FIFTY-NINTH ANNUAL REVIEW OF THE MILLING SEASON IN SOUTHERN AFRICA (1983-1984)

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Abstract

Data for the 1983/84 season on cane and sugar production, cane quality and the performance of sugar factories in South Africa, Swaziland, Zimbabwe and Malawi are listed and discussed. All four countries were affected by a severe drought and sugar production in South Africa was reduced to such an extent that sugar had to be imported. The extraction performance of South African mills remained at a very high level but boiling house recovery was low.

Introduction

The 1983/84 season was influenced by a severe drought in the four countries covered in the report: South Africa, Swaziland, Zimbabwe and Malawi. This should be borne in mind when comparing the laboratory data and factory performance figures listed in this review, which are all as reported by the mills, except for sugar weights of South African factories which were obtained from the South African Sugar Association (SASA). Data on cane varieties and transport were supplied by the Central Board. The paragraphs on weather and crop conditions and on cane varieties and transport were written by contributors from the SASA Experiment Station.

In general all the mills reviewed used the same analytical methods and all calculations from basic data were carried out at the Sugar Milling Research Institute using the same computer programme. The only difference of importance is that the mixed juice and final molasses analyses of South African mills are converted to a sucrose basis by multiplying the pol values reported by the mills by a pol-to-sucrose ratio determined for each mill on a weekly average sample, while data from the Swaziland, Zimbabwe and Malawi mills are based solely on pol.

A key to the symbols used to designate South African mills will be found in Table A and those of neighbouring countries are listed below:-

Swaziland	MH	Mhlume
	UR	Ubombo Ranches
	SM	Simunye
Malawi	NH	Sucoma
	DW	Dwangwa
Zimbabwe	HV	Hippo Valley
	TR	Triangle

Highlights of the 1983/84 Season

South Africa

The influence of the weather on the crop and on factory performance was so predominant that, except in a few mills, other factors were of little significance.

When the season started, a major drought was being experienced. It stretched into the winter months and was not broken until July on the coast and the beginning of 1984 in the Transvaal. The end of the season was characterised by very heavy rains over the whole sugar belt and by disastrous floods in the Transvaal and Zululand.

The only part of the country which had a normal sugar season was the South Coast. Indeed the crop deteriorated as one moved north, with the poorest results being reported from Zululand. The irrigated areas of the Transvaal were affected by a shortage of irrigation water, while the midlands mills reported very high sucrose in cane from their reduced crop.

This was probably the first year during which some mills had to shut down in mid-season to allow additional time for cane growth. This was the case at AK, DL and FX, while at EM the factory closed down in July, probably for ever. Several other mills reduced their throughput or scheduled long weekend stops because of the shortage of cane. During the season, the Felixton 2 (FX 2) mill, which is the first new mill to be built in South Africa since 1967, was completed and commissioned. This factory will replace EM and FX.

A crop of 13 422 876 tons of cane was processed in South Africa and produced 1 377 718 tons of sugar (a cane to sugar ratio of 9,74). The production was so low that sugar had to be imported from the neighbouring and overseas countries and refined locally to meet internal consumption demands and export commitments.

The stunted, drought-stricken cane processed by most mills was of extremely poor quality, generally very dirty and had a large proportion of tops. Average sucrose % cane was 12,33, fibre % cane 16,15 and mixed juice purity 84,20 to yield an ERC % cane of 10,20.

Except for extraction which was maintained at a high level (97,02), the poor factory performance is reflected by the following industrial averages:-

Overall time efficiency	74,40
Boiling house recovery	85,37
Overall recovery	82,83

Malawi

The two mills in Malawi (NH and DW), which are supplied with cane from irrigated fields, set a new production record of 175 291 tons of sugar of which about 30% was refined. The main problem faced by the industry during the season was the transport of export sugars to the coast.

Cane quality was second only to Zimbabwe and averaged 13,2 pol. ERC % cane was 11,42 at DW and 10,78 at NH. The corresponding cane-to-sugar ratios were 8,75 and 9,26 respectively.

There was a marked improvement in time efficiency at both DW (79,50) and NH (78,03) compared with the previous season, but extraction remained relatively low (DW: 94,70, NH: 95,95) and boiling house recovery (DW: 87,43, NH: 85,99) was lower than in 1982 at both mills.

Zimbabwe

Zimbabwe's cane crop increased by 230 000 tons to 3 515 737 tons. Of the country's cane, 54,3% was processed at HV into raw sugar and the balance at TR which produced both sugar and alcohol.

HV reported a time efficiency of 88,8%, an extraction of 97,37, and a boiling house recovery of 91,08, which were in keeping with the high standards which had been set during the previous seasons. The new diffuser at TR (TR(A)) averaged 97,92 extraction for the season and bettered 98 for several weeks.

Swaziland

Limitations on the availability of irrigation water affected cane quality which in turn had an effect on factory performance. Fortunately the milling season was over when the country was hit by very severe floods in February 1984.

Total cane production was 3 562 319 tons which was evenly distributed between the three mills. A total of 384 613 tons of sugar was produced, an increase of about 5 000 tons on the previous season's production.

The time efficiency of all three mills was higher than 80% with 85,63% being reported by UR. Except for SM which had a very good extraction of 97,49, front-end performance was lower than in South Africa, but was more than made up by the boiling house recovery which averaged 88,8. The overall recovery of SM (87,49) was second only to that of HV in Zimbabwe.

Weather and crop conditions*

Rainfall records after May 1982 reflected the continuation of the drought which was to affect the 1983/84 crop. At the end of May 1983, the average annual rainfall for the industry was 613 mm or only 65% of the long term mean. Rainfall the previous year had been somewhat below average and very poorly distributed.

Last season's crop was only 69% of the 1982/83 harvest. Only the Lower South Coast received enough rain to support good cane growth and a crop which was only slightly smaller than that of the previous season, was harvested. Increasing drought stress and poor crop growth were reported from all other parts of the industry. In the midlands, cane production was only 72% of the 1982/83 crop, on the north coast, 63% and in Zululand, only 55%. By May 1983, patches of cane on the shallower soils in the latter two areas, were dead, and significant areas of dead cane were reported on the Mtubatuba flats. The reduced water supply in the rivers and consequent restricted irrigation reduced the crop at Malelane and Pongola to 60% and 59% of the 1982/83 production respectively.

The badly drought-stricken cane at GH, DL and AK had a high infestation of eldana which seriously reduced the quality of the cane and the mills had difficulty in processing the eldana damaged stalks.

In contrast to the past few seasons, the rainfall from July 1983 onwards was higher than the long term mean; the result of a cyclone in January and one in February 1984. These cyclones caused great damage at UF, PG and in the Eastern Transvaal but raised the level of the water table and filled dams in the rest of the industry.

The crop responded to the favourable temperatures and rainfall in late 1983, but the effects of the excellent growing conditions since August 1983 will only be seen in the 1984/85 crop. Until then, part of the crop will reflect the extreme drought stress during its earlier growth in thin light stalks and many bull shoots.

* By the Extension Staff, SASA Experiment station.

Cane varieties*

The variety NCo 376 has again accounted for more than 65% of the total amount of cane crushed in South African mills during the season. However, in the northern irrigated areas of the industry, changes in the variety disposition, which started four or five years ago, are gaining momentum. Initially, varieties such as N52/219 and J59/3 were being used to replace the smut susceptible NCo 376. In 1980, the variety N14 was released and it now accounts for the major replant acreage in the Eastern Transvaal. During the past two seasons, all the available N14 cane was used for seedcane and the variety did not feature in the mill returns. However, this season there seems to be a surplus of seed requirements and N14 formed a substantial portion of the crush at ML and PG, (11,5% and 7,5% respectively of the total crush). It appears that N14 will become the major variety in the area during the next few years.

In the southern rainfed areas, the contribution of NCo 376 to the annual crush has remained the same as last season. However, planting of the new variety, N12 in this region is reported to be widespread, and it appears that all available cane is being used for seed. Once seedcane requirements have been met, N12 should feature prominently in the mill returns for this area.

Undoubtedly, NCo 376 will continue to be an important variety in the industry for many years to come, but it does appear to have passed its peak and in future years, NCo 376 will lose ground to the new varieties.

* By R. S. Bond, SASA Experiment Station.

The Season

The 1983/84 season in South Africa started at IL on 14 April 1983 and officially ended on 31 March 1984 with DL still grinding. It was probably the sugar industry's longest season (348 days). Ironically, the long season was a result of the poor cane harvest caused by one of the worst droughts in living memory. Four mills had to stop in mid-season because of the shortage of cane. EM stopped in July after a season which lasted only 77 days and did not start again because the cane supply in this region did not warrant the running of two factories. EM's cane supply was therefore diverted to FX.

The FX 2 mill was put through commissioning trials during December and January. Its actual production was insignificant and did not warrant separate reporting, so the FX 2 data have been combined with those of FX. The new factory which has been designed to cope with 600 tons cane/hour, will initially process 300 tons cane/hour. It features quite a number of novel ideas and new equipment, some of which will be discussed in other sections of this review. It is very highly instrumented and can be run from a central control room.

Apart from EM, the mills at FX, DL and AK also stopped in mid-season because of a shortage of cane. The first two of these mills started again in September and DL in February. They all had difficulties at the end of the season because of poor cane quality. The time during which these mills were closed in mid-season has been excluded from the crushing time for the calculation of true time efficiency.

All mills, except those on the South Coast, had to cope with smaller crops and their approach was usually to reduce the crushing rate and to schedule long weekend stops. These stops obviously had an adverse effect on their time efficiency and, in a number of cases (UF, ML, ME, EN), may have had an adverse influence on overall recovery.

The drought was followed by good rains during the second half of 1983 and by heavy floods in Zululand and the Transvaal Lowveld in February and March 1984. Fortunately, by then most of the mills had stopped and only at DL was the production affected. Severe damage was caused to bridges, roads and tramway lines in these regions and at UF, flood damage to cane fields was very severe and will reduce considerably, the sugar potential of this area in future seasons.

Cane transport*

The only significant change in Table H compared with that in 1982/83 is a five percent increase in the amount of cane delivered by hilo trucks. Not reflected in the table, is the interest in handling loose cane since growers and millers are attempting to move away from the use of chains.

The 1983/84 season was the last during which transport subsidies applied and in future, growers will be responsible for the transport of cane from their farms to the mills. It can therefore be expected that they will consider transport options more critically and will eliminate transloading in favour of direct delivery when possible.

The Rorich Commission, which has investigated cane transport, has recommended that changes be gradual and that growers will initially be required to deliver their cane to the mill, using the same mode of transport as was previously the case. Changes in cane transportation will therefore be spread over several years.

* By Dr. A. G. de Beer, SASA Experiment Station.

Cane production and quality

The cane crop in South Africa was the smallest since 1965, with only a total of 13 422 876 tons being harvested. When compared with the previous season, the reduction suffered by the different mills generally increased from south to north and ranged from 10 000 tons at UK to 670 000 tons at ML.

In most cases, the reduction in the amount of cane harvested was accompanied by a deterioration in quality. The only exception was the Midlands (UC and NB) where the sucrose content of cane and juice purities was good at both mills, especially at UC where the 20% reduction in the cane crop was partially compensated by a high sucrose % cane (14,50) and mixed juice purity (87,19). The industrial average values were 12,33 and 84,20 respectively.

The season started with a relatively high sucrose % cane (Figure 1), but peaked early and reached a maximum in July when the average was 13,60. It dropped very quickly after September and very low values were reported by the North Coast and Zululand mills (DL, AK, FX) which were still running in February and March. Even as early as the end of November, 5,4% of the weekly average crush at GH, which represented 2 300 tons of cane, had a purity of 70 or less. The record for the poorest quality cane was probably held by FX where the analysis of a cane consignment delivered in January showed 1,5 pol, 15,2 fibre and 29,1 purity. These results have revived the old question which is still to be answered: at what point should cane be rejected?

