 554
FX	39,6	22,4			3,7		0,2			0,1	0,6	0,1		15,9	0,7			0,4		0,5	14,9	1 375
AK	69,2	2,1	2,1		0,2						0,2	0,5		11,8				0,3		1,4	13,5	1 208
DL	76,1	0,4	0,4		0,1						0,1	0,1		18,9						3,2	0,2	949
ME	51,7	2,6	11,1									0,3		19,8						9,2	4,2	1 131
GD	91,0	4,0				1,2								3,3								856
MV	53,0													4,7						41,9	0,1	890
GH	73,6	0,7	0,4		0,2						0,6	0,7		12,7						6,4	4,2	1 028
JB	18,3		41,2	1,0	19,7	0,3					2,4	5,3		1,2	0,3					0,5	9,1	890
UC	11,8		62,0	0,2	13,5	0,1					0,9	1,1			0,3						9,5	793
TS	77,1	1,1	0,1		0,6		0,1				0,1			15,1						5,1		998
IL	56,6	0,2	21,6		1,8			1,6			0,3	1,8		8,7	1,6		0,2			1,8	3,2	1 011
SZ	86,7	1,9		0,1	0,1						0,7			6,4	0,2					0,7	2,7	1 021
UK	76,7	0,9	7,1								0,1	0,1		10,5	0,8						3,3	1 246
Average South African Mills	63,5	5,0	5,8	0,1	2,2		0,1	0,1	0,4		0,4	0,6		10,4	0,2			0,1		4,2	6,6	–
BZ	90,0	5,0																			5,0	1 666
IC	84,0				9,2																6,8	1 301
MH	85,6								7,8							6,6						1 192
UR	92,6								5,0							1,9				0,5		675
NH	22,7	73,5																			3,8	823

TABLE H

TRANSPORT SUMMARY SOUTH AFRICAN MILLS
(Season 1977 - 1978)
Percent of Cane Transported

MILLS	ML	PG	UF	EN	EM	FX	AK	DL	ME	GD	MV	GH	JB	UC	TS	IL	SZ	UK	Average
South African Railways	14,4		42,5		26,2	63,2	11.5		25,0			15,9	7,0	8,6		1,3			12,2
Chopped Cane Bins			12,8												1,6				0,7
Tram		99,9	41,6		39,3	36,7													10,5
Hilo	80,1			11,5	15,1		66,9	77,6	62,3	35,1	48,4	60,8	37,7	12,9	89,4	97,3	97,4	26,3	55.1
Lorry				5,9			3,2	6,6	12,1	31,4	20,3	2,8	34,2	49.8	0,8		2,1	14.8	6.7
Tractor	5,3		3,0	82,5	19,3		18.2	15.7	0,5	33,3	31,2	20,4	20,9	15.5	7,9	1,3	0,4	5,4	11,1
Trailer														12.9				53,3	3,3

