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SIXTY-SEVENTH REVIEW OF THE MILLING SEASON IN SOUTHERN AFRICA (1991-1992)

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Abstract

Performance and throughput data for South Africa, Swaziland, Malawi and Zimbabwe are presented and discussed. In South Africa the trends in sucrose % cane and mixed juice purity seem to have levelled around 13,0 and 86,4 respectively, but fibre % cane is still decreasing. Both cane and sugar tonnages show an increase for this season. Extraction has risen to 97,95 which is a record. Boiling house recovery (88,88) is the highest for the decade and corrected boiling house recovery (CRB) shows an increase, for the first time in four seasons. Severe processing difficulties, particularly in terms of viscosity, were experienced by three factories which crush Midlands cane. Sugar quality has been generally good except for colour. Some effects of diffusion on juice colour are presented.

The Cane Crop

*Weather and crop conditions**

After a dry winter in 1990, young plant and ratoon cane in the rainfed areas of the South African industry responded quickly to good rain at the end of August. There were prolonged spells of overcast, cool weather in December, and the good rainfall which was recorded between several spells of hot, dry weather up to February 1991 kept the crop alternating between temporary drought stress and periods of recovery, restricting the growth during this period.

Good rain and hot conditions in late February and March encouraged a late season spell of vigorous growth, and with ample water for irrigation in the northern areas, weather and crop conditions were very good for the use of ripeners on the standing crop.

April 1991 was a very dry month with only 20% of the long term mean rainfall being recorded. Subsequent growth in the rainfed cane was retarded and consequently natural ripening of the cane occurred, with drought stress developing in cane on shallow and sandy soils. It was cooler in May and reasonable rain caused the cane to green up again, with heavy rain recorded north of Felixton causing minor flooding and some damage. Little rain was recorded between June and the end of September and the crop on the south coast and in the midlands became drought stressed, although on the north coast and in Zululand it remained green but with minimal growth.

During October and November 1991 there was good rain in the midlands and on the coast south of Mtunzini. The cane in these areas greened up and was growing well at the end of November. North of Mtunzini there was less rain and it was poorly distributed.

The crop in the irrigated areas was not subjected to much drought stress but in September 1990 irrigation water was restricted at Pongola, and there were restrictions in all the northern areas during October and November, and again a year later in October and November 1991. These restrictions caused some stress in the cane in 1990, but it was much more severe in the eastern Transvaal in October and November 1991.

There was moderate flowering in the cane in the winter months of 1990 and the incidence of eldana recorded at the mills was low to very low throughout the industry, as much of the cane was harvested when less than 18 months of age. Smut and mosaic have been the subject of local Pest and Disease Control Committee attention and in some areas varieties prone to these diseases have been removed from the list of varieties which may be planted.

*Cane varieties***

In the rainfed areas the tonnage of N12 crushed during the season increased by 4,2% to 16,4% of the total cane crushed. In most mill areas the increase was slight, but at NB, UC and UK increases of over 7% were recorded. N12 accounts for more than 50% of the cane crushed at NB and UC where NCo376 has now fallen to below 10% of the crush. N12 is popular in these regions because it has a better sucrose content and better mosaic resistance than NCo376.

N14 remains the most popular variety crushed at South African mills in the northern irrigated areas, but there was a small decrease in the amount crushed at PG. At this mill, N14 accounted for 68,2% of the annual crush, compared to 77,5% for the previous season. The decrease in the quantity of N14 crushed at this mill was matched by a corresponding increase in the amount of N19 delivered. N19 has proved popular in this area on account of its relatively high sucrose content, freedom from flowering and ability to tolerate slightly poorer growing conditions than N14.

NCo376 remained the most popular variety in Swaziland, where chemical ripening of the variety is widely practiced. N14 appears to respond less satisfactorily to ripeners than NCo376. N19 has also shown a moderate increase in its contribution to the annual crush in that area.

*Cane transport****

Generally the type of vehicle and the mode of transport used to deliver the total sugarcane crop during the 1991/1992 season were similar to those of the previous season. Sixty-two percent of all cane was delivered to South African mills by large articulated trucks, 21% by tractor/trailer rigs, 9% by rigid trucks and 8% by rail/tram.

At individual mills there were some changes. There were substantial increases in 'short haul' tractor/trailer transport at mills such as DL, MS and specially ME where these units replaced the traditional truck/tractor/trailer combination. At UK rigid truck deliveries increased by more than 25% compared to the previous season. A significant shift from Hilo trucks to tri-axle trailer combinations took place at GH during the season. The percentage cane delivered by tractor/interlink trailer rigs has doubled at PG since the 1989/90 season with Hilo truck deliveries being reduced from nearly 50% to 17% during the same period.

A greater percentage of the total crop was delivered by tramline due to the larger crop harvested on the Umfolozi flats.

Cane quality

After marked improvements over the period 1987/1988 to 1989/1990, both sucrose % cane (13,04) and mixed juice purity (86,39) in South Africa appear to have levelled out around these values, although the long term trends show increases. Fibre % cane (14,93) is however still decreasing, being less than 15,0 for the first time since the present measurement systems were adopted. These trends are shown in Figure 1.

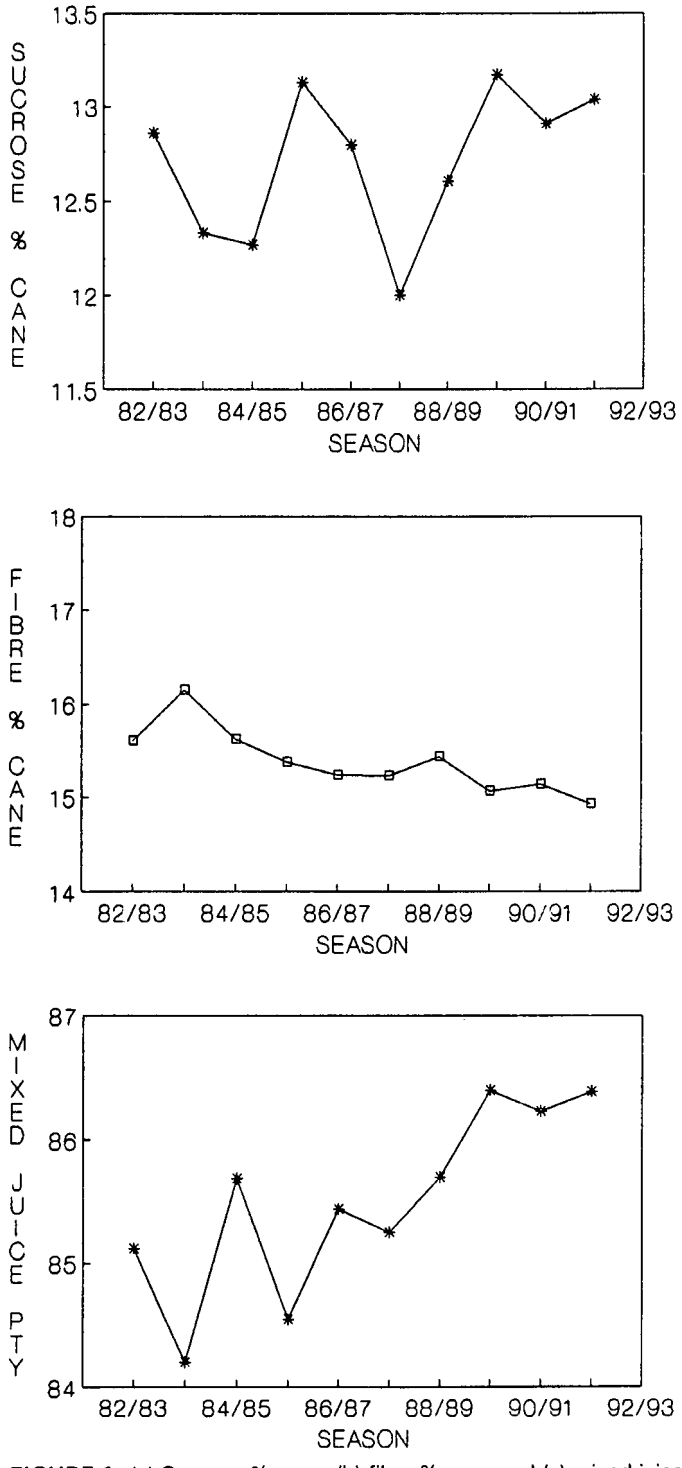


FIGURE 1 (a) Sucrose % cane, (b) fibre % cane and (c) mixed juice purity for the South African industry, over the last ten seasons.