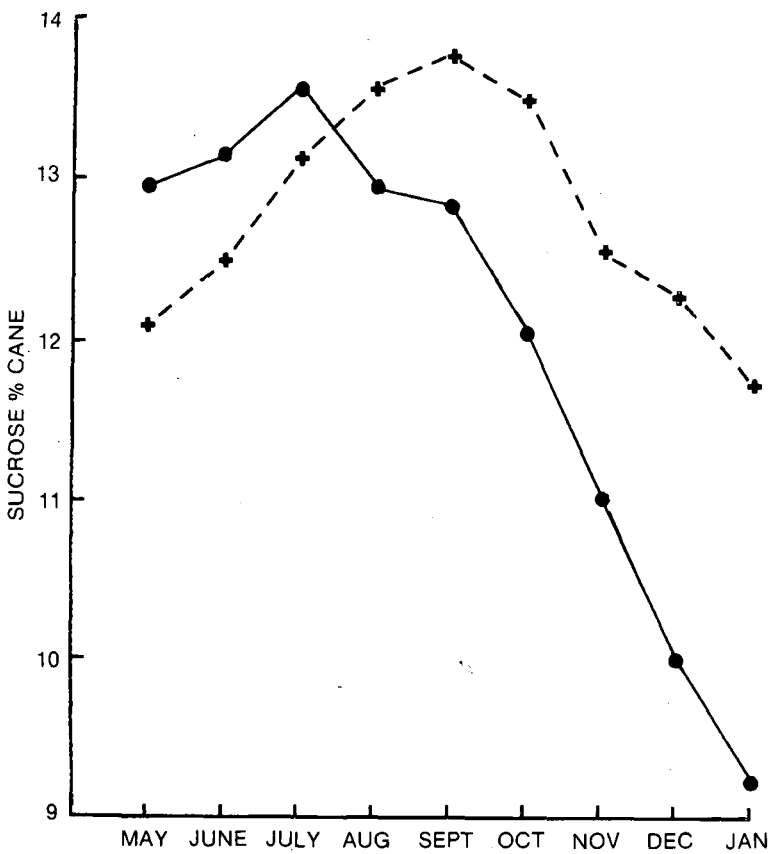

FIGURE 1 Sucrose curve
—1983/1984 season
---1982/1983 season

Cane from the drought-stricken areas was so short that it could not be properly topped and often could not be topped at all. Under these conditions, a high trash and soil content was difficult to avoid, and the extraneous matter in cane must have contributed to the poor cane and juice quality.

Burning cane helps to reduce the trash content and is a normal practice in some areas. It is not recommended in other regions for agronomic reasons, but its disadvantages in the fields should be weighed up against its advantages in the factory, especially if the indications that trash has a large influence on juice colour are confirmed.

The effect of cane cleanliness on quality was illustrated once again by data from NB and UC. Both these mills were supplied with cane from the same area. At UC, a sustained effort has been made over the past few years to improve cane cleanliness and the results listed in Table 1 indicate that it has been successful.

TABLE 1

Cane quality at UC and NB

	UC	NB
Sucrose % cane	14,50	14,36
Fibre % cane	14,19	14,50
ERC % cane	12,53	12,32
Mixed juice purity	87,19	86,97

In view of the low cane tonnage processed by most mills and the wide variations in cane quality, average data listed in Tables B, C, and D, should be considered with some reservation. This also applies in Table K where installed equipment per ton of cane or per ton of fibre, is compared.

Sugar production and quality

Sugar production for the season was only 1 377 718 tons, the lowest since 1965/66 and 35% less than last season. Production was so low that sugar had to be imported from neighbouring and overseas countries for local refining to meet local consumption and export commitments. For the first time, a number of back end refineries which were designed to process only their own raw sugars, had to import raw sugar for refining. For example NB refined 25 018 tons of UC raw sugar and ML refined sugar imported from MH in Swaziland. In the case of NB, the conversions involved in apportioning refined sugar between the two factories, has adversely affected the performance figures and reduced the boiling house recovery of this factory from 86,38 to 85,79.

Efforts had to be made to maintain sugar quality to the normal VHP standards because of the influence of the poor juice quality. The results were successful and specifications were met in all parameters except colour which rose from 1 450 to 1 550 ICUMSA units. In spite of the adverse circumstances, the mills managed to reduce the average starch content of VHP sugar from 125 to 115 ppm, that of gums from 800 to 750 ppm, and to achieve small reductions in ash content.

Cane preparation and extraction

In spite of the poor cane quality, the average industrial extraction was 97,02 for the third successive season. Extraction

does not seem to have reacted to variations in fibre content which were 16,13 15,61 and 16,15 for the three seasons. This may be the result of the higher percentage of cane processed by diffusion (54%) which is less affected by fibre content than milling. The lower loading of the extraction plants during the past two seasons (1981/82: 35,96 tfh, 1982/83: 34,76 and 1983/84: 33,61) may also be responsible for the stable extraction figures.

Complaints were received from a number of mills during the past season on the difficulty of dewatering bagasse, which was attributed to the "pithiness" of the cane. Average moisture content was 52,68 compared with 51,35 for the previous season, and ranged from 49,33 to 56,43, with only one mill (ME) in South Africa reporting a value below 50.

The effect of the high soil content of cane on preparation and extraction equipment has been a cause of complaint at most mills. An extreme example was provided by UF, where a set of shredder hammers had to be changed after processing only 16 000 tons of cane during a particularly bad week. The high cost of maintenance of front-end equipment is of increasing concern, and it has been suggested that the work done to bring extraction to its present high level should be complemented by efforts to reduce maintenance costs.

There were a number of interesting new developments during the season, most of which were at FX 2 where the extraction plant features a number of new ideas for South Africa. They are:

- Billeters mounted at the top of inclined feed tables to chop the cane into short lengths.
- An air cushioned rubber belt to convey the chopped cane to the cane knives.
- A "scratcher" at the feed end of the two cane diffusers to even out the surface of the cane bed.
- Six roller mills with a number of new features for dewatering bagasse.

Other developments in the industry were:

- The successful use of a "spikey" roll pressure feeder on a dewatering mill at AK.
- The commissioning of a new cane diffuser at UR and of the second hand bagasse diffuser from SZ at GD.
- The reduction of the moisture content of final bagasse by about 2 points at UF through the use of a perforated top roll, and a moisture reduction of about 1,5 points at SM by changing the grooving of the last mill top roll from 50 to 25 mm.
- The use of a rotary juice screen at GH which reduced the bagacillo content of the juice from 5 800 to 1 200 ppm.
- A movable flap on the first mill Donnelly chute at NB which is automatically adjusted in proportion to the power taken by the mill drive to keep mill power constant.
- The commissioning of a second cane preparation line at ML.

Clarification and boiling house

Boiling house recovery (85,37) was the lowest since 1934 and reflects, to a certain extent, the drop in mixed juice purity. However, if one considers the parameters plotted in Figure 2, it appears that the drop in boiling house recovery during the past five years has been more severe than the change in juice purity. As could be expected, it is the mirror image of losses in final molasses which in turn seem to have been mainly influenced by the weight of molasses percent cane.

Unfortunately, because of changes in the method of calculation of molasses target purity, a curve for this parameter could not be included; it could have explained the steep rise in molasses losses during the 1982/83 season. Until a satisfactory reduced boiling house recovery formula is available, a careful watch should be kept on the effect on boiling house recovery of modifications in process work carried out to improve the target purity difference.

The poor quality cane created a number of boiling house problems. At least two mills (FX and UF) reported stops to clear out soil which had settled out in the clarifiers and blocked the stirrers, while others (DL and FX) had to resort to the two-boiling system because of low mixed juice purities.

Colour of sugar was the most difficult boiling house problem of the past season. There is evidence that poor cane was the main source of the high colours measured and there has been considerable speculation on the influence of extraction and of boiling house processes on the development of colour from mixed juice to sugar. A new boiling process which involves the use of C-sugar as footing for B-massecuite, the remelting of all B-sugar and graining for A-massecuite has been used for a limited period at MH, SZ and IL in an attempt to bring down sugar colour. Further tests will have to be carried out to define, with more precision, the advantages and disadvantages of this process. ML has tried adding phosphoric acid to mixed juice but was not able to measure any effect on sugar colour.

A computerised instrument which can process images from a microscope was acquired by the SMRI and used to measure the size distribution of crystals in a systematic survey of C-massecuites. It has revealed that grain size was generally smaller than estimated by the mills and that on average, 17% of the crystals were smaller than 0,06 mm, the nominal size of the C-centrifugal screen perforations. The best results were reported by UK which had only 7% of its C-sugar crystals smaller than 0,06 mm. It is significant that this factory also reported the lowest final molasses target purity difference (2,9).

FX 2 provided most of the developments in boiling house equipment last season with among others:

- an all continuous pan station for A-, B- and C-massecuites,
- continuous vertical crystallisers for all three massecuites,
- the use of load cells for weighing mixed juice, final molasses and sugar,

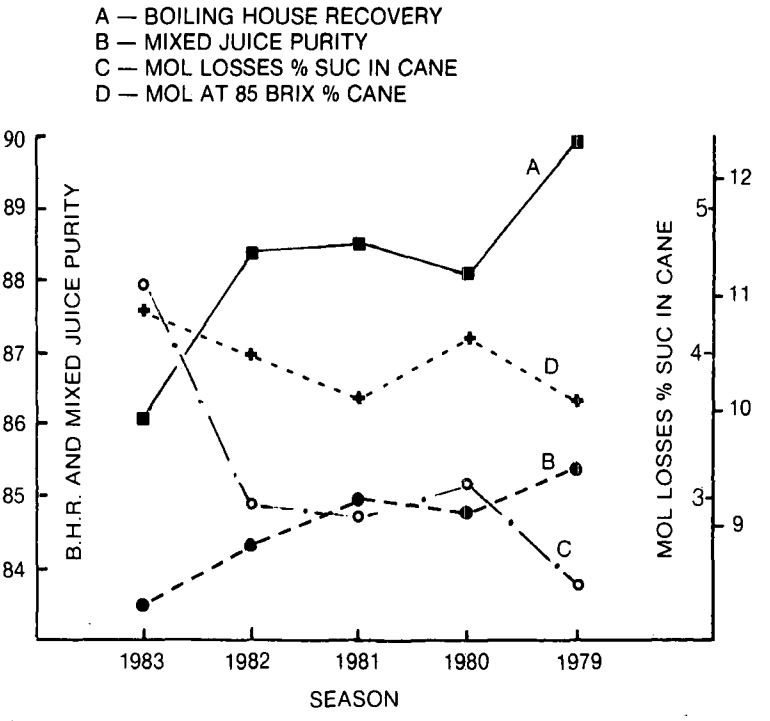

FIGURE 2 BHR Mixed juice purity mol losses and mol % cane 1979 to 1983

- centralised control of the whole boiling house using electronic instruments.

In spite of their problems, the older mills also found time to experiment with:

- the development of a new radial system of juice extraction from a Rapidorr clarifier at SM which reduced retention time to about 75 minutes and enabled the factory to run on only one out of two units,
- modifications to the filter-station at IL to reduce retention time and temperature drop from mud to filtrate which improved purity drop from clear juice to filtrate from 5 to 2 points,
- the successful chemical cleaning of an evaporator vessel at UF by spraying with caustic soda followed by sulphamic acid,
- the use of A-wash as feed for graining at SM, which has proved to be better than syrup and has solved the vexing problem of where to send A-wash.
- vertical C-crystallisers fitted with a new type of cooling element at SZ.