TABLE J
COMPARATIVE DATA OF REPORTING S.A. MILLS FROM 1925 ONWARDS

PERIOD (SEASON)	Percent Cane		Cane/Sugar Ratio		Extraction	Pol % Fibre in Bagasse	Percent Bagasse		Imbibition Percent		Mixed Juice		Final Molasses Purity	Boiling House Recovery	Overall Recovery
	Sucrose	Fibre	Tel Quel	96 Pol Sugar			Pol	Moisture	Cane	Fibre	Purity	Reducing Sugar Ratio			
Average 1925-1934	13,19	15,78	9,86	9,64	89,83	8,86	3,88	50,57	27,6	175	85,09	3,65	45,3	83,67	75,12
Average 1935–1944	13,53	15,30	8,96	8,73	92,05	7,05	3,11	51,60	32,6	213	86,01	3,22	43,3	88,36	81,34
1945	14,28	15,99	8,29	8,08	93,28	6,01	2,77	50,19	35,0	219	86,23	3,38	42,0	89,29	83,30
1946	14,21	16,21	8,36	8,14	93,07	6,08	2,79	50,32	35,2	217	85,86	3,30	41,8	89,12	82,94
1947	13,32	15,80	8,84	8,60	93,94	5,53	2,54	50,46	34,4	218	86,24	2,95	41,1	89,61	83,73
1948	13,89	15,90	8,55	8,31	93,32	5,81	2,67	50,53	34,1	214	85,92	3,67	41,5	89,14	83,19
1949	13,52	16,19	8,76	8,52	92,94	5,82	2,66	50,84	33,7	208	86,22	3,11	41,4	89,68	83,35
1950	14,19	15,80	8,32	8,09	93,33	6,02	2,72	51,22	32,8	206	86,40	3,12	40,5	89,63	83,65
1951	13,33	16,29	8,98	8,73	92,98	5,74	2,57	51,71	35,0	215	84,92	3,52	40,3	88,72	82,50
1952	13,87	16,10	8,50	8,27	93,00	6,02	2,65	52,53	34,9	217	86,25	2,92	39,3	89,96	83,66
1953	13,93	16,31	8,55	8,32	92,67	6,25	2,75	52,47	32,7	200	85,61	3,66	39,5	89,36	82,81
1954	13,34	16,03	8,87	8,65	92,40	6,32	2,75	52,92	30,7	191	85,86	3,28	39,3	90,04	83,20
Average 1945–1954	13,79	16,06	8,60	8,36	93,04	5,95	2,69	51,32	33,8	210	85,95	3,29	40,7	89,46	83,23
1955	13,87	15,74	8,51	8,28	92,32	6,76	2,91	53,18	32,1	204	85,96	3,40	39,6	90,51	83,56
1956	13,35	15,81	8,87	8,62	92,93	5,98	2,60	53,12	35,2	222	85,49	3,32	39,9	89,79	83,44
1957	13,11	15,38	8,93	8,67	93,36	5,66	2,47	53,06	34,5	224	85,10	3,69	38,5	90,43	84,42
1958	13,12	15,92	9,09	8,82	92,87	5,89	2,55	52,38	32,9	207	84,46	4,30	39,1	89,49	83,11
1959	13,66	15,92	8,74	8,44	92,86	6,16	2,66	53,26	34,6	218	85,52	3,51	40,3	89,42	83,04
1960	13,69	15,22	8,70	8,41	93,35	5,98	2,60	53,01	36,2	238	85,63	3,31	40,3	89,40	83,45
1961	13,75	14,52	8,51	8,26	94,21	5,50	2,43	52,54	36,7	253	86,04	3,31	39,5	89,72	84,53
1962	13,29	15,49	8,97	8,73	94,15	5,02	2,24	52,17	41,2	266	83,36	5,11	39,6	87,81	82,67
1963	13,55	15,50	8,66	8,42	94,08	5,16	2,29	52,46	39,8	258	85,30	3,44	39,4	89,60	84,30
1964	13,90	15,38	8,42	8,20	94,16	5,23	2,34	52,64	39,4	256	85,52	3,32	39,9	89,65	84,42
Average 1955–1964	13,53	15,49	8,75	8,49	93,43	5,73	2,51	52,78	36,3	235	85,24	3,67	39,6	89,58	83,69
1965	12,99	15,57	9,20	8,97	93,99	5,00	2,20	52,98	40,6	261	84,22	3,73	39,9	87,67	82,40
1966	13,72	15,09	8,63	8,40	94,22	5,24	2,29	53,52	39,9	262	85,06	3,63	40,6	88,38	83,27
1967	12,92	15,01	9,28	9,06	94,15	5,04	2,19	53,47	39,2	261	83,41	3,81	38,8	87,52	82,33
1968	13,11	15,32	9,06	8,83	94,74	4,51	1,98	53,32	41,1	268	83,60	4,23	39,4	87,40	82,72
1969	12,88	15,03	9,10	8,86	94,98	4,30	1,89	53,30	41,2	274	84,25	4,17	38,3	88,58	84,13
1970	13,61	15,34	8,64	8,34	95,41	4,06	1,80	53,07	43,2	285	84,99	3,80	38,9	88,57	84,51
1971	12,97	14,82	8,93	8,63	95,91	3,58	1,61	52,66	41,1	277	85,14	4,20	39,4	89,41	85,76
1972	13,26	14,82	8,77	8,47	95,55	3,98	1,75	52,85	41,3	279	86,66	4,17	40,0	89,48	85,50
1973	13,08	15,64	8,93	8,62	95,55	3,87	1,69	53,19	45,0	288	85,66	4,70	39,2	89,13	85,17
1974	13,08	15,59	8,97	8,65	95,49	3,94	1,73	53,10	44,6	286	85,01	5,05	38,4	88,76	84,76
Average 1965–1974	13,16	15,22	8,95	8,68	95,00	4,35	1,91	53,15	41,7	274	84,80	4,15	39,3	88,49	84,06
1975	12,60	15,67	9,33	9,00	95,38	3,87	1,68	53,52	43,7	279	84,70	5,31	38,8	88,68	84,58
1976	12,43	15,52	9,41	9,08	95,48	3,79	1,66	53,20	41,7	281	84,47	5,58	38,2	88,99	84,97
1977	12,83	15,79	9,12	8,80	95,87	3,51	1,56	52,55	45,6	302	84,39	5,67	38,3	88,62	84,96