In an attempt to look at cane quality in more detail, sucrose % cane, sucrose % dry matter in cane and sucrose/fibre ratios have been plotted against time, for the South African industry, in Figure 2. It is evident that the trends are similar. All the parameters show a levelling off over the last three seasons but the trends, from 1987/1988, are increasing.

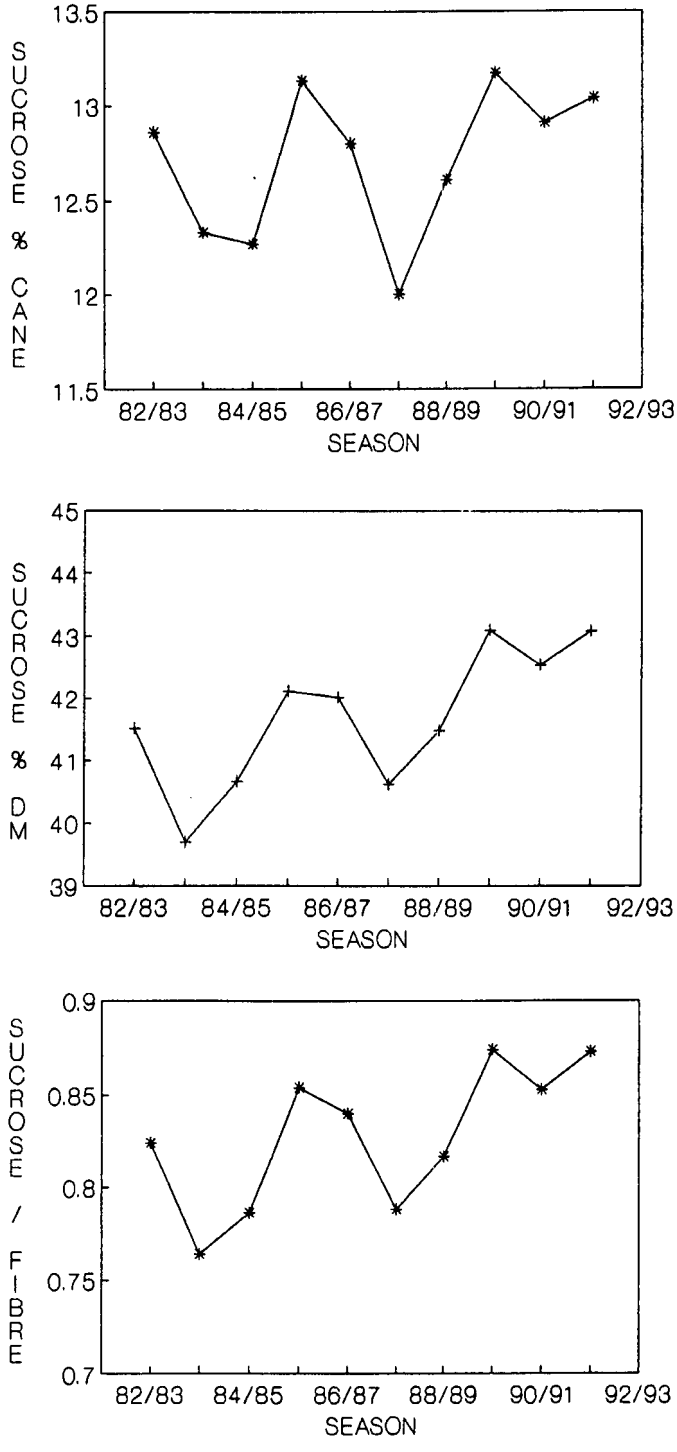


FIGURE 2 (a) Sucrose % cane, (b) sucrose % dry matter in cane and (c) sucrose/fibre for the South African industry over the last ten seasons.

The highest sucrose % cane values in South Africa were reported by IL (13,92) and UC (13,91). These two mills also showed the highest mixed juice purities (UC: 88,37; IL: 87,81). The lowest sucrose % cane values were at MS (12,61) and SZ (12,69).

The lowest fibre % cane was reported by UC (12,39) while SZ (16,11) and FX (16,04) reported the highest values.

Pol % cane can be used to compare the results obtained in Southern Africa. In South Africa pol % cane was 12,91, the best value being 13,79 at UC and IL. DW in Malawi reported the highest value (14,83), followed by HV in Zimbabwe (14,73) and MH in Swaziland (14,12).

DL, ME and MS reported improvements in cane quality with respect to the previous season. Some results are shown in Table 1.

Table 1

Improvements in cane quality at DL and ME

	DL		ME	
	1991/92	1990/91	1991/92	1990/91
Sucrose % cane	12,94	12,51	13,02	12,60
Fibre % cane	15,11	15,72	14,43	14,25
Mixed juice purity	86,93	86,11	86,93	85,40

The following reasons were given for the improvements.

- At DL the eldana borer counts were low. The levels of ethanol in cane have been used to monitor delays, ripeners have been used more extensively and the factory has had a good mechanical efficiency.
- Ethanol levels in cane have been used extensively at ME to monitor cane deterioration, and fresher cane was obtained. Eldana levels were also low at MS, ripeners were used more extensively and the percentage of burnt cane increased.

NB, IL and UC reported serious processing problems after the first spring rains (Koster *et al.*, 1992). There is no doubt that these problems were related to cane deterioration, caused by an unusually wet Spring. Monthly ethanol levels at IL and NB, expressed as ppm on brix in Direct Analysis of Cane (DAC) extracts, are shown in Table 2. These results show large increases in the ethanol content of the cane in October and November.

Table 2

Ethanol as ppm on brix in DAC samples at IL and NB

	August	September	October	November
IL	3 300	4 200	7 000	7 900
NB	5 250	6 250	8 000	7 500

Monthly sucrose % cane and mixed juice purity values, expressed as arithmetic averages for NB, IL and UC, have been plotted in Figure 3. The values for this season and for a five-season (1986/87 to 1990/1991) arithmetic average have been used.

It is clearly evident that sucrose % cane shows an unexpected drop in October. This value is in fact lower than the five-season average in contrast to all the other values for the season. If a smooth curve is drawn, it is found that the sucrose % cane for October is about 0,7 unit lower than expected. The changes in mixed juice purity are less striking. It is evident however that the values for September, October and November are very similar to those for the five-season average while they were above the average for most of the rest of the season.

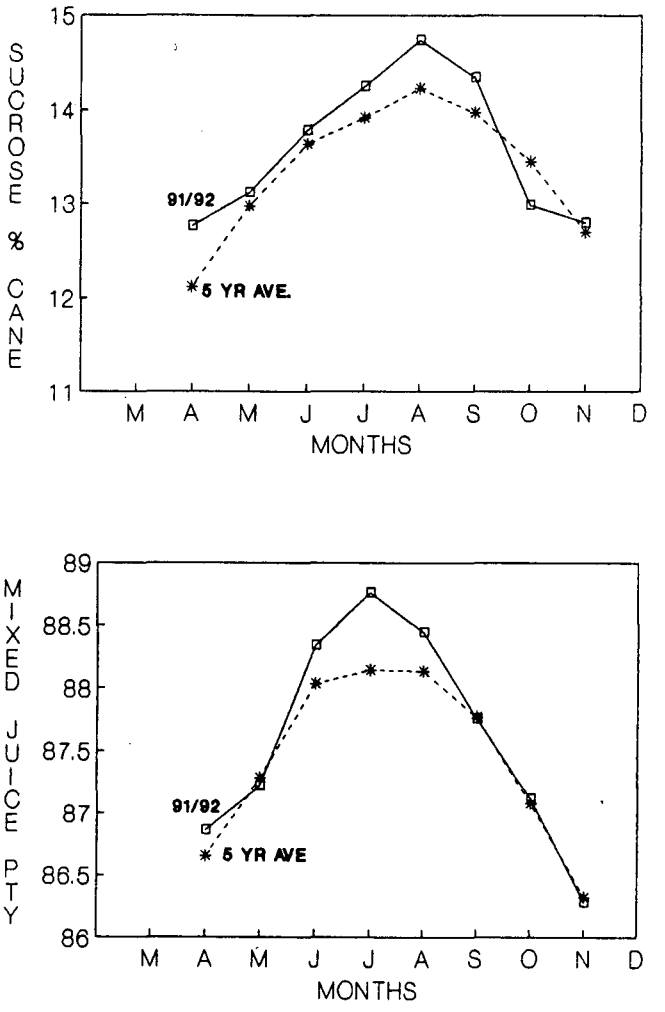


FIGURE 3 Monthly (a) sucrose % cane and (b) mixed juice purity for NB, UC and IL.