The Services: steam, water, electricity

Apart from FX 2, new boilers came on range at DL and ML during the season. The ML unit, which is rated at 200 tons of steam per hour at 31 bars, is the largest boiler in the South African sugar industry.

Efforts to improve the steam balance of factories and reduce the burning of coal were negated by a shortage of cane and long stops in most mills. In the back end refineries, the situation was aggravated by the necessity to refine a larger proportion of sugar to satisfy the local market. At GH for example, refined sugar accounted for 97,1% of total production compared with 79,2% for the previous season and the refinery had to continue with operations during some weekends when the raw house was stopped. Under these conditions, steam on cane increased from 62% in 1982/83 (at 300 tch) to 76% for the past season at an average crushing rate of 266 tch.

Water supply was a major problem at some mills and caused shutdowns or reductions in crushing capacity. At GD, the Umvoti river dried up and sprayers were placed on the canal feeding the mill which was used as a spray pond. The temperature of incoming water rose to over 35°C. At AK, where the river also dried up, dunder water was stored in molasses tanks, recirculated through the cooling towers and used again in the factory so that no water ran out for several days. ML commissioned a 2 000 $m^3 h^{-1}$ spray pond in only seven weeks to be able to start the season. At UC, a pilot reverse osmosis plant on effluent was successfully commissioned. The quality of the clarified water was such that it could have been used for boiler feed or for domestic purposes. The economics of the unit are being studied. DL on the other hand was stopped for several days in February when floods washed away the service lines to their high pressure boilers.

Two interesting mechanical developments which were commissioned during the season were:

- the use of avalanche screws, which had already proved to be successful at MS, to regulate bagasse reclamation from the stockpile at AK, and
- the replacement of a roller chain on the bagasse carrier to the boiler at SM by an ordinary link chain which was fitted with a clever system for aligning and tensioning.

Acknowledgements

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TABLE A

SOUTH AFRICAN SUGAR ASSOCIATION FINAL SUGAR PRODUCTION (SEASON 1983 - 1984)
(Metric tons)

Mill	Local Market			Export Production		Total
	White	Refinery Raws	Brown	Sugar Equivalent of H.T.M.	Export Raws	
Malelane (ML)	100 884	—	217		—	101 101
Pongola (PG)	56 680	—	1 055	—	—	57 735
Umfolosi (UF)	69 272	—	2 000		874	72 146
Entumeni (EN)	13 664	77	1 939	—	6 503	22 183
Empangeni (EM)	—	49	30	—	26 246	26 325
Felixton (FX)	—	45 057	55	—	—	45 112
Amatikulu (AK)	—	82 569	4 437	3 250	15 147	105 403
Darnall (DL)	—	72 432	—	—	4 282	76 714
Mount Edgecombe (ME)	—	293	67 249	12 589	—	80 131
Maidstone (MS)	—	117 806	—	—	2 907	120 713
Gledhow (GH)	104 337	—	—	—	3 082	107 419
Noodsberg (NB)	96 184	—	—	—	2 690	98 874
Union Co-op (UC)	25 018*	—	112	—	27 545	52 675
Glendale (GD)	—	24 809	21	—	1 684	26 514
Illovo (IL)	—	83 357	4 027	—	3 727	91 111
Sezela (SZ)	—	42 733	—	—	112 002	154 735
Umzimkulu (UK)	—	56 126	72 941	—	9 760	138 827
TOTAL	466 039	525 308	154 083	15 839	216 449	1 377 718

* Refined by NB on behalf of UC

TABLE B_1
CANE CRUSHED AND SUGAR MADE, CANE COMPOSITION, SOUTH AFRICAN MILLS

SYMBOLS OF FACTORIES	ML*	PG†	UF	EN†	EM†	FX			AK*	DL	ME
						A	B	Average			
Tons sugar made	101 101	57 735	72 146	22 183	26 325	—	—	45 112	105 403	76 714	80 131
Refined % total sugar	99,79	98,17	96,02	61,60	—	—	—	—	—	—	—
Moisture raw sugar	0,92	0,28	0,45	0,33	0,12	—	—	0,15	0,12	0,15	0,31
Pol raw sugar	98,16	98,58	98,53	99,00	99,46	—	—	99,27	99,43	99,38	98,63
Tons of cane crushed total	1 017 549	556 520	726 229	207 058	277 605			576 720	1 116 803	792 677	761 480
Tons of cane crushed per tandem	—	—	—	—	—	383 754	192 966		—	—	—
Season started on	16.5.83	16.6.83	16.5.83	10.5.83	5.5.83	—	—	12.5.83	29.4.83	11.5.83	28.4.83
Season completed on	17.1.84	11.12.83	11.12.83	2.12.83	20.7.83	—	—	26.2.84	22.1.84	31.3.84	11.12.83
Number of crushing days	247	150	210	207	77	—	—	182**	196**	159**	228
Time account											
Overall time efficiency %	70,60	73,61	58,96	62,44	87,57	75,92	65,89	70,96	77,65	79,17	68,82
Scheduled stops % gross available time	7,46	12,66	8,78	10,65	9,63	10,26	10,93	10,59	12,78	8,71	21,74
Lack of cane stops % gross available time	13,35	5,24	22,55	8,87	1,35	5,01	9,82	7,39	4,95	7,82	4,89
Other stops % gross available time	8,59	8,49	9,71	18,03	1,45	8,82	13,36	11,07	4,62	4,30	4,55
Lost time % available crushing time	10,85	10,34	14,14	22,41	1,63	10,40	16,86	13,49	5,61	5,15	6,20
Throughputs per hour actual crushing											
Tons of cane crushed	243,15	177,22	245,83	66,65	178,28	96,78	57,24	154,02	309,56	252,24	202,85
Tons of fibre milled	35,52	26,01	35,22	9,74	28,36	15,79	9,67	25,46	48,30	42,45	29,84
Tons of brix processed	34,93	26,05	34,22	10,01	24,78	11,68	6,99	18,67	41,89	34,06	29,09
Tons of sugar produced	24,15	18,42	24,41	7,14	16,83	—	—	12,07	29,23	24,39	21,35
Tons of sucrose in mixed juice	28,67	21,82	28,99	8,54	20,32	—	—	14,92	34,48	27,97	24,51
Tons non sucrose in mixed juice	6,26	4,23	5,23	1,47	4,46	—	—	3,75	7,41	6,09	4,58
Composition of cane crushed											
Suc % cane	12,12	12,66	12,21	13,37	11,67	10,15	10,08	10,13	11,44	11,63	12,44
Pol % cane	11,95	12,54	12,14	13,29	11,54	10,02	10,00	10,01	11,35	11,70	12,32
Fibre % cane	15,35	15,33	15,81	15,30	16,61	18,02	18,36	18,13	16,09	17,81	15,43
Brix % cane	14,98	15,34	14,65	15,94	14,42	12,87	13,01	12,91	14,13	14,27	15,02
Ash % cane	1,57	1,58	2,16	1,70	—	2,53	—	2,53	1,31	—	1,69
ERC % cane	9,87	10,49	10,17	11,24	9,45	7,95	7,76	7,89	9,28	9,45	10,32
ERC % suc in cane	81,38	82,84	83,31	84,08	81,02	78,39	77,00	77,92	81,12	81,27	82,99
Extraction											
Extraction	97,25	97,28	96,61	95,88	97,73	96,17	96,14	96,16	97,33	97,03	97,14
Corrected reduced extraction	97,19	97,16	96,49	95,55	97,96	96,95	97,07	96,99	97,56	97,54	97,06
Imbibition % cane	59,48	58,08	39,75	59,45	48,17	51,30	57,20	53,27	56,99	52,06	36,03
Imbibition % fibre	407	396	277	407	303	314	339	322	365	306	245
Preparation index	92	91	88	87	88	87	88	87	92	93	90
Pol factor	99,07	101,14	99,03	99,66	99,17	100,22	98,00	99,48	99,19	98,65	98,63
Brix fctor	100,54	101,92	100,23	100,67	99,98	101,45	99,75	100,88	100,85	99,19	98,96
Recoveries											
Boiling house recovery	84,22	84,18	84,12	83,24	82,72	—	—	79,77	84,24	85,23	85,90
Overall recovery	81,90	81,88	81,27	79,81	80,84	—	—	76,70	81,99	82,69	83,45
Ton cane per ton sugar	10,06	9,64	10,07	9,33	10,54	—	—	12,78	10,60	10,33	9,50
Ton cane per ton 96 sugar	9,67	9,27	9,68	9,00	10,17	—	—	12,36	10,23	9,98	9,25
Balances											
Suc lost % suc in cane											
— in bagasse (a)	2,75	2,72	3,39	4,12	2,27	—	—	3,84	2,67	2,97	2,86
— in filter cake (b)	0,39	0,24	0,49	0,29	0,25	—	—	0,58	0,26	0,54	0,56
— in final molasses (c)	12,27	12,69	11,79	11,84	13,69	—	—	14,64	12,72	12,13	9,69
— undetermined (d)	2,69	2,46	3,06	3,93	2,95	—	—	4,23	2,36	1,67	3,44
Boiling house losses (b+c+d)	15,35	15,39	15,34	16,06	16,89	—	—	19,45	15,34	15,29	13,69
Sum of all losses (a+b+c+d)	18,10	18,11	18,73	20,18	19,16	—	—	23,29	18,01	18,26	16,55
Non suc ratio	1,13	1,03	1,02	1,07	1,06	—	—	0,95	1,01	1,09	1,02
Pol lost % pol in cane											
— in bagasse	2,79	2,75	3,40	4,15	2,29	—	—	3,88	2,69	3,00	2,89
— in filter cake	0,39	0,24	0,50	0,29	0,25	—	—	0,59	0,26	0,54	0,57
— in final molasses	11,25	12,02	11,57	11,87	13,03	—	—	14,28	12,48	11,67	9,31
— undetermined	2,51	2,33	2,80	3,43	2,66	—	—	3,72	1,92	1,45	2,98
Fructose ratio FM/MJ	0,89	0,89	0,91	0,91	0,88	—	—	0,74	0,84	0,83	0,82
Glucose ratio FM/MJ	0,70	0,54	0,60	0,74	0,62	—	—	0,56	0,63	0,58	0,67

* Cane diffuser
† Bagasse diffuser
** Does not include mid-season stop

THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCES AND LOSSES (SEASON 1983 - 1984)