Other factories also reported cane quality problems after the first Spring rains, but none of these problems was of the magnitude found at IL, NB and UC.

This season saw the introduction of bonus systems on an industrial scale. These systems are based on selected cane quality parameters and allocate money to the growers whose cane meets the set targets. Such systems operated at DL, AK, FX and PG over the whole season, and at UK for half the season. The possibility of applying these systems is being investigated at other factories.

Mill performance

Throughputs and sugar production

The tonnages of cane crushed and sugar produced are shown in Table 3. In South Africa the tonnage of cane crushed shows an increase with respect to the last three seasons, with higher tonnages only in the 1987/1988 and 1984/1985 seasons. The sugar tonnage on the other hand is the second highest of the decade. Similarly the cane to sugar ratio (8,77) is the second best of the decade, with the best value (8,72) having been obtained in 1989/1990. Finally, the season's crushing rate (275,87 tch) is the highest of the decade. Thus in terms of throughputs and of sugar production this has been a good season. FX crushed a record 2 511 570 tons of cane which is just above the 1987/1988 tonnage, but their hourly throughput (551,1 tch) is much higher than that of the 1987/1988 season.

Table 3

Cane and sugar tonnages

	Tons cane	Tons sugar
South Africa	20 077 405	2 289 549
Zimbabwe	2 797 031	328 753
Swaziland	3 941 196	490 427
Malawi	1 668 497	191 121

Length of season and time efficiency

The season started at UC on 10 April 1991 and ended when ML stopped crushing on 9 February 1992. The overall length of the season was 300 days. The shortest and longest periods were 196 and 295 days at GD and ML, respectively.

The overall time efficiency was 81,1 for the South African factories, which is nearly identical to last season's value (81,2), showing that a high time efficiency was maintained. GH again reported a high value of 91,4. DW (91,7), TR (92,3) and particularly HV (95,9 and 92,3) reported some very high overall time efficiencies.

Extraction

Extraction has continued to increase in South Africa with a record value of 97,95 being reached for the season. The two best factories in Southern Africa are DW (98,79; pol based extraction) and AK (98,70). Some data concerning extraction are given in Table 4.

Table 4

Extraction data

	AK	DW	South Africa
Pol % cane	12,94	14,83	12,92
Imbibition % fibre	429	319	375
Fibre % cane	15,13	14,68	14,92
Extraction	98,70	98,79 (pol)	97,95

Except for DW the extractions in Table 4 are sucrose based and pol % cane has been used to allow comparison. The high pol at DW must have had an effect on their good performance. At AK the high extraction was attributed to the following:

- Attention to cane preparation, particularly shredder work. Preparation Index is considered to be an important measurement.
- Good control on the operations of the diffuser.
- Attention to the dewatering mills.

The low bagasse moisture (44,92) obtained at PG needs to be mentioned. This value contrasts with an industrial average of 51,18 and the highest value of 54,00, obtained on the diffuser at MS. The low bagasse moisture at PG was attributed to careful attention to trash plate settings and to chute level control. Another benefit was that PG used only one trash plate per mill for the whole season.

A new diffuser (250 tch), similar to those at SZ, was installed and commissioned at UK. The extraction (97,97), moisture % bagasse (53,43) and imbibition % fibre (426) show that its performance has been good.

UC installed an additional set of knives and the first set is now used as a leveller set.

Automatic control, based on the level of juice in the diffuser, has been used at FX and AK to direct the spray distribution in an optimum manner. Measurement of the juice level is not easy but the concept has been found to be a success.

A comparison of milling and diffusion in the South African industry is given in Table 5. Seventy-three percent of the cane in South Africa was processed by diffusion. The average sucrose percent of the cane supplied to the milling trains was 0,1 unit lower than that supplied to the diffusers, but fibre % at nearly 0,3 unit lower helped the milling extraction. Nevertheless, the diffusers achieved a higher extraction but with a higher imbibition % fibre.

Table 5

Mills versus diffusers - crushing season 91/92

	Milling trains		Diffusers	
	Tons	%	Tons	%
Cane and imbibition: IN				
Cane -	5 341 606		14 735 800	
Sucrose	693 047	12,97	1 925 953	13,07
Brix	810 637	15,18	2 267 222	15,39
Purity		85,49		84,95
Fibre	786 181	14,72	2 210 983	15,00
Imbibition -	2 403 415		8 520 712	
on fibre		306		385
Mixed juice and bagasse: OUT				
Mixed juice -	6 163 493		18 650 020	
Sucrose	677 353	10,99	1 887 940	10,12
Brix	778 951	12,64	2 190 404	11,74
Purity		86,96		86,19
Suspended solids	48 503	0,79	36 162	0,19
on cane		115,40		126,60
Bagasse -	1 581 528		4 606 492	
Pol	15 694	0,99	38 013	0,83
Brix	31 686	2,00	76 818	1,67
Fibre	737 678	46,64	2 174 821	47,21
on cane		29,61		31,26
Performance - Extraction		97,74		98,03

The purity of the mixed juice from the milling trains was 1,47 units higher than that of the input cane whereas for diffusion the increase was 1,24 units. The differences between these two values is small and would be partly explained by the higher initial purity of the cane to the mills and by the higher extraction level of the diffusers.

Clarification and filtration

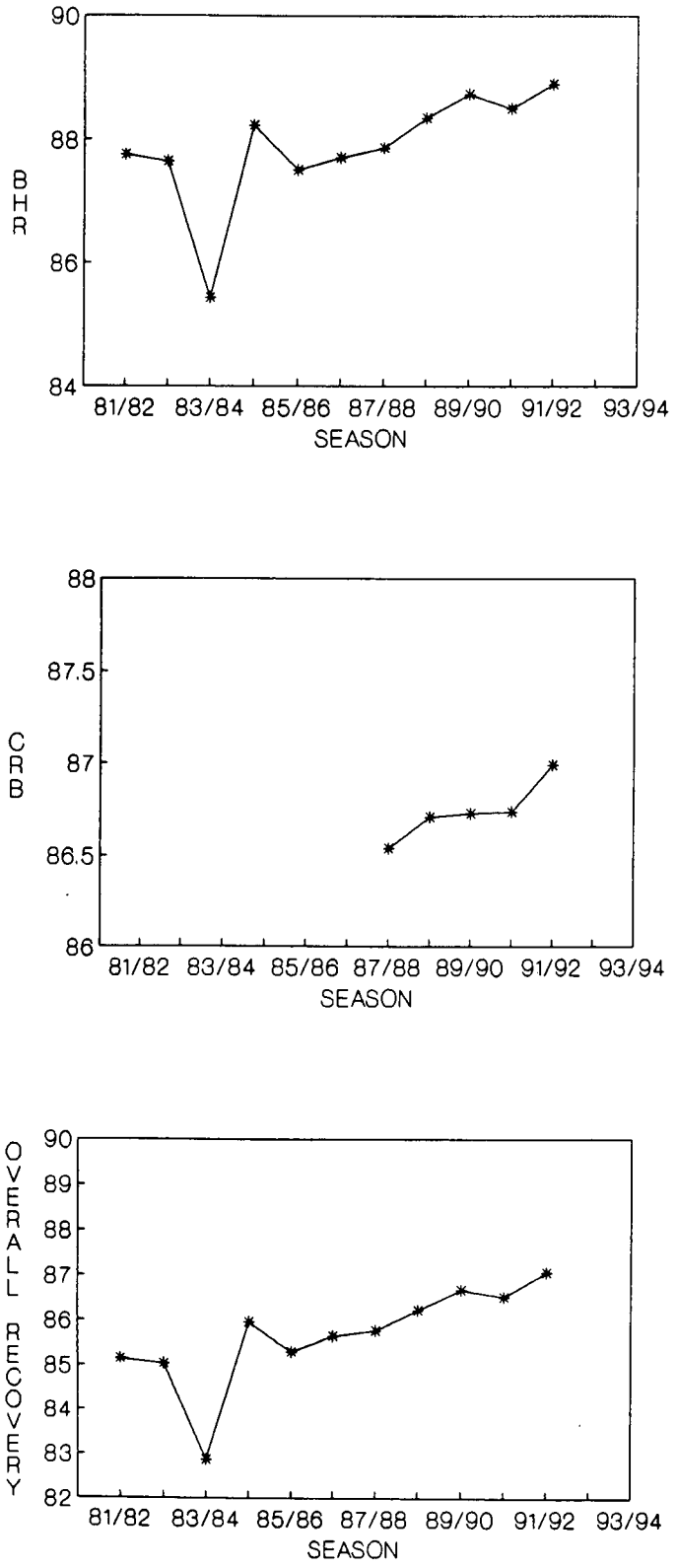
Clarification and filtration presented no serious problems during the season. IL reported difficulties in October due to low phosphate levels in juice, and phosphoric acid had to be added.

All mixed juice heating at UC is done using wide-gap plate heat exchangers, with automatic reverse flow facilities. Diffuser juice is screened at UC, using DSM screens. MS, where mill juice but not diffuser juice is screened, had severe choking problems with a wide gap plate heater and it had to be removed.

At GH 12 bagacillo louvre screens were replaced by two rotary feeders, blowing the bagacillo to a cyclone and into the mud mixer. This system has been found to be better than the previous one which was based on an induced draught. An added advantage is that the rotary valve is not needed.

Boiling house

Some boiling house performance parameters for the last 10 seasons are shown in Figure 4. The results in this figure show that the season's performance has been good. Boiling house recovery (88,88) is the highest of the decade, being 0,15 unit higher than the previous record. For the first time in the last four seasons, corrected boiling house recovery (CRB) has risen significantly (from 86,7 to 87,0) indicating that factory performance has improved, together with cane quality, to contribute to the higher recoveries.



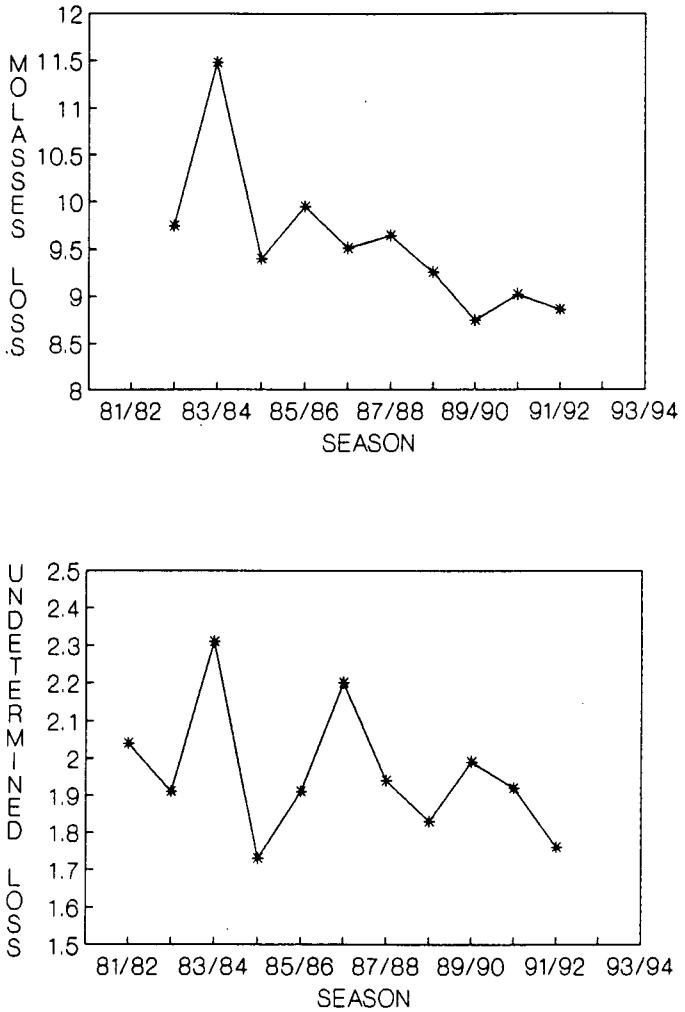


FIGURE 4 Boiling house performances, for the South African industry over the last ten seasons (a) boiling house recovery, (b) corrected boiling house recovery, (c) overall recovery, (d) molasses loss, (e) undetermined loss.

The long term trend in sucrose lost in molasses is definitely towards lower values, but the value has been relatively stable around 9,0 for the last three seasons. This season's loss (8,86) is the second lowest of the decade. Undetermined loss seems to oscillate around a value of 1,9. The decrease from 2,00 in 1989/1990 to 1,76 this season has contributed to the higher recoveries; here again this season's value is the second lowest of the decade. Filter cake loss has been stable around 0,27 over the last five seasons.

The highest boiling house recoveries were IL (90,59), AK (90,41), UC (89,90), UK and DL (89,71). AK (88,45) and FX (88,04) showed the highest CRB values. In terms of undetermined loss UK (0,94), GD (1,14) and IL (1,23) showed the lowest values.

Severe boiling house problems were experienced at a number of factories after the first Spring rains. In most cases extremely high viscosities caused crystallisation and centrifuging problems. At NB where the problems were the worst ever encountered, crystal deformation and reduced crystallisation rates occurred from mid-September to mid-October and this was followed by extremely high viscosities. Viscosity problems were also experienced at IL and UC. Target purity difference (TPD) is a sensitive measure of back-end performance and the arithmetic average of the weekly TPD values for NB, UC and IL, together with the industrial weekly average, are plotted in Figure 5.

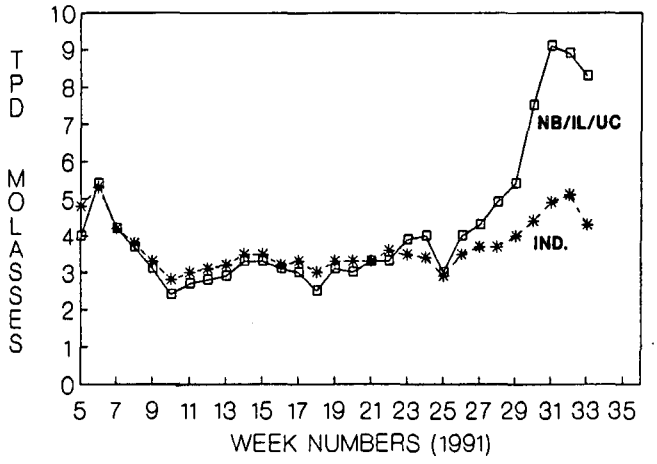


FIGURE 5 Weekly target purity differences for NB, UC and IL.

It is evident that from May to September the average of NB, UC and IL is in fact lower than the industrial average. As from mid-September, however, the performance at the three factories deteriorated significantly with the average reaching a value of nine in early November, against an industrial average of five. There is strong evidence (Koster *et al.*, 1992) that these problems were caused by extremely high viscosities which in turn were caused by severe cane deterioration.