MS			GD†	GH			NB	UC*	IL*	SZ			UK	Totals & Averages
A*	B	Average		A*	B	Average				A*	B*	Average		
—	—	120 713	26 514	—	—	107 419	98 874	52 675	91 111	—	—	154 735	138 827	1 377 718
—	—	—	—	—	—	97,13	97,28	-	-	-	-	-	-	32,01
—	—	0,12	0,14	—	—	0,10	0,11	0,11	0,19	—	—	0,13	0,13	0,15
—	—	99,42	99,32	—	—	99,64	99,38	99,45	99,38	—	—	99,34	99,22	99,29
—	—	1 232 250	238 261	—	—	1 084 705	823 961	412 154	826 330	—	—	1 534 076	1 238 534	13 422 876
734 951	497 299	—	—	331 886	752 819	—	—	—	—	699 606	834 470	—	—	
—	—	18.5.83	3.6.83	—	—	9.5.83	26.4.83	18.4.83	14.4.83	—	—	6.6.83	22.4.83	14.4.83
—	—	29.11.83	22.12.83	—	—	2.12.83	3.11.83	3.11.83	23.11.83	—	—	29.1.84	8.2.84	31.3.84
—	—	195	202	—	—	206	164	197	224	—	—	238	293	348
82,43	72,96	77,71	74,57	78,50	84,04	81,27	76,78	77,55	84,14	67,61	74,50	71,06	80,78	74,40
4,96	4,17	4,56	6,50	12,54	10,75	11,65	10,29	8,12	5,05	11,36	10,95	11,15	12,08	10,25
1,39	4,88	3,13	10,04	2,76	1,93	2,35	6,44	8,54	3,46	11,80	4,26	8,02	2,85	7,34
11,23	18,00	14,60	8,88	6,20	3,27	4,73	6,48	5,79	7,35	9,23	10,29	9,76	4,29	8,01
11,99	19,79	15,82	10,64	7,32	3,75	5,50	7,78	6,95	8,04	12,02	12,13	12,07	5,05	9,72
190,59	146,40	336,99	66,69	85,44	180,69	266,13	234,66	110,99	183,47	182,22	196,65	378,87	220,13	217,42
32,07	23,76	55,83	9,36	15,10	28,82	43,92	31,26	15,30	27,75	30,55	33,38	63,93	32,44	33,61
26,37	19,88	46,25	9,90	11,75	25,18	36,93	37,70	18,04	27,09	26,18	28,02	54,20	31,10	30,89
—	—	33,01	7,45	—	—	26,35	28,34	14,19	20,25	—	—	38,23	24,65	22,32
—	—	38,33	8,52	—	—	30,84	32,79	15,73	23,23	—	—	45,24	27,19	26,01
—	—	7,92	1,38	—	—	6,09	4,91	2,31	3,86	—	—	8,96	3,91	4,88
11,77	11,68	11,73	13,28	11,70	12,02	11,92	14,36	14,50	13,08	12,44	12,25	12,34	12,79	12,33
11,70	11,58	11,65	13,22	11,64	11,96	11,86	14,24	14,41	12,96	12,33	12,15	12,23	12,70	12,23
17,03	17,01	17,02	14,63	17,88	16,74	17,09	14,50	14,19	15,29	17,00	17,20	17,11	15,64	16,15
14,48	14,38	14,44	15,64	14,33	14,53	14,47	16,75	16,78	15,48	15,13	15,02	15,07	14,97	14,91
1,15	1,63	1,34	—	—	—	—	1,05	1,09	1,70	1,20	1,28	1,24	1,08	1,45
9,56	9,48	9,53	11,28	9,53	9,92	9,80	12,32	12,53	11,05	10,23	10,00	10,10	10,89	10,20
81,24	81,15	81,20	84,95	81,39	82,57	82,21	85,80	86,40	84,50	82,24	81,62	81,90	85,12	82,77
97,36	96,97	97,20	96,21	97,53	97,44	97,47	97,31	97,73	96,81	96,84	96,77	96,80	96,57	97,02
97,75	97,34	97,58	95,71	98,02	97,66	97,77	96,64	97,23	96,72	97,21	97,22	97,21	96,43	97,13
63,48	58,82	61,60	46,36	67,24	58,15	60,93	45,91	47,05	59,49	71,90	68,69	70,15	49,14	55,01
377	362	371	330	380	365	370	345	341	393	429	405	416	333	356
92	91	92	89	92	93	93	92	91	87	90	90	90	91	91
100,62	100,54	100,59	99,72	99,26	98,39	98,66	98,73	99,34	99,60	100,01	100,57	100,31	99,74	99,48
102,18	102,06	102,13	100,51	99,52	98,53	98,83	100,13	101,12	100,28	102,33	103,29	102,85	100,90	100,71
—	—	85,41	86,52	—	—	85,19	85,79	89,71	86,55	—	—	83,90	90,03	85,37
—	—	83,02	83,24	—	—	83,03	83,48	87,67	83,80	—	—	81,22	86,93	82,83
—	—	10,21	8,99	—	—	10,10	8,33	7,82	9,07	—	—	9,91	8,92	9,74
—	—	9,86	8,69	—	—	9,70	8,00	7,55	8,75	—	—	9,58	8,63	9,40
—	—	2,80	3,79	—	—	2,53	2,69	2,27	3,19	—	—	3,20	3,43	2,98
—	—	0,29	0,67	—	—	0,44	0,42	0,13	0,12	—	—	0,21	0,46	0,36
—	—	12,57	11,08	—	—	11,83	10,48	8,67	11,01	—	—	12,39	7,99	11,48
—	—	1,33	1,22	—	—	2,17	2,92	1,26	1,89	—	—	2,99	1,18	2,35
—	—	14,19	12,97	—	—	14,44	13,82	10,06	13,02	—	—	15,99	9,63	14,19
—	—	16,99	16,76	—	—	16,97	16,51	12,33	16,21			18,79	13,06	17,17
—	—	0,96	1,08	—	—	1,03	1,13	0,95	1,10	—	—	1,03	1,03	1,04
—	—	2,82	3,81	—	—	2,55	2,71	2,29	3,21	—	—	3,22	3,46	3,00
—	—	0,29	0,67	—	—	0,44	0,43	0,13	0,12	—	—	0,21	0,47	0,36
—	—	12,35	10,92	—	—	11,90	10,03	8,31	10,43	—	—	12,00	7,70	11,10
—	—	0,92	1,02	—	—	1,68	2,63	1,05	1,68	—	—	2,62	0,84	1,24
—	—	0,87	0,99	—	—	0,83	0,88	0,83	0,91	—	—	0,95	0,78	0,86
—	—	0,68	0,82	—	—	0,59	0,50	0,45	0,60	—	—	0,74	0,57	0,63

TABLE C_1

ANALYSIS OF BAGASSE, JUICES, FILTER SOUTH AFRICAN MILLS

SYMBOLS OF FACTORIES	ML*	PG†	UF	EN†	EM†	FX			AK*	DL	ME
						A	B	Average			
Final Bagasse											
Pol % bagasse	1,00	1,12	1,28	1,65	0,79	1,10	1,06	1,09	0,89	0,91	1,16
Moisture % bagasse	54,17	50,08	53,25	53,60	50,78	51,47	51,74	51,56	53,03	53,18	49,98
Fibre % bagasse	43,98	47,83	44,50	43,66	47,67	46,28	46,07	46,21	45,25	44,80	47,81
Bagasse % cane	33,21	30,68	32,20	33,48	33,37	35,26	36,67	35,73	34,48	38,01	30,77
Ash % bagasse	4,25	3,70	—	2,22	—	—	—	4,05	3,08	—	2,47
LCV in kJ per kg bagasse††	6172	7121	—	6661	—	—	—	6741	6642	—	7381
Mixed Juice											
Mixed juice % cane	126,26	127,41	107,56	125,97	114,80	116,04	120,53	117,58	122,51	114,05	105,26
Brix	11,38	11,54	12,94	11,92	12,11	10,40	10,13	10,31	11,05	11,84	13,62
Sucrose purity	82,07	83,78	84,72	85,32	82,02	80,83	79,35	80,32	82,31	83,58	84,26
Apparent purity	80,90	82,97	84,24	84,82	81,07	79,82	78,70	79,43	81,64	82,90	83,43
Purity difference (MJ-DAC)	−0,11	0,58	0,34	0,57	0,42	0,95	0,50	0,80	−0,07	1,58	1,15
Pol/suc. ratio	0,9857	0,9904	0,9943	0,9942	0,9885	0,9875	0,9918	0,9890	0,9919	0,9919	0,9901
Reducing sugars/pol ratio	9,30	6,59	4,95	4,71	6,66	—	—	6,17	6,55	7,66	5,87
Suspended solids % mixed juice	0,59	0,52	1,38	0,54	0,61	1,47	1,22	1,38	0,40	0,69	0,69
Clarified juice											
Brix	11,68	11,28	12,70	12,55	12,04	—	—	10,14	10,78	10,98	12,97
Apparent purity	79,83	82,08	83,63	84,05	80,70	—	—	80,67	81,11	82,85	83,95
Purity difference (CJ-MJ)	−1,06	−0,89	−0,61	−0,78	−0,37	—	—	1,23	−0,53	−0,05	0,52
Reducing sugars/pol ratio	9,28	6,72	4,99	4,75	6,46	—	—	6,17	7,09	7,94	5,89
Average pH	7,1	7,2	7,4	7,1	7,0	—	—	7,1	7,1	7,1	7,2
Filter cake											
Pol % filter cake	2,03	0,85	1,00	1,06	0,79	—	—	0,94	0,95	0,86	0,86
Filter cake % cane	2,31	3,56	6,01	3,68	3,69	—	—	6,26	3,09	7,26	8,15
Filter wash index	97,4	102,3	101,9	95,0	100,6	—	—	101,7	102,5	107,8	105,0
Purity difference (CJ-filtrate)	7,22	3,12	2,83	3,03	0,59	—	—	0,21	1,36	2,04	1,41
Syrup											
Brix	69,05	70,51	63,34	62,28	65,89	—	—	65,56	67,18	65,96	67,71
Apparent purity	79,66	82,87	84,86	84,91	81,33	—	—	82,03	81,00	83,48	84,53
Purity diff (syrup-MJ)	−1,23	−0,10	0,62	0,08	0,26	—	—	2,59	−0,64	0,58	1,10
Reducing sugars/pol ratio	9,36	6,41	4,79	4,12	3,95	—	—	6,12	7,03	7,56	3,22
Average pH	6,2	6,1	6,2	6,5	6,2	—	—	6,1	6,1	6,4	6,0
Final molasses											
Refracto brix	87,98	80,46	79,96	83,93	81,38	—	—	79,00	78,74	82,15	80,74
Pol/refracto brix purity	30,68	37,22	39,10	40,41	35,82	—	—	38,61	37,06	35,59	33,80
Sucrose/refracto brix purity	33,95	39,66	40,06	40,55	38,05	—	—	40,01	38,07	37,27	35,52
Pol/suc ratio	0,9038	0,9385	0,9760	0,9966	0,9415	—	—	0,9651	0,9734	0,9543	0,9517
Purity difference (true-target)	4,2	3,8	3,8	7,7	5,1	—	—	6,6	4,0	3,9	3,9
Reducing sugars %	17,15	9,30	8,71	10,55	12,05	—	—	11,60	9,88	11,96	12,25
Sulphated ash %	13,81	14,62	15,85	14,10	13,25	—	—	13,42	13,96	14,46	13,68
Reducing sugar/ash ratio	1,24	0,64	0,55	0,75	0,91	—	—	0,86	0,71	0,83	0,90
Fructose %	9,4	5,8	5,4	6,0	7,1	—	—	6,6	5,7	6,9	7,0
Glucose %	7,7	3,4	3,3	4,6	5,0	—	—	5,0	4,2	5,0	5,2
Final mol at 85 brix % cane	5,16	4,77	4,23	4,59	4,94	—	—	4,36	4,50	4,45	3,99

* Cane diffuser
† Bagasse diffuser
†† LCV = 18309 - 31,14 Bx of bagasse - 207,63 moisture % bagasse - 196,05 Ash % bagasse

CAKE, SYRUP AND FINAL MOLASSES (Season 1983 - 1984)