Boiling house difficulties were also experienced at AK, ME and SZ. At AK boiling times for C-massecuite were about twice the usual values for a three to four day period after the Spring rains. The problem disappeared after all the deteriorated cane had been crushed and fresh cane became available again. At ME sudden and severe viscosity problems were encountered, particularly with C-massecuite, during the last two weeks of the season. Sodium hydrosulphite (blankite) was used in the C-pans and crystallisers. This chemical was also used at IL (400 ppm on C-massecuite).

As far as plant is concerned, two new Broadbent centrifugals were installed on C-massecuite at MS. An experimental BMA (K1301) was also tested. On 20 April 1991 pan 7 (C-massecuite; 28 m^3) at IL imploded after steaming out and raising vacuum. It is believed that there were weak points at a welded joint. The pan was totally destroyed but fortunately there were no injuries. A continuous pan, of the Tongaat-Hulett design of 110 m^3 capacity, was installed at ML on C-massecuite.

Sugar quality

The average pol of all sugar produced in South Africa was 99,59. Malawi reported 99,58, Swaziland 98,90 and Zimbabwe 99,09. The average quality of the South African sugar supplied to the terminal and to Hulett Refineries is shown in Table 6. Again, apart from an increase in the colour, there has been little change in the sugar quality over recent seasons.

Table 6

Average analysis of sugar supplied to the terminal and to Hulett Refineries

	Terminal	Refinery
Pol %	99,44	99,45
Colour (ICUMSA)	1 473	1 246
Moisture %	0,11	0,13
Starch (ppm)	110	106
Ash %	0,15	0,15
Fines %	28	-

Cane variety, month of harvest and the different constituents of the cane, particularly tops and trash, have been found to have significant effects on colour (Lionnet, 1992). Recent work at the Sugar Milling Research Institute has looked at the difference between milling and diffusion. Some results are given in Table 7.

Table 7

Colour in DAC extracts and in mixed juice from milling and from diffusion

Extraction plant	Colour		Percent difference	Remarks
	DAC	Mixed Juice		
GH Mills	22 110	19 150	−5	Averages over 10 days
Diffuser	20 850	24 360	+14	
SZ Diffuser	23 890	24 730	+3	Averages over 7 weeks
NB Mills	17 425	15 960	−9	Averages over 6 weeks
GH Mills	25 240	26 860	+6	Averages over 1 week
Diffuser	24 110	31 810	+24	

These results indicate that diffusers produce juices which are always higher in colour than the corresponding DAC extracts. Milling tandems on the other hand yield juice colours which are similar to or lower than the DAC extract colour.

Large samples of mixed juice from the GH milling tandem and diffuser were clarified, evaporated to syrup and boiled to yield A-massecuites in the pilot plants at the Institute. The colours obtained are shown in Table 8. These results indicate that the higher colour of the diffuser juice persists throughout the process. There are indications that the colour found in the diffuser juice has a higher than average affinity for the crystal since the 20% average difference in the juices and syrup increases to 30% in the crystal. These comments are based on a small number of measurements. Much work is required in this area to investigate these effects more fully.

Table 8

Colour from mixed juice samples treated at the SMRI

	MJ	CJ	Syrup	Affinated A-sugar
Mills	26 860	25 370	20 730	354
Diffuser	31 810	29 920	25 170	468
% difference	+18	+18	+21	+32

Refining

The percentage of sugar refined by the six back-end refineries (33,6) is very close to that of last season (33,7).

At GH two refinery pans were automated and all the refinery pans have stirrers. A new packaging machine was also commissioned. NB again refined raw sugar from UC. At HR all the pans have stirrers and this has been found to reduce the colour formed during boiling. The HR pans have ribbon calandrias and high temperature steam is needed. These pans required a special design of stirrer because of the ribbon calandria. HR also reported that the quality of its feed raw sugar, in terms of colour and impurity, was variable this season. Filtration problems were encountered.

The possibility of using hydrogen peroxide as a decolourising agent in refining is being investigated (Moodley, 1992). Although more work needs to be done, it appears that this chemical could be useful.

Acknowledgements

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TABLE B1
CANE CRUSHED AND SUGAR MADE, CANE COMPOSITION, SOUTH AFRICAN MILLS

SYMBOLS OF FACTORIES	ML *	PG *	UF *	EN **	FX-A *	FX-B *	FX-AVE	AK *	DL	MS-A *	MS-B
TONS SUGAR MADE AND ESTIMATED	227394	117023	144390	24516	-	-	281665	196544	168519	-	-
Refined % total sugar	99.46	100.00	83.70	62.83	-	-	-	-	-	-	-
Moisture all sugar	0.02	0.08	0.08	0.09	-	-	0.10	0.10	0.10	-	-
Pol all sugar	99.93	99.93	99.79	99.46	-	-	99.44	99.52	99.45	-	-
Tons cane crushed total							2511019				
Tons cane crushed per tandem	1991587	1018957	1262862	214282	1230084	1280935		1679825	1475950	965192	763435
Season started on	15.04.91	16.04.91	10.04.91	25.04.91			02.05.91	02.05.91	25.04.91		
Season completed on	04.02.92	23.12.91	18.12.91	08.12.91			15.12.91	16.12.91	14.12.91		
Number of crushing days	295	251	252	227			227	228	233		
TIME ACCOUNT											
Overal time efficiency %	79.07	85.60	76.00	56.18	81.99	85.00	83.50	85.51	84.49	86.27	79.90
Sched.stops% gross avail.time	6.58	7.13	6.76	10.28	8.02	7.12	7.57	8.70	7.98	4.24	3.92
Lack of cane % gross " "	2.69	2.14	2.68	20.89	5.42	3.32	4.37	4.20	4.33	2.48	9.16
Other stops % gross " "	11.66	5.13	14.57	12.65	4.57	4.56	4.56	1.59	3.20	7.01	7.01
Lost time % avail.crush.time	12.85	5.65	16.09	18.38	5.28	5.09	5.18	1.83	3.65	7.51	8.07
THROUGHPUTS PER CRUSHING HOUR											
Tons cane	354.55	198.28	280.36	70.09	274.94	276.16	551.10	358.44	311.77	203.93	179.36
Tons fibre	50.20	27.70	35.76	10.21	43.90	43.60	87.50	53.71	44.34	29.70	25.26
Tons brix in mixed juice	54.66	29.78	41.73	10.39	40.09	40.28	80.37	53.18	45.39	29.32	25.69
Tons sucrose in mixed juice	46.75	25.63	36.20	9.11	-	-	68.97	46.16	39.46	-	-
Tons non-suc. in mixed juice	7.90	4.15	5.53	1.28	-	-	11.41	7.02	5.93	-	-
Tons of sugar produced	40.48	22.77	32.05	8.02	-	-	61.82	41.94	35.60	-	-
COMPOSITION OF CANE CRUSHED											
Sucrose % cane	13.51	13.16	13.28	13.31	12.72	12.74	12.73	13.05	12.94	12.54	12.69
Pol % cane	13.36	13.03	13.15	13.23	12.63	12.65	12.64	12.94	12.80	12.41	12.51
Fibre % cane	14.32	14.09	13.59	15.36	16.14	15.95	16.04	15.13	15.11	14.79	14.90
Brix % cane	16.03	15.46	15.56	15.46	15.11	15.10	15.11	15.22	15.15	14.79	14.84
Ash % cane	1.49	-	1.60	1.70	1.87	1.83	1.85	1.24	0.91	1.40	1.31
ERC % cane	11.71	11.47	11.61	11.68	10.97	11.00	10.99	11.42	11.29	10.89	11.08
ERC % sucrose in cane	86.64	87.19	87.45	87.77	86.20	86.35	86.28	87.48	87.25	86.80	87.31
EXTRACTION											
Extraction (sucrose based)	97.57	98.25	97.24	97.67	98.26	98.31	98.28	98.70	97.82	98.36	97.99
Corrected reduced extraction	97.24	98.01	96.52	97.48	98.34	98.37	98.36	98.64	97.62	98.28	97.81
Imbibition % cane	52.64	54.25	53.54	57.91	54.80	53.36	54.06	64.22	46.99	52.62	54.95
Imbibition % fibre	372	388	420	397	343	338	341	429	330	361	390
Preparation index	92	90	90	94	92	92	92	93	93	91	91
Pol factor	99.06	98.88	99.21	99.25	99.40	99.33	99.36	99.21	99.67	99.52	100.10
Brix factor	100.54	100.15	100.77	100.21	101.96	101.76	101.86	100.32	100.38	100.51	100.64
RECOVERIES											
Boiling house recovery (sucr.)	86.53	88.79	88.36	87.52	-	-	89.14	90.41	89.71	-	-
C. R. B.	85.26	87.71	87.12	84.81	-	-	88.04	88.45	87.01	-	-
Overall recovery (sucr.)	84.[illegible]	87.23	85.91	85.48	-	-	87.61	89.24	87.76	-	-
Ton cane per ton sugar	8.76	8.71	8.75	8.74	-	-	8.91	8.55	8.76	-	-
Ton cane per ton 96 sugar	8.41	8.36	8.40	8.39	-	-	8.56	8.20	8.41	-	-
BALANCES											
Suc. lost % suc.in cane											
- lost in bagasse (a)	2.43	1.75	2.76	2.33	-	-	1.72	1.30	2.18	-	-
- lost in filter cake (b)	0.58	0.09	0.40	0.76	-	-	0.25	0.08	0.28	-	-
- lost in final molasses (c)	9.51	8.84	9.54	8.12	-	-	8.76	7.99	8.22	-	-
- undetermined losses (d)	3.06	2.08	1.37	3.31	-	-	1.67	1.40	1.56	-	-
Boiling house losses(b+c+d)	13.15	11.01	11.32	12.19	-	-	10.68	9.46	10.07	-	-
Sum of all losses(a+b+c+d)	15.58	12.77	14.09	14.52	-	-	12.39	10.76	12.24	-	-
Non sucrose ratio	1.06	0.99	0.96	0.97	-	-	0.96	0.93	1.01	-	-
Fructose ratio FR/MJ	0.90	0.87	0.80	0.75	-	-	0.92	0.90	0.86	-	-
Glucose ratio FR/MJ	0.73	0.59	0.57	0.64	-	-	0.72	0.70	0.64	-	-