MS			GD†	GH			NB	UC*	IL*	SZ			UK	Average
A*	B	Average		A*	B	Average				A*	B*	Average		
0,78	0,95	0,84	1,57	0,77	0,90	0,86	1,32	1,08	1,21	1,06	1,06	1,06	1,38	1,08
56,43	54,25	55,59	53,66	51,75	51,32	51,46	52,24	52,89	53,82	52,58	52,52	52,55	50,94	52,68
41,96	43,60	42,59	43,84	46,72	46,94	46,87	45,42	45,38	44,10	45,37	45,42	45,40	46,40	45,27
40,10	37,23	38,99	32,00	37,83	33,98	35,16	29,33	30,39	34,30	36,96	37,37	37,18	31,76	34,14
—	—	1,60	—	—	—	—	1,95	2,09	2,88	—	--	2,50	2,17	2,74
—	—	6399	—	—	—	—	7009	6866	6506	—	--	6846	7225	6906
123,38	121,59	122,69	114,36	129,41	124,17	125,77	116,58	116,66	125,20	134,91	131,32	132,96	117,38	120,87
11,21	11,17	11,19	12,98	10,63	11,22	11,04	13,78	13,93	11,79	10,65	10,85	10,76	12,04	11,75
82,81	83,38	83,03	86,05	82,99	84,01	83,70	86,97	87,19	85,75	83,8	83,21	83,50	87,44	84,20
82,28	82,65	82,42	85,69	82,55	83,60	83,28	86,21	86,62	84,96	83,07	82,46	82,74	86,81	83,49
0,28	0,93	0,53	0,49	1,11	1,17	1,15	0,03	−0,77	0,65	−0,31	−0,61	−0,47	0,98	0,43
0,9936	0,9912	0,9927	0,9958	0,9947	0,9951	0,9950	0,9913	0,9936	0,9908	0,9906	0,9910	0,9908	0,9928	0,9916
—	—	6,85	5,14	—	—	5,46	5,21	3,86	5,12	—	--	5,97	4,98	6,06
0,17	0,64	0,35	0,53	0,16	0,64	0,49	1,01	0,34	0,13	0,18	0,18	0,18	0,77	0,57
—	—	10,60	12,42	—	—	10,66	13,52	14,10	11,59	—	--	10,35	11,84	11,51
—	—	81,68	85,93	—	—	83,11	86,28	86,71	84,30	—	--	82,64	86,45	83,12
—	—	−0,75	0,24	—	—	−0,17	0,07	0,09	−0,66	—	--	−0,10	−0,37	−0,37
—	—	6,02	5,63	—	—	4,72	4,72	4,32	5,27	—	--	5,89	4,69	5,87
—	—	7,2	7,0	—	—	7,1	7,2	7,0	7,1	—	--	7,1	7,1	7,1
—	—	0,96	2,32	—	—	1,05	1,08	1,65	1,40	—	--	1,52	1,00	1,07
—	—	3,49	3,84	—	—	4,97	5,61	1,10	1,13	—	--	1,70	5,90	4,18
—	—	105,8	104,5	—	—	103,6	101,9	98,8	101,7	—	--	104,0	101,7	102,1
—	—	1,38	0,36	—	—	3,61	1,57	3,37	1,37	—	--	3,51	0,74	1,78
—	—	68,96	67,67	—	—	66,54	66,12	67,52	65,33	—	--	62,72	69,91	66,76
—	—	82,97	86,42	—	—	83,72	86,69	86,86	84,32	—	--	82,71	86,63	83,94
—	—	0,54	0,73	—	—	0,44	0,48	0,24	−0,64	—	--	−0,30	−0,19	0,45
—	—	6,37	6,34	—	—	4,59	4,63	4,85	5,54	—	--	6,42	4,92	5,72
—	—	6,4	6,5	—	—	6,2	6,2	6,5	6,2	—	--	6,0	6,3	6,2
—	—	82,12	81,10	—	—	79,90	81,00	84,43	83,85	—	--	79,41	80,35	81,35
—	—	39,26	39,58	—	—	37,80	37,06	37,56	36,54	—	--	37,52	35,28	36,66
—	—	40,22	40,33	—	—	37,78	39,05	39,44	38,91	—	--	39,08	36,88	38,22
—	—	0,9761	0,9815	—	—	1,0005	0,9490	0,9523	0,9389	—	--	0,9602	0,9567	0,9590
—	—	6,0	7,1	—	—	4,0	5,5	4,5	5,1	—	--	6,3	2,9	4,9
—	—	10,94	12,53	—	—	9,56	9,14	8,08	10,44	—	--	12,04	11,51	11,20
—	—	14,45	13,41	—	—	14,22	12,84	15,31	14,07	—	--	12,49	14,27	13,92
—	—	0,76	0,93	—	—	0,67	0,71	0,53	0,74	—	--	0,96	0,81	0,80
—	—	6,3	7,0	—	—	5,7	6,2	5,6	6,6	—	--	7,0	6,8	6,6
—	—	4,6	5,5	—	—	3,9	2,9	2,5	3,9	—	--	5,0	4,7	4,6
—	—	4,31	4,29	—	—	4,39	4,53	3,75	4,35	—	--	4,60	3,26	4,36

TABLE D_1

MASSECUITES, EXHAUSTIONS, CLARIFYING AGENTS AND ADDITIONAL FUELS SOUTH AFRICAN MILLS (Season 1983–1984)

Symbols of Factories	ML	PG	UF	EN	EM	FX	AK	DL	MS	ME	GD	GH	NB	UC	IL	SZ	UK	Averages
Brix in mixed juice % cane	14,36	14,70	13,92	15,02	13,90	12,12	13,53	13,50	13,73	14,34	14,84	13,88	16,07	16,25	14,76	14,30	14,13	14,20
A-massecuite																		
m^3 per ton brix in mixed juice	1,08	1,16	1,02	1,24	1,06	1,02	1,05	0,93	1,04	0,92	1,12	1,20	1,09	1,03	0,98	1,07	1,07	1,06
Ref. brix of massecuite	93,18	92,96	91,85	91,99	92,73	92,94	93,05	92,65	91,96	91,90	92,28	92,19	92,33	92,30	92,22	91,92	91,95	92,34
Purity of massecuite	81,11	83,97	85,42	85,62	82,54	83,11	83,08	85,20	83,97	84,32	85,95	86,50	86,51	87,00	84,86	84,22	86,51	84,62
Purity of A-molasses	64,01	66,14	69,42	71,74	66,68	67,32	65,63	65,91	67,91	67,94	71,02	69,64	69,84	68,26	67,43	67,57	69,17	67,76
Purity drop	17,10	17,83	16,00	13,88	15,86	15,79	17,45	19,29	16,06	16,38	14,93	16,86	16,67	18,74	17,43	16,65	17,34	16,86
Exhaustion	58,58	62,71	61,25	57,36	57,67	58,14	61,11	66,41	59,60	60,59	59,94	64,20	63,89	67,86	63,06	60,96	65,01	61,80
Purity A-massecuite – purity syrup	1,45	1,10	0,56	0,71	1,21	1,08	2,08	0,84	1,00	−0,21	−0,47	2,78	−0,18	0,14	0,54	1,51	−0,12	0,68
Purity of remelt	82,83	83,42	—	87,54	86,67	87,99	85,02	88,58	85,14	85,01	85,44	88,87	—	87,63	85,13	87,82	86,30	86,23
B-massecuite																		
m^3 per ton brix in mixed juice	0,55	0,43	0,43	0,47	0,41	0,41	0,40	0,38	0,26	0,35	0,54	0,47	0,42	0,38	0,35	0,41	0,41	0,41
Ref. brix of massecuite	95,14	93,87	94,14	92,59	95,26	94,52	94,51	93,18	93,12	92,47	93,44	93,80	94,74	94,92	94,08	93,09	93,05	93,87
Purity of massecuite	66,10	66,70	69,14	72,66	67,21	68,05	68,15	66,90	67,16	67,89	71,75	70,30	70,05	68,78	67,95	68,94	69,32	68,49
Purity of B-molasses	41,44	45,80	50,43	54,23	44,70	46,42	45,77	46,01	48,55	47,07	50,67	49,70	49,20	46,34	43,37	45,42	46,17	46,59
Purity drop	24,66	20,90	18,71	18,43	22,51	21,63	22,38	20,89	18,61	20,82	21,08	20,60	20,85	22,44	24,58	23,52	23,15	21,90
Exhaustion	63,71	57,81	54,59	55,42	60,56	59,32	60,56	57,84	53,86	57,94	59,56	58,26	58,59	60,80	63,88	62,51	62,04	59,87
C-massecuite																		
m^3 per ton brix in mixed juice	0,36	0,31	0,26	0,29	0,34	0,39	0,33	0,31	—	0,25	0,26	0,30	0,25	0,21	0,26	0,31	0,25	0,29
Ref. brix of massecuite	97,48	95,52	95,93	96,86	97,89	97,23	97,16	96,05	95,66	95,61	95,56	96,58	95,64	96,62	96,06	95,38	97,06	96,30
Purity of massecuite	52,04	53,15	53,80	55,20	52,14	55,47	55,14	54,46	55,31	54,59	54,42	52,17	52,87	50,52	52,49	54,07	52,79	53,63
Apparent purity of C-molasses	30,68	37,22	39,10	40,41	35,82	38,61	37,06	35,59	39,26	33,80	39,58	37,80	37,06	37,56	36,54	37,52	35,28	36,66
Purity drop	21,36	15,93	14,70	14,79	16,32	16,86	18,08	18,87	16,05	20,79	14,84	14,37	15,81	12,96	15,95	16,55	17,51	16,98
Crystal content	30,04	24,24	23,15	24,04	24,89	26,70	27,91	28,14	25,28	30,03	23,47	22,31	24,02	20,05	24,14	25,26	26,26	25,82
Exhaustion	59,21	47,74	44,87	44,96	48,77	49,51	52,10	53,79	47,77	57,53	45,13	44,28	47,51	41,08	47,88	48,99	51,25	49,99
Total volume all raw massecuites																		
m^3 per ton brix in mixed juice	2,00	1,90	1,72	1,99	1,81	1,82	1,79	1,62	—	1,52	1,92	1,97	1,75	1,61	1,58	1,79	1,68	1,75
White sugar massecuites																		
Kg sugar per m^3 white massecuite	530	516	787	540	—	—	—	—	—	—	—	535	574	—	—	—	—	580
Clarifying agents and chemicals																		
Tons limestone per 1 000 tons white sugar	—	50,4	—	—	—	—		—	—	—	—	44,8	—	—	—	—	—	—
Tons coke per 1 000 tons white sugar	—	6,6	—	—	—	—	—	—	—	—	—	4,4	—	—	—	—	—	—
Tons phos. acid per 1 000 tons white sugar	—	—	—	0,77	—	—	—	—	—	—	—	—	1,24	—	—	—	—	—
Tons sulphur per 1 000 tons white sugar	0,1	0,1	6,0	—	—	—	—	—	—	—	—	0,01	—	—	—	—	—	—
Phos. acid ppm mixed juice	16,73	—	—	—	—	—	—		—	—	—	0,31	—	—	—	—	—	—
Flocculant ppm mixed juice	1,5	3,0	4,7	3,2	7,8	2,8	3,4	1,9	2,2	2,2	1,8	4,9	5,9	3,0	1,5	6,6	1,5	3,6
Tons lime per 1 000 tc	2,0*	1,0	1,7*	1,9*	0,8	0,8	—	0,7	1,3	0,8	1,0	1,4*	1,0*	0,5	0,9	0,8	0,8	1,1
Enzymes ppm sugar	—	—	8,0	30,4	26,7	29,4	10,0	15,4	16,1	—	44,9	10,3	0,4	5,1	19,5	8,5	17,0	11,3
Additional fuels per 1 000 TC																		
Tons of coal	54,87	27,92	16,20	65,74	4,60	76,29	2,89	—	29,58	1,95	31,46	—	23,99	7,64	1,02	—	0,14	—
Tons of wood	—	—	—	1,18	7,00	—	—	3,61	0,09	0,39	4,42	—	0,28	—	0,47	—	0,21	—
Converted into bagasse ***	219,48†	111,68	64,79	264,38†	26,81	305,17†	11,57	4,33	118,43†	8,28	131,16	—	96,29	30,55	4,63	—	0,81	—

* Includes lime used in refinery
† Part of bagasse used for by-products
*** 1 ton coal equivalent to 4 tons of bagasse
1 ton firewood equivalent to 1,2 tons of bagasse

TABLE B_2

CANE CRUSHED AND SUGAR MADE, CANE COMPOSITION, THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCE AND LOSSES SWAZILAND, MALAWI AND ZIMBABWE MILLS

(SEASON 1983 – 1984)