* Cane diffuser
** Bagasse diffuser

THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCES AND LOSSES (Season 1991-1992)

MS-AVE	ME	GD **	GH-A *	GH-B	GH-AVE	NB	UC *	IL *	SZ-A *	SZ-B *	SZ-AVE	UK *	INDUSTRY
192278	96764	36033	-	-	147064	151381	68711	120853	-	-	205607	110750	2289492
-	-	-	-	-	93.82	100.00	-	-	-	-	-	-	33.58
0.16	0.17	0.11	-	-	0.03	0.02	0.11	0.10	-	-	0.10	0.11	0.09
99.37	99.10	99.42	-	-	99.90	99.92	99.49	99.51	-	-	99.43	99.44	99.59
1728627	850526	326014	391169	935028	1326197	1316667	560325	968010	914114	949297	1863411	983147	20077406
24.04.91	02.05.91	27.05.91			02.05.91	25.04.91	15.04.91	17.04.91			18.04.91	22.04.91	10.04.91
09.12.91	19.12.91	09.12.91			09.12.91	28.11.91	17.11.91	11.12.91			20.12.91	21.12.91	04.02.92
229	231	196			221	217	216	238			246	243	300
83.14	72.48	84.34	88.69	91.42	90.06	84.18	81.61	88.21	85.08	86.17	85.63	78.64	81.10
4.08	15.23	5.04	6.50	5.78	6.14	6.72	4.71	3.05	5.44	5.89	5.66	9.50	7.21
5.77	8.23	4.50	1.68	1.29	1.48	2.42	5.77	4.80	5.92	2.14	4.03	2.21	4.96
7.01	4.06	6.12	3.12	1.51	2.31	6.67	7.91	3.95	3.55	5.80	4.68	9.65	6.73
7.78	5.30	6.76	3.40	1.63	2.50	7.35	8.83	4.28	4.01	6.31	5.18	10.93	7.66
383.29	211.55	82.07	84.18	193.31	277.49	301.83	132.20	192.36	183.16	186.60	369.76	214.62	275.87
54.96	28.90	11.76	13.12	28.04	41.16	38.61	16.11	28.64	29.11	29.84	58.95	32.75	40.02
55.01	30.92	12.01	12.19	27.82	40.01	44.89	20.30	30.04	26.88	27.20	54.08	31.06	40.80
47.62	26.88	10.30	-	-	34.96	39.10	17.94	26.38	-	-	45.97	26.80	35.25
7.54	4.04	1.70	-	-	5.32	5.78	2.36	3.66	-	-	8.11	4.27	5.55
42.78	24.07	9.07	-	-	31.01	34.70	16.21	24.02	-	-	40.80	24.18	31.46
12.61	13.02	12.94	12.73	12.72	12.72	13.33	13.91	13.92	12.75	12.64	12.69	12.75	13.04
12.45	12.85	12.83	12.64	12.60	12.61	13.14	13.79	13.79	12.62	12.51	12.57	12.61	12.91
14.84	14.43	14.57	15.71	15.32	15.43	13.93	12.39	15.09	16.06	16.16	16.11	15.60	14.93
14.81	15.23	15.34	14.96	14.84	14.88	15.60	15.89	16.03	15.21	15.12	15.16	15.02	15.33
1.36	1.41	-	1.93	1.87	1.89	1.76	1.01	2.17	1.23	1.25	1.24	1.52	1.51
10.97	11.38	11.20	11.06	11.12	11.10	11.66	12.41	12.30	10.96	10.83	10.89	11.05	11.36
87.03	87.38	86.56	86.88	87.40	87.25	87.47	89.21	88.40	85.93	85.74	85.83	86.73	87.06
98.20	97.60	97.02	98.15	98.28	98.24	97.21	97.54	98.53	97.94	97.94	97.94	97.97	97.95
98.07	97.24	96.75	98.19	98.18	98.18	96.51	96.62	98.39	98.03	98.05	98.04	97.96	97.79
53.65	40.96	46.51	59.52	49.25	52.28	36.56	44.12	71.33	64.59	65.67	65.14	65.02	54.41
374	300	325	382	340	353	286	362	479	406	411	409	426	375
91	92	89	89	89	89	90	91	92	-	-	-	90	91
99.77	99.55	99.53	99.84	99.52	99.62	99.65	99.83	99.91	99.84	99.89	99.86	99.57	99.48
100.57	99.86	100.41	100.65	99.86	100.09	100.79	101.24	100.48	101.04	101.31	101.18	100.39	100.69
89.26	88.72	87.51	-	-	88.62	88.67	89.90	90.59	-	-	88.25	89.71	88.88
87.22	85.58	86.05	-	-	87.06	85.85	85.78	87.10	-	-	87.28	87.55	86.99
87.65	86.59	84.91	-	-	87.06	86.20	87.69	89.25	-	-	86.44	87.89	87.06
8.99	8.79	9.05	-	-	9.02	8.70	8.15	8.01	-	-	9.06	8.88	8.77
8.63	8.44	8.69	-	-	8.66	8.35	7.83	7.69	-	-	8.70	8.52	8.42
1.80	2.40	2.98	-	-	1.76	2.79	2.46	1.47	-	-	2.06	2.03	2.05
0.28	0.35	0.18	-	-	0.29	0.58	0.12	0.05	-	-	0.05	0.08	0.27
8.84	8.25	10.80	-	-	8.88	8.84	7.73	7.98	-	-	9.94	9.07	8.86
1.43	2.41	1.14	-	-	2.01	1.59	2.00	1.23	-	-	1.51	0.94	1.76
10.55	11.01	12.11	-	-	11.18	11.01	9.85	9.27	-	-	11.51	10.08	10.89
12.35	13.41	15.09	-	-	12.94	13.80	12.31	10.75	-	-	13.56	12.11	12.94
1.00	0.97	1.02	-	-	0.99	1.00	1.02	0.99	-	-	1.00	0.99	0.99
0.89	0.85	0.94	-	-	0.86	0.89	0.85	0.84	-	-	0.98	0.87	0.89
0.71	0.68	0.68	-	-	0.63	0.66	0.39	0.61	-	-	0.74	0.66	0.67