Symbols of Factories	MH			UR	SM	NH			DW*	HV			TR		
	A*	B	Average			A†	B	Average		A*	B*	Average	A*	B	Average
Tons raw sugar	—	—	120 423	131 210	127 015	—	—	74 587	47 262	—	—	248 659	—	—	XXX
Tons white sugar	—	—	—	5 965	—	—	—	28 748	24 694	—	—	—	—	—	—
Total sugar, tons	—	—	120 423	137 175	127 015	—	—	103 335	71 956	—	—	248 659	—	—	—
White % total sugar	—	—	—	4,35	—	—	—	27,82	34,32	—	—	—	—	—	—
Pol raw sugar	—	—	98,75	98,88	98,61	—	—	98,72	99,18	—	—	98,73	—	—	—
Moisture raw sugar	—	—	0,29	0,18	0,26	—	—	0,25	0,15	—	—	0,19	—	—	—
Tons cane crushed – total	—	—	1 124 101	1 283 424	1 154 794	—	—	957 359	629 606	—	—	1 909 080	—	—	1 606 657
Tons of cane crushed – per tandem	529 532	594 569	—	—	—	359 589	597 770	—	—	972 860	936 220	—	933 800	672 857	—
Season started on	—	—	10/5/83	1/5/83	18/4/83	—	—	4/4/83	20/5/83	—	—	12/4/83	—	—	7/4/83
Season completed on	—	—	24/11/83	9/1/84	6/12/83	—	—	30/11/83	26/11/83	—	—	2/12/83	—	—	12/12/83
Number of crushing days	—	—	198	254	233	—	—	241	191	—	—	235	—	—	250
Time Account															
Overall time efficiency %	80,16	84,33	82,37	85,63	83,04	71,88	81,74	78,03	79,51	88,93	88,68	88,81	82,75	78,67	81,04
Scheduled stops % gross available time	6,37	6,57	6,48	4,51	4,96	9,14	9,14	9,14	5,83	2,81	3,37	3,08	5,58	6,63	6,02
Lack of cane stops % gross available time	4,70	3,53	4,08	2,33	9,00	7,76	3,18	4,90	4,41	0,13	0,31	0,22	1,14	3,03	1,93
Other stops % gross available time	8,77	5,57	7,08	7,53	3,01	11,22	5,95	7,93	10,25	8,14	7,64	7,89	10,53	11,66	11,00
Lost time % available crushing time	9,86	6,20	7,92	8,08	3,50	13,50	6,79	9,31	11,41	8,38	7,93	8,16	11,29	12,91	11,97
Throughputs per hour actual crushing															
Tons of cane crushed	143,54	151,89	295,43	246,65	251,55	87,30	127,62	214,92	167,32	200,32	196,34	396,66	190,24	164,30	354,54
Tons of fibre milled	21,07	20,61	41,68	33,95	28,57	13,47	19,70	33,17	26,45	29,06	28,40	57,46	29,54	25,07	54,61
Tons of brix processed	20,60	21,32	41,92	35,19	36,34	13,03	19,01	32,04	25,82	32,86	32,49	65,35	30,09	25,61	55,70
Tons of sugar produced	—	—	31,66	26,35	27,67	—	—	23,21	19,12	—	—	51,65	—	—	—
Tons of pol in cane	17,98	19,02	37,00	30,95	31,19	11,38	16,49	27,87	22,97	28,93	28,61	57,54	26,48	22,95	49,43
Tons of non pol in mixed juice	—	—	6,49	5,67	5,94	—	—	5,38	—	—	—	9,34	—	—	7,80
Composition of cane crushed															
Pol % cane	12,53	12,52	12,52	12,55	12,40	13,03	12,92	12,96	13,73	14,44	14,57	14,50	13,92	13,97	13,94
Fibre % cane	14,88	14,50	14,68	14,38	12,30	15,42	15,43	15,43	15,81	14,97	14,95	14,96	15,44	15,71	15,84
Brix % cane	15,06	15,01	15,03	15,43	15,12	15,68	15,61	15,63	16,57	17,08	17,17	17,12	16,43	16,55	16,48
ERC % cane	10,45	10,47	10,46	10,29	10,27	10,87	10,72	10,78	11,42	12,25	12,40	12,31	11,81	11,80	11,81
ERC % pol in cane	83,40	83,64	83,53	81,98	82,88	83,38	83,04	83,17	83,21	84,82	85,11	84,88	84,53	84,75	84,62
Extraction															
Extraction	96,60	95,03	95,77	95,34	97,49	95,83	96,02	95,95	94,70	97,18	97,57	97,37	97,92	95,92	97,08
Corrected reduced extraction	96,47	94,39	95,37	94,79	96,54	95,80	96,01	95,93	94,65	96,78	97,19	96,98	97,85	95,69	96,94
Imbibition % cane	52,89	44,86	48,64	40,90	45,39	34,07	32,39	33,02	43,54	57,35	59,75	58,52	48,89	48,22	48,61
Imbibition % fibre	360	331	345	297	400	221	210	214	275	395	413	404	315	316	315
Preparation index	90	90	90	90	91	83	84	84	89	92	93	92	90	90	90
Recoveries															
Boiling house recovery	—	—	88,23	88,34	89,74	—	—	85,99	87,43	—	—	91,08	—	—	—
Overall recovery	—	—	84,50	84,22	87,49	—	—	82,50	82,79	—	—	88,68	—	—	—
Tons cane per ton sugar	—	—	9,33	9,36	9,09	—	—	9,26	8,75	—	—	7,68	—	—	—
Tons cane per ton 96° sugar	—	—	9,07	9,09	8,85	—	—	9,00	8,47	—	—	7,47	—	—	—
Pol balance															
Lost in bagasse (a)	—	—	4,23	4,66	2,51	—	—	4,05	5,30	—	—	2,63	—	—	2,92
Lost in filter cake (b)	—	—	0,38	0,21	0,30	—	—	0,93	0,08	—	—	0,01	—	—	0,21
Lost in final molasses (c)	—	—	9,77	9,91	9,31	—	—	10,45	10,79	—	—	7,64	—	—	—
Undetermined losses (d)	—	—	1,12	1,00	0,39	—	—	2,06	1,04	—	—	1,04	—	—	—
Boiling house losses (b+c+d)	—	—	11,27	11,12	10,00	—	—	13,44	11,91	—	—	8,69	—	—	—
Sum of all losses (a+b+c+d)	—	—	15,55	15,78	12,51	—	—	17,49	17,21	—	—	11,32	—	—	—
Red. sugars in F.M. % R.S. in M.J.	—	—	—	171	91	—	—	—	95	—	—	—	—	—	—
Non pol ratio	—	—	1,05	1,01	0,97	—	—	1,96	0,88	—	—	1,03	—	—	—

* Cane diffuser † Bagasse diffuser XXX Simultaneous production of sugar and alcohol. N.B. All extraction and recovery figures listed in Table B_2 are based on pol.

TABLE C_2

ANALYSIS OF BAGASSE, JUICES, FILTER CAKE, SYRUP AND FINAL MOLASSES SWAZILAND, MALAWI AND ZIMBABWE MILLS

(Season 1983 – 1984)

SYMBOLS OF FACTORIES	MH			UR	SM	NH			DW*	HV			TR		
	A*	B	Average			A†	B	Average		A*	B	Average	A*	B	Average
Final bagasse															
Pol % bagasse	1,34	2,08	1,72	1,77	1,28	1,62	1,59	1,60	2,12	1,32	1,18	1,25	0,91	1,69	1,25
Moisture % bagasse	51,49	51,38	51,43	54,75	50,43	51,65	50,07	50,68	50,67	50,59	49,70	50,16	49,38	51,96	50,50
Fibre % bagasse	46,27	45,36	45,80	41,71	46,79	46,11	47,71	47,10	46,01	47,20	48,24	47,70	48,69	45,19	47,18
Ash % bagasse	—	—	—	—	2,99	—	—	—	—	—	—	—	—	—	—
Bagasse % cane	31,73	29,92	30,77	32,99	24,27	33,45	32,35	32,76	34,36	30,74	29,99	30,37	31,90	33,76	32,68
LCV in kJ per kg bagasse	—	—	—	—	7167	—	—	—	—	—	—	—	—	—	—
Mixed juice															
Mixed juice % cane	121,16	114,94	117,87	107,90	121,11	100,62	100,05	100,26	109,18	126,61	129,76	128,15	117,00	114,46	115,94
Brix	11,85	12,21	12,04	13,22	11,93	14,84	14,89	14,87	14,14	12,96	12,75	12,86	13,52	13,62	13,56
Apparent purity	84,31	84,74	84,54	83,88	83,66	83,65	83,27	83,41	84,23	85,54	85,88	85,71	86,21	85,95	86,10
Reducing sugars/pol ratio	—	—	4,61	3,65	6,40	—	—	5,48	6,02	—	—	5,26	—	—	7,03
Suspended solids % mixed juice	0,16	0,81	0,50	0,57	0,78	—	—	—	—	0,37	0,37	0,37	0,35	0,40	0,37
Clarified juice															
Brix	—	—	12,12	13,19	11,70	—	—	13,63	13,46	—	—	13,01	—	—	13,27
Apparent purity	—	—	84,59	83,99	83,11	—	—	87,89	84,32	—	—	86,01	—	—	85,59
Purity difference (CJ-MJ)	—	—	0,05	0,11	−0,55	—	—	4,48	0,09	—	—	0,30	—	—	−0,51
Reducing sugars/pol ratio	—	—	4,54	3,56	6,46	—	—	4,17	6,02	—	—	5,45	—	—	5,97
Average pH	—	—	7,1	7,1	7,0	—	—	7,2	7,0	—	—	6,9	—	—	—
Filter cake and filtrate															
Pol % filter cake	—	—	1,89	0,73	1,10	—	—	2,66	0,54	—	—	0,28	—	—	1,23
Moisture % filter cake	—	—	—	—	73,0	—	—	72,9	72,1	—	—	72,2	—	—	72,8
Filter cake % cane	—	—	2,49	3,65	3,35	—	—	4,54	2,02	—	—	0,50	—	—	2,35
Filter wash index	—	—	99,3	100,2	102,0	—	—	109,1	105,0	—	—	98,8	—	—	102,2
Purity difference (CJ-filtrate)	—	—	3,22	2,11	2,17	—	—	3,12	0,04	—	—	4,13	—	—	2,34
Syrup															
Brix	—	—	62,17	61,38	64,69	—	—	64,73	63,67	—	—	65,88	—	—	62,39
Apparent purity	—	—	84,29	85,12	83,33	—	—	86,74	85,05	—	—	85,87	—	—	85,49
Purity difference (syrup – MJ)	—	—	−0,25	1,24	−0,33	—	—	3,33	0,82	—	—	0,16	—	—	−0,61
Reducing sugars/pol ratio	—	—	3,62	4,14	6,78	—	—	4,79	6,43	—	—	5,67	—	—	6,17
Average pH	—	—	6,4	6,4	6,3	—	—	6,6	6,6	—	—	6,1	—	—	—
Final molasses															
Refracto brix	—	—	78,93	83,99	83,12	—	—	79,29	85,08	—	—	87,70	—	—	—
Pol/refracto brix purity	—	—	35,66	35,98	34,77	—	—	43,37	41,34	—	—	32,60	—	—	—
Percentage reducing sugars	—	—	—	18,08	17,57	—	—	—	17,60	—	—	—	—	—	—
Percentage sulphated ash	—	—	—	15,28	15,03	—	—	—	12,22	—	—	—	—	—	—
Reducing sugars/ash ratio	—	—	—	1,18	1,17	—	—	—	1,44	—	—	—	—	—	—
Mol at 85 refracto brix % cane	—	—	4,04	4,07	3,90	—	—	3,67	4,21	—	—	4,00	—	—	—

* Cane diffuser
† Bagasse diffuser

TABLE D_2

MASSECUITES, EXHAUSTIONS, CLARIFYING AGENTS AND ADDITIONAL FUELS SWAZILAND, MALAWI AND ZIMBABWE MILLS (Season 1983 - 1984)

Symbols of Factories	MH	UR	SM	NH	DW	HV	TR
Brix in mixed juice % cane	14,18	14,27	14,45	14,91	15,43	16,47	15,72
A-massecuite							
m^3 per ton brix in mixed juice	0,93	0,96	0,96	0,90	1,22	0,95	–
Ref. brix of massecuite	92,61	91,44	93,32	91,59	92,99	92,68	–
Purity of massecuite	85,32	86,16	82,78	85,38	86,97	85,16	–
Purity of A-molasses	67,62	69,18	65,35	72,27	72,69	64,39	–
Purity drop	17,70	16,98	17,43	13,11	14,28	20,77	–
Exhaustion	64,07	63,94	60,77	55,37	60,12	68,49	–
Purity A-massecuite — purity syrup	1,03	1,06	−0,55	−1,36	1,92	−0,71	–
B-massecuite							
m^3 per ton brix in mixed juice	0,40	0,42	0,21	0,47	0,47	0,42	–
Ref. brix of massecuite	94,14	93,47	95,40	94,40	93,51	94,38	–
Purity of massecuite	71,07	71,10	65,39	75,36	72,81	66,60	–
Purity of B-molasses	47,67	47,17	45,84	60,18	54,40	43,26	–
Purity drop	23,40	23,93	19,55	15,18	18,41	23,34	–
Exhaustion	62,92	63,71	55,20	50,59	55,45	61,76	–
C-massecuite							
m^3 per ton brix in mixed juice	0,27	–	0,31	0,33	0,32	0,26	–
Ref. brix of massecuite	96,15	95,93	97,68	98,50	95,56	97,10	–
Purity of massecuite	55,08	55,64	56,55	61,45	59,11	50,27	–
Apparent purity of C-molasses	35,66	35,92	34,77	43,37	41,34	32,60	–
Purity drop	19,42	19,72	21,78	18,08	17,77	17,67	–
Crystal content	29,02	29,52	32,61	31,45	28,95	25,46	–
Exhaustion	54,80	55,31	59,04	51,95	51,25	52,15	–
Total volume all raw massecuites							
m^3 per ton brix in mixed juice	1,60	–	1,48	1,70	2,01	1,62	–
White sugar massecuites							
Kg sugar per m^3 white massecuites	–	575	–	532	553	–	–
Clarifying agents and chemicals							
Tons lime per 1 000 tons cane	0,74	0,80	0,68	1,39*	1,76*	0,76	–
Tons sulphur per 1 000 tons white sugar	–	0,035	–	–	0,52	–	–
Tons phosphoric acid per 1 000 tons white sugar	–	–	–	0,87	–	–	–
Flocculant ppm mixed juice	3,2	1,9	0,6	0,2	2,8	1,2	–
Enzyme ppm sugar	4,9	–	–	–	–	–	–
Additional fuels per 1 000 tons cane							
Tons of coal	2,27	6,04	3,26	–	–	6,12	18,18†
Tons of wood	–	–	0,03	0,36	–	–	–
Converted into bagasse	9,08	24,17	13,08	0,43	–	24,48	72,72

* Includes lime used in refinery
† Includes coal used for irrigation power generation

TABLE E

COMPARATIVE MANUFACTURING DATA OF RECENT YEARS (SOUTH AFRICAN MILLS)

Season	1983/84	1982/83	1981/82	1980/81	1979/80
Throughput and time efficiency					
Tons cane per hour	217,42	232,96	233,87	224,86	234,75
Tons fibre per hour	33,61	34,76	35,96	34,16	34,61
Time efficiency	74,40	78,39	77,45	79,02	79,24
Cane					
Pol % cane	12,23	12,75	12,20	13,34	12,96
Fibre % cane	16,15	15,61	16,13	15,95	15,49
Juice					
Apparent purity of mixed juice	83,49	84,37	84,94	84,80	85,40
Reducing sugars/pol ratio (mixed juice)	6,06	5,80	5,27	5,25	5,11
Milling					
Imbibition % fibre	356	345	341	344	333
Extraction	97,02	97,02	97,02	96,89	96,92
Pol % bagasse	1,08	1,19	1,10	1,24	1,23
Moisture % bagasse	52,68	51,35	51,57	52,10	52,04
Bagasse % cane	34,14	32,13	33,24	33,35	32,31
LCV bagasse kJ/kg	69,06	7 153	7 050	6 985	7 003
Available kJ in bagasse/kg brix in mixed juice	16 597	15 676	16 827	15 283	15 391
Recoveries					
Boiling house recovery	85,37†	87,64†	87,75†	88,17	89,48
Overall recovery	82,83	85,03†	85,14†	85,42	86,73
Tons cane per ton sugar	9,74	9,10	9,50	8,73	8,85
Filter cake					
Pol % filter cake	1,07	1,11	1,09	1,18	1,19
Filter cake % cane	4,18	3,87	4,19	4,62	4,32
Final molasses					
Brix	81,35	82,03	82,78	82,44	82,45
Gravity purity	38,22	36,56	37,15	38,70	38,32
Weight at 85 Bx % cane	4,36	4,03	3,69	4,12	3,67
Average sugar polarisation	99,50	99,48	99,30	99,42	99,50
Pol balance					
Lost in bagasse	3,00	3,01	3,00	3,11	3,08
Lost in filter cake	0,36	0,34	0,37	0,41	0,40
Lost in final molasses	11,10	9,27	9,23	9,46	8,59
Undetermined losses	2,02	1,62	1,55	1,60	1,21
Lost in boiling house	13,48	11,23	11,15	11,47	10,20
Total losses	16,48	14,24	14,15	14,58	13,28
M^3 massecuite per ton brix in mixed juice					
A-massecuite	1,06	1,05	1,07	1,05	1,05
B-massecuite	0,41	0,42	0,42	0,42	0,39
C-massecuite	0,29	0,27	0,26	0,26	0,24
Total	1,75	1,73	1,75	1,73	1,69
Exhaustion of massecuites					
A-massecuite	61,80	62,61	62,99	62,93	63,80
B-massecuite	59,87	61,29	60,61	59,58	60,50
C-massecuite	49,99	52,48	50,93	49,98	50,43
Brix of syrup	66,76	67,32	66,46	66,95	66,00

† Sucrose basis.

TABLE F

AVERAGE MANUFACTURING RESULTS BY MONTHLY PERIODS FOR SOUTH AFRICAN MILLS (Season 1983–1984)

End of Monthly Period		April 30 1983	May 28 1983	July 2 1983	July 30 1983	August 27 1983	October 1 1983	October 29 1983	November 26 1983	December 31 1983	January 28 1984	February 25 1984	March 31 1984
Tons sugar made and estimated	Month	14 162	132 351	259 137	196 597	162 084	214 511	155 314	121 800	68 805	36 090	6 919	9 948
	To-date	14 162	146 513	405 650	602 247	764 331	978 842	1 134 156	1 255 956	1 324 761	1 360 851	1 367 770	1 377 718
Tons cane crushed	Month	129 713	1 214 358	2 332 317	1 715 590	1 489 914	1 997 913	1 559 613	1 355 114	854 691	496 697	118 162	158 794
	To-date	129 713	1 344 071	3 676 388	5 391 978	6 881 892	8 879 805	10 439 418	11 794 532	12 649 223	13 145 920	13 264 082	13 422 876
Tons cane crushed per hour actual crushing	Month	168,82	208,27	216,20	218,93	233,41	211,81	215,77	219,07	224,52	254,73	206,42	261,92
	To-date	168,82	203,68	211,17	213,24	215,36	214,55	214,73	215,22	215,83	217,08	216,98	217,42
Sucrose % cane	Month	12,81	12,96	13,18	13,60	12,93	12,81	12,02	11,02	10,04	9,27	8,19	8,35
	To-date	12,81	12,95	13,10	13,26	13,19	13,10	12,94	12,72	12,54	12,41	12,38	12,33
Fibre % cane	Month	15,36	15,54	15,62	15,50	16,00	15,78	16,62	17,19	17,50	17,28	17,25	17,62
	To-date	15,36	15,52	15,59	15,56	15,66	15,68	15,82	15,97	16,08	16,12	16,13	16,15
Tons cane per ton sugar	Month	9,16	9,18	9,00	8,73	9,20	9,31	10,04	11,13	12,42	13,76	17,08	14,85
	To-date	9,16	9,17	9,06	8,95	9,00	9,07	9,20	9,39	9,55	9,66	9,70	9,74
Extraction	Month	96,53	96,91	96,98	97,23	97,10	97,25	97,08	96,92	96,69	96,55	95,26	96,17
	To-date	96,53	96,87	96,94	97,04	97,05	97,09	97,09	97,07	97,05	97,04	97,03	97,02
Imbibition % fibre	Month	332	338	355	362	353	368	360	354	359	365	330	288
	To-date	332	338	348	353	353	356	357	356	357	357	357	356
Pol % bagasse	Month	1,29	1,21	1,19	1,14	1,11	1,06	1,01	0,94	0,91	0,88	1,09	0,86
	To-date	1,29	1,21	1,20	1,18	1,17	1,14	1,12	1,10	1,09	1,08	1,08	1,08
Moisture % bagasse	Month	54,64	53,20	53,06	52,71	52,39	52,31	52,36	52,60	52,49	52,70	53,13	53,06
	To-date	54,64	53,34	53,16	53,02	52,88	52,75	52,69	52,68	52,67	52,67	52,67	52,68
Boiling House recovery	Month	87,68	86,35	86,52	86,25	86,17	85,87	84,93	83,80	81,78	80,60	74,19	83,24
	To-date	87,68	86,47	86,50	86,43	86,40	86,28	86,09	85,87	85,64	85,50	85,43	85,37
Overall Recovery	Month	84,64	83,68	83,91	83,86	83,67	83,51	82,45	81,22	79,07	77,82	70,67	80,05
	To-date	84,64	83,77	83,86	83,86	83,85	83,77	83,59	83,35	83,12	82,97	82,90	82,83
Mixed juice sucrose purity	Month	86,43	84,28	85,14	85,10	85,18	84,70	84,01	83,04	81,18	79,41	76,92	79,14
	To-date	86,43	84,48	84,90	84,97	85,01	84,94	84,81	84,63	84,44	84,29	84,25	84,20
R.S./Pol ratio in mixed juice	Month	5,43	6,18	5,69	5,94	5,67	5,51	5,96	6,08	7,20	9,08	8,03	15,19
	To-date	5,43	6,10	5,84	5,87	5,83	5,76	5,79	5,82	5,89	5,98	5,99	6,06
Pol/sucrose ratio in Mixed juice	Month	0,9925	0,9913	0,9921	0,9894	0,9922	0,9923	0,9946	0,9950	0,9899	0,9814	0,9802	0,9710
	To-date	0,9925	0,9914	0,9919	0,9911	0,9913	0,9915	0,9919	0,9923	0,9921	0,9918	0,9917	0,9916
Purity final molasses	Month	37,31	35,01	36,03	35,45	36,28	37,22	37,63	38,76	38,55	36,58	37,94	29,25
	To-date	37,31	35,21	35,73	35,64	35,77	36,11	36,33	36,61	36,73	36,73	36,74	36,66
Sucrose lost in final molasses % sucrose in cane	Month	—	10,87	10,56	10,55	10,86	11,18	12,02	12,90	14,12	15,92	15,78	12,99
	To-date	—	10,81	10,65	10,62	10,67	10,79	10,96	11,15	11,31	11,44	11,47	11,48
Undetermined lost sucrose % sucrose in cane	Month	—	2,03	2,20	2,50	2,17	2,18	2,25	2,41	3,10	2,41	7,87	2,57
	To-date	—	1,97	2,11	2,22	2,19	2,19	2,20	2,22	2,27	2,28	2,31	2,35
Pol/sucrose ratio FM	Month	—	0,9359	0,9518	0,9428	0,9524	0,9710	0,9743	0,9892	0,9728	0,9404	0,9369	0,8912
	To-date	—	0,9373	0,9465	0,9453	0,9468	0,9523	0,9557	0,9595	0,9607	0,9599	0,9596	0,9590