TABLE C1
ANALYSIS OF BAGASSE, JUICES, FILTER SOUTH AFRICAN MILLS

SYMBOLS OF FACTORIES	ML *	PG *	UF *	EN **	FX-A *	FX-B *	FX-AVE	AK *	DL	MS-A *	MS-B
FINAL BAGASSE											
Pol % bagasse	1.05	0.88	1.28	1.01	0.65	0.63	0.64	0.55	0.91	0.63	0.83
Moisture % bagasse	52.66	44.92	53.14	50.68	51.77	51.97	51.87	49.98	52.19	54.00	52.44
Fibre % bagasse	45.36	53.39	44.50	47.28	46.69	46.51	46.60	48.77	45.91	44.74	45.87
Bagasse % cane	31.21	26.17	28.67	30.82	34.20	33.94	34.07	30.72	30.97	32.56	30.70
Ash % bagasse	1.49	0.00	3.21	3.54	-	-	4.28	2.81	2.70	-	-
LCV in kJ per kg bagasse ##	7022	0	6573	7031	-	-	6654	7344	6886	-	-
MIXED JUICE											
Mixed juice % cane	121.42	128.08	124.87	127.09	120.60	119.41	119.99	133.49	116.02	120.06	124.25
Brix % mixed juice	12.70	11.72	11.92	11.67	12.09	12.21	12.15	11.11	12.55	11.98	11.53
Sucrose purity	85.54	86.07	86.74	87.69	85.74	85.87	85.81	86.80	86.93	85.82	86.85
Apparent purity	84.50	85.21	85.86	87.11	85.06	85.23	85.15	86.05	86.01	84.90	85.54
Purity difference(MJ - DAC)	-0.04	-0.13	0.04	0.71	-0.65	-0.57	-0.61	0.10	0.88	0.13	0.83
(Gluc. + fruct.)/sucr. ratio	6.45	5.08	4.34	3.58	-	0.00	4.47	4.03	4.64	-	-
Suspended solids % mixed juice	0.13	0.09	0.67	0.62	0.14	0.13	0.14	0.11	0.77	0.19	0.66
Pol/sucrose ratio	0.9879	0.9900	0.9899	0.9934	0.9921	0.9926	0.9923	0.9913	0.9894	0.9893	0.9849
CLARIFIED JUICE											
Brix % clarified juice	12.76	11.67	12.01	11.89	-	-	12.17	10.88	12.37	-	-
Apparent purity	84.87	84.98	85.60	86.33	-	-	84.78	85.88	86.34	-	-
Purity difference(CJ - MJ)	0.37	-0.23	-0.26	-0.78	-	-	-0.37	-0.17	0.33	-	-
Average pH	7.1	7.0	7.0	7.6	-	-	7.0	7.1	7.0	-	-
FILTER CAKE											
Pol % filter cake	3.40	0.44	1.11	2.30	-	-	1.28	0.99	0.71	-	-
Moisture % filter cake	74.84	74.94	70.60	75.51	-	-	73.08	76.95	74.63	-	-
Filter cake % cane	2.31	2.75	4.84	4.38	-	-	2.50	1.04	5.05	-	-
Filter wash index	99.5	100.5	99.3	98.1	-	-	99.9	102.2	101.5	-	-
Purity diff.(CJ - filtrate)	2.45	1.47	5.16	0.07	-	-	1.20	1.60	1.69	-	-
SYRUP											
Brix % syrup	68.11	59.36	61.58	62.80	-	-	63.36	66.22	64.91	-	-
Apparent purity	84.39	84.37	85.91	86.91	-	-	85.23	86.37	86.59	-	-
Purity difference(Syrup - MJ)	-0.11	-0.84	0.05	-0.20	-	-	0.08	0.32	0.58	-	-
Average pH	6.2	6.2	6.4	6.9	-	-	6.0	6.1	6.2	-	-
FINAL MOLASSES											
Refracto brix	86.39	81.18	79.98	82.27	-	-	82.77	84.92	83.47	-	-
Pol/refracto brix purity	32.26	32.10	36.87	37.93	-	-	33.52	34.06	32.79	-	-
Suc/refracto brix purity	35.37	35.96	40.16	38.67	-	-	36.44	37.01	36.17	-	-
Sulphated ash %	14.67	14.65	15.62	15.26	-	-	15.27	16.07	15.01	-	-
(Gluc. + fruct.)/ash ratio	1.12	0.82	0.62	0.63	-	-	0.82	0.78	0.84	-	-
Fructose %	8.53	7.03	5.84	5.36	-	-	7.11	7.26	7.39	-	-
Glucose %	7.88	4.94	3.89	4.24	-	-	5.34	5.32	5.19	-	-
TPD based on molasses	4.4	3.2	4.9	5.2	-	-	2.8	2.7	3.4	-	-
TPD based on mixed juice	6.0	5.3	6.9	7.6	-	-	3.7	4.0	5.4	-	-
Final mol at 85 brix % cane	4.27	3.81	3.71	3.29	-	-	3.60	3.31	3.46	-	-
Pol/sucrose ratio	0.9121	0.8927	0.9182	0.9809	-	-	0.9198	0.9203	0.9066	-	-

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

CAKE, SYRUP AND FINAL MOLASSES (Season 1991-1992)