TABLE G
CANE VARIETIES AND RAINFALL
(Season 1983 – 1984)

SYMBOLS OF FACTORIES	CANE VARIETIES CRUSHED (Percentage by Weight)																					Rainfall during season (mm)
	NCo 376	NCo 310	NCo 293	NCo 382	N 13	NCo 334	N 53/216	CB 36/14	N 6	N 52/219	N 55/805	N 7	N 8	J 59/3	N 11	N 14	N 12	Mixed Varieties	Unknown and other varieties	NCo 292	N 50/211	Co 331	
ML	57,3					3,0				15,1				6,4	4,0	11,5		0,5	1,9				439
PG	73,7	0,6				0,8				5,0				0,1	2,9	7,5		1,6	7,5				381
UF	31,9	46,5		1,1						1,2	4,5		5,5		0,5	0,1	0,1	6,6					558
EN			11,3					0,5			0,5							86,9					438
EM	47,9	4,6		0,1					0,1	0,5	2,8	0,2	0,7		0,8		0,1	0,1	41,6				76
FX	50,8	10,6		0,1							4,7	0,1	3,6		0,3		0,1	0,2	28,7				1664
AK	67,8	1,4	0,5				0,1			0,1	3,5		0,7		0,3			1,1	23,8				612
DL	90,5	0,4	0,2								4,5		0,5		0,1		0,1	2,1	1,1				986
ME	65,8	1,5	17,5	0,3				0,8			6,1		1,6		0,3		0,1	5,7	0,1				593
MS	88,9	0,3	0,2	0,1							7,7		0,3		0,2			1,5					411
GH	87,1	0,7	0,2		0,2						5,0		0,3					1,3	4,6				457
NB	20,9		57,2	6,3			2,0	1,2	0,5		1,6		0,4		0,3			0,3	8,0		0,5	0,1	215
UC	10,9		57,9	1,9			0,1	0,2	0,2	0,1			0,2						27,8				245
GD	99,5												0,2										575
IL	54,4	0,2	19,7				0,4	0,3		5,4		1,0	0,1		0,1			0,4	17,2	0,2			662
SZ	91,5	0,6	0,1						0,1	0,2	2,8		0,2		0,6		0,1	1,0	2,3				1 029
UK	73,8	0,8	4,8		0,3				0,1	0,5	1,3			0,1	0,6		0,6	0,1	16,5				993
Average S.A. Mills	67,5	3,5	8,2	0,5		0,2	0,1	0,1		1,5	3,4	0,1	0,8	0,5	0,7	1,2	0,1	1,4	9,2				
MH	92,3					2,1				0,4					0,2				5,0				330
UR	82,6									10,8					1,2	4,6		0,5	0,3				453
SM	85,4					1,1				9,5				2,9	0,1			0,1	0,9				91
NH	74,4	20,0								0,6									5,0				86
DW	72,0	14,1								0,3								1,6	12,0				186
HV	95,5									0,8									3,7				92
TR	98,8														0,1				1,1				142

TABLE H
TRANSPORT SUMMARY SOUTH AFRICAN MILLS
(Season 1983 – 1984)
PERCENT OF CANE TRANSPORTED

MILLS	ML	PG	UF	EN	EM	FX	AK	DL	ME	MS	GH	NB	UC	GD	IL	SZ	UK	Average
South African Railways	7,6		23,8		50,6	60,1	10,1		31,8		15,3	4,7	5,4		0,3			9,8
Trams		100,0	73,7		16,8	38,5												10,1
Hilo	81,9		0,9		12,8	1,2	77,4	80,1	20,0	91,3	64,4	40,5	37,9	65,6	99,5	66,1	44,5	55,1
Lorry and Trailer				9,1	6,1		2,2	3,5	47,0	0,9	1,7	30,1	29,3	11,9		33,7	53,0	15,2
Tractor	10,5		1,4	90,8	13,4		10,1	16,2	1,0	7,6	18,3	24,3	27,1	22,4			2,3	9,5

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
1978	12,64	15,22	9,07	8,77	96,63	2,95	1,35	51,59	45,4	314	85,36	5,27	38,0	89,58	86,55
1979	12,96	15,49	8,85	8,54	96,92	2,70	1,23	52,04	49,1	333	85,40	5,11	38,3	89,48	86,73
1980	13,34	15,95	8,73	8,42	96,89	2,73	1,24	52,10	52,2	344	84,80	5,25	38,7	88,17	85,42
1981	12,30	16,13	9,50	9,18	97,02	2,38	1,10	51,57	52,4	341	85,67	5,27	37,1	87,75	85,14
1982	12,86	15,61	9,10	8,79	97,02	2,57	1,19	51,35	51,5	345	85,12	5,80	36,6	87,64	85,03
1983	12,33	16,15	9,74	9,40	97,02	2,37	1,08	52,68	55,0	356	84,20	6,06	38,2	85,37	82,83

TABLE K

EQUIPMENT AND POWER USED SOUTH AFRICAN AND SWAZILAND MILLS

SYMBOLS OF FACTORIES	ML	PG	UF	EN	EM	FX A	FX B	AK	DL	ME
Extraction plant										
Total installed power kW/tfh	196	153	246	138	131	172	172	172	183	143
Cane preparation kW/tfh	122	96	92	52	55	86	96	112	82	60
Mills: Total roller volume m^3/tfh	0,51	0,57	1,12	0,64	0,89	1,52	1,56	0,63	1,07	1,20
Diffuser: Screen area m^2/tch†	(C)2,09	(B)2,20	–	(B)0,89	(B)1,12	–	–	(C)2,04	–	–
Clarification and Evaporation										
Juice heaters: Heating surface m^2/tch°	9,5	9,7	8,6	9,0	6,7	7,6		6,6	5,8	7,3
Clarifiers: Volume m^3/tch	(E)4,9	(T)1,0	(T)1,4	(E)2,7	(E)3,0	(E)2,7		(E)3,4	(E)2,5	(E)2,6
Evaporators: Heating surface m^2/tch	45,1	61,8	47,6	44,0	35,3	40,8		43,0	42,1	32,8
Filters: Screening area m^2/tch	0,46	0,79	0,72	0,70	0,63	1,09		0,48	0,59	0,73
Boiling house										
Vacuum pans: Volume m^3/tch	2,1	1,7	1,8	2,4	1,8	1,8		1,8	1,5	1,9
Crystallisers: Volume A m^3/tch	*1,55* –	*0,85* **1,05**	*0,81* **0,55**	*0,89* **0,54**	*1,44* –	*1,35* –		*1,63* –	*1,57* –	*1,38* –
Volume B m^3/tch	*0,53* **0,69**	*0,85* **1,52**	*0,51* **0,18**	*1,32* –	*1,90* –	*0,99* –		*0,55* **1,09**	*1,23* –	*0,83* **0,55**
Volume C m^3/tch	*0,53* **2,07**	*0,69* **1,93**	*1,28* **0,61**	*2,39* –	*0,44* **2,24**	*0,66* **1,48**		*0,55* **2,17**	– **2,45**	*1,10* **1,10**
Centrifugals		***								
Batch: A mcte. D^3 H/tch ‡	97,1	47,2 102,3	64,0	41,7	61,2	53,9		53,7	49,4	47,8
Continuous: B mcte. W^2 V/tch §	224,5	165,2	151,3	191,3	164,2	155,1		151,3	116,0	144,3
C mcte. W^2 V/tch	208,2	330,3	181,6	383,8	361,2	304,1		397,1	259,4	288,6
Steam and power generation										
Electricity ** kW/tch	79,0	51,9	24,4	60,0	36,5	45,5		25,8	27,8	44,4
Boilers: M.C.R. Tons steam/tch	0,97	1,05	0,66	0,66	0,87	0,84		0,74	0,82	1,04

Crystallizers: Italic figures denote air cooled. Bold figures denote water cooled.

† C - Cane diffuser, B - bagasse diffuser
‡ D - Basket diameter, H - Basket height
§ W - Speed of rotation, V - Volume of cone formed by basket
¶ Continuous pans
** Electricity generated by steam driven prime movers.
E - Conventional clarifiers, T - Trayless clarifiers
M - Average of milling tandems, d - Average diffusers
*** Continuous 'A' centrifugals.
° Excluding diffuser juice heaters

FOR RAW SUGAR PRODUCTION (Season 1983–1984)

MS A	MS B	GH A	GH B	NB	UC	GD	IL	SZ A	SZ B	UK	TOTALS & AVERAGES S.A. MILLS	MH A	MH B	UR	SM
121	221	259	193	228	188	180	175	164	150	185	183(M) 177(d)	185	228	227	284
85	84	199	93	103	101	68	121	100	91	93	95	94	81	100	95
0,24	1,51	0,42	1,31	1,32	0,61	1,00	0,39	0,37	0,34	0,96	0,87	0,44	0,97	0,96	1,61
(C)1,98	—	(C)2,45	—	—	(C)2,05	(B)1,98	(C)1,88	(C)2,22	(C)2,06	—	1,99(C)1,55(B)	(C)1,54	—	(C)0,76	—
7,2		7,1		7,8	9,9	5,3	5,2	8,7		7,1	7,6	4,7		6,5	5,2
(E)2,0		(T)0,9		(E)2,0	(E+T)2,3	(E)2,7	(E+T)2,0	(T)1,0		(E)2,4	2,8(E) 1,1(T)	(T)0,4		(E)2,7	(E)1,8
50,7		46,1		53,7	37,7	29,8	46,8	59,6		34,1	44,2	39,9		41,9	34,0
0,71		0,70		0,75	0,34	0,73	0,30	0,53		0,55	0,64	0,44		0,55	0,37
¶		¶					¶	¶						¶	
1,0	0,5	1,3	0,4	1,7	1,8	1,6	1,1	1,4	0,2	1,6	—	1,4		1,3	0,4	1,3
0,58	**0,33**	*2,49*	—	*1,94*	—	*1,28*	—	*2,22*	—	*1,60*	**0,59**	*0,45*	**1,77**	*0,69*	**0,76**	—	*1,43*	—	*1,27*	—	*0,81*	—
—	**0,33**	*1,67*	—	*1,43*	—	*1,12*	**0,47**	*1,84*	—	—	**1,66**	*0,40*	**1,88**	*0,69*	**0,76**	—	*1,18*	—	*1,58*	—	*0,27*	—
0,40	**1,66**	—	**1,50**	*1,25*	**1,25**	*1,55*	**1,41**	*1,59*	**0,33**	—	**2,18**	*0,32*	**1,58**	*0,45*	**1,34**	—	—	**2,03**	—	**2,03**	*0,54*	**1,59**
42,4		43,2		49,0	41,7	62,3	42,9	34,3		47,7	55,8	41,7		35,6	33,0
104,2		132,0		160,1	158,2	51,9	241,5	170,0		143,8	153,6	162,9		163,0	125,8
260,6		330,0		340,2	459,6	284,7	295,4	291,9		316,3	311,4	158,5		244,5	226,4
51,9		51,1		42,6	27,0	67,5	54,5	44,3		39,1	45,5	22,0		40,2	27,8
0,76		1,04		0,70	0,76	0,72	0,96	0,82		0,99	0,85	0,62		0,78	0,66