MS-AVE	ME	GD **	GH-A *	GH-B	GH-AVE	NB	UC *	IL *	SZ-A *	SZ-B *	SZ-AVE	UK *	INDUSTRY
0.72	1.10	1.23	0.73	0.76	0.75	1.29	1.28	0.68	0.81	0.81	0.81	0.76	0.87
53.33	49.89	52.16	50.23	48.26	48.89	52.83	52.49	49.38	49.22	48.28	48.74	53.43	51.18
45.22	47.95	45.58	48.26	50.19	49.58	44.63	45.51	49.27	49.11	50.04	49.58	44.95	47.07
31.74	28.50	31.44	32.30	28.90	29.90	28.66	26.77	30.22	32.36	31.96	32.16	33.95	30.82
3.45	0.00	0.00	3.62	-	-	3.74	2.51	5.53	-	-	2.95	3.05	3.53
6516	0	0	7403	-	-	6530	6858	6932	-	-	7559	6569	7197
121.91	112.47	115.07	127.22	120.35	122.38	107.90	117.35	141.11	132.23	133.71	132.98	131.07	123.59
11.77	13.00	12.72	11.38	11.96	11.78	13.78	13.09	11.07	11.10	10.90	11.00	11.04	11.97
86.27	86.93	85.80	86.31	86.88	86.71	87.12	88.37	87.81	85.11	84.91	85.01	86.27	86.39
85.18	85.77	85.01	85.66	86.00	85.90	85.89	87.57	87.01	84.25	84.05	84.15	85.36	85.50
0.44	1.17	0.68	0.53	0.84	0.75	0.68	-0.42	0.45	0.26	0.10	0.18	0.72	0.25
4.95	4.97	4.83	-	-	4.59	4.97	3.91	4.00	-	-	5.11	4.71	4.80
0.40	0.68	0.21	0.10	0.68	0.50	1.05	0.17	0.15	0.12	0.12	0.12	0.26	0.34
0.9874	0.9866	0.9908	0.9925	0.9899	0.9907	0.9859	0.9910	0.9908	0.9899	0.9899	0.9899	0.9895	0.9896
11.19	12.28	11.81	-	-	11.48	13.10	13.65	10.98	-	-	10.53	10.78	11.79
84.96	86.23	85.40	-	-	85.45	86.39	86.70	86.60	-	-	84.33	84.89	85.42
-0.22	0.46	0.39	-	-	-0.45	0.50	-0.87	-0.41	-	-	0.18	-0.47	-0.08
7.1	7.1	7.1	-	-	7.1	7.5	7.0	7.1	-	-	7.1	6.9	7.0
0.90	0.84	1.10	-	-	1.01	1.37	1.09	0.71	-	-	0.74	0.92	1.20
73.72	75.37	-	-	-	75.47	73.37	74.54	75.12	-	-	77.78	78.01	74.18
3.99	5.46	2.09	-	-	3.61	5.67	1.50	1.07	-	-	0.92	1.06	2.94
105.2	105.8	107.7	-	-	102.6	105.2	95.9	100.8	-	-	104.4	102.4	101.5
1.92	1.56	2.54	-	-	1.20	1.02	2.56	1.30	-	-	0.62	1.64	1.73
66.66	66.56	58.33	-	-	63.55	69.92	67.36	62.34	-	-	60.47	68.37	64.60
85.63	87.07	85.75	-	-	85.61	86.41	87.06	86.63	-	-	84.58	85.57	85.64
0.45	1.30	0.74	-	-	-0.29	0.52	-0.51	-0.38	-	-	0.43	0.21	0.15
6.0	6.3	6.6	-	-	6.1	6.2	6.3	6.2	-	-	5.9	6.0	6.2
83.34	83.61	79.26	-	-	81.05	82.62	80.16	79.88	-	-	79.82	81.79	82.43
33.38	33.85	37.25	-	-	35.35	33.50	32.20	34.85	-	-	33.74	34.69	33.84
36.76	37.83	40.35	-	-	37.45	38.08	37.65	37.78	-	-	37.04	37.51	37.10
15.10	14.70	14.93	-	-	14.66	12.92	12.99	12.95	-	-	13.50	13.98	14.58
0.89	0.97	0.76	-	-	0.78	1.04	0.74	0.85	-	-	0.95	0.86	0.87
7.75	8.24	6.72	-	-	6.78	8.35	6.94	6.72	-	-	7.52	7.16	7.36
5.74	6.04	4.61	-	-	4.70	5.13	2.64	4.27	-	-	5.29	4.85	5.32
3.6	4.6	5.6	-	-	3.7	6.1	3.9	3.9	-	-	3.9	4.2	4.0
5.1	6.3	7.3	-	-	5.6	8.1	6.8	6.0	-	-	5.0	6.0	5.6
3.57	3.34	4.08	-	-	3.55	3.64	3.36	3.46	-	-	4.01	3.63	3.67
0.9081	0.8947	0.9230	-	-	0.9438	0.8799	0.8553	0.9224	-	-	0.9110	0.9247	0.9120

TABLE D1

MASSECUITES, EXHAUSTIONS, CLARIFYING AGENTS AND ADDITIONAL FUELS SOUTH AFRICAN MILLS (Season 1991–1992)

SYMBOLS OF FACTORIES	ML	PG	UF	EN	FX	AK	DL	MS	ME	GD	GH	NB	UC	IL	SZ	UK	INDUSTRY
A - MASSECUITE																	
m3 per ton brix in mixed juice	1.16	1.04	0.96	1.34	0.96	0.95	0.95	0.94	1.04	0.94	1.05	1.00	0.99	1.01	0.98	0.94	1.00
Ref brix of massecuite	92.73	92.84	91.75	92.92	92.89	92.70	93.37	92.89	91.67	93.00	92.33	92.74	93.08	93.35	93.25	92.27	92.75
Purity of massecuite	85.21	83.88	87.27	86.15	85.50	86.10	86.53	85.69	85.51	85.87	86.55	87.17	87.25	86.67	83.85	85.04	85.76
Purity of A - molasses	66.26	64.42	71.78	71.25	66.74	66.31	66.43	65.39	68.96	68.32	67.98	68.71	68.76	66.97	62.79	64.80	66.73
Purity drop	18.95	19.46	15.49	14.90	18.76	19.79	20.10	20.30	16.55	17.55	18.57	18.46	18.49	19.70	21.06	20.24	19.03
Exhaustion	65.91	65.20	62.90	60.16	65.97	68.22	69.20	68.45	62.35	64.51	67.01	67.68	67.84	68.82	67.50	67.62	66.69
Pty of A-mass - purity syrup	0.82	-0.49	1.36	-0.76	0.27	-0.27	-0.06	0.06	-1.56	0.12	0.94	0.76	0.19	0.04	-0.73	-0.53	0.11
Pty of remelt	85.29	80.30	87.26	86.23	84.68	85.99	85.47	84.16	84.76	86.53	81.92	85.18	86.57	84.94	81.20	84.85	84.48
B - MASSECUITE																	
m3 per ton brix in mixed juice	0.43	0.41	0.42	0.34	0.25	0.24	0.31	0.32	0.35	0.39	0.39	0.34	0.29	0.28	0.26	0.33	0.33
Ref brix of massecuite	95.10	94.38	94.12	94.46	94.60	94.77	94.79	93.96	92.69	94.04	93.93	93.64	96.51	94.20	94.17	93.25	94.31
Purity of massecuite	67.29	66.02	71.58	71.14	67.75	67.33	67.37	65.08	69.54	67.82	68.57	69.00	70.15	68.54	65.36	64.89	67.67
Purity of B - molasses	40.82	42.41	50.26	50.77	43.43	43.07	44.69	44.43	48.26	47.94	46.54	46.33	41.35	42.67	40.45	42.29	44.16
Purity drop	26.47	23.61	21.32	20.37	24.32	24.26	22.68	20.65	21.28	19.88	22.03	22.67	28.80	25.87	24.91	22.60	23.51
Exhaustion	66.47	62.10	59.88	58.16	63.46	63.29	60.87	57.10	59.14	56.31	60.10	61.22	70.00	65.84	64.00	60.35	62.21
C - MASSECUITE																	
m3 per ton brix in mixed juice	0.24	0.25	0.22	0.23	0.25	0.23	0.23	0.24	0.23	0.24	0.18	0.23	0.20	0.22	0.27	0.25	0.24
Ref brix of massecuite	97.07	96.81	96.63	97.03	96.77	96.46	96.64	96.84	95.88	95.80	96.23	96.54	98.00	97.14	96.29	95.61	96.61
Purity of massecuite	50.48	50.51	53.14	54.26	55.60	53.79	53.06	54.21	54.18	52.04	50.81	53.37	50.78	53.08	53.58	51.46	53.01
Purity of C - molasses	32.26	32.10	36.87	37.93	33.52	34.06	32.79	33.38	33.85	37.25	35.35	33.50	32.20	34.85	33.74	34.69	33.84
Crystal content	26.11	26.25	24.90	25.53	32.14	28.86	29.15	30.28	29.47	22.58	23.01	28.84	26.86	27.18	28.83	24.55	28.00
Exhaustion	53.29	53.68	48.49	48.49	59.74	55.62	56.84	57.68	56.73	45.30	47.07	55.98	53.97	52.72	55.88	49.91	54.68
TOTAL VOLUME ALL RAW MASSECUITES m3 per ton brix in mixed juice	1.83	1.70	1.60	1.91	1.47	1.42	1.48	1.49	1.62	1.56	1.62	1.57	1.48	1.51	1.52	1.52	1.56
WHITE SUGAR MASSECUITES Kg sugar per m3 massecuite	523	629	748	666	-	-	-	-	-	-	649	571	-	-	-	-	600
Tons limestone per 1000 tons white sugar	-	51.9	-	-	-	-	-	-	-	-	34.7	-	-	-	-	-	14.1
Tons coke/1000 tons white sugar	-	5.6	-	-	-	-	-	-	-	-	4.2	-	-	-	-	-	-
Tons phos acid/1000 tons white sugar	-	-	-	0.56	-	-	-	-	-	-	-	1.29	-	-	-	-	-
Tons sulphur/1000 tons white sugar	0.07	0.08	0.01	-	-	-	-	-	-	-	0.10	-	-	-	-	-	-
Phos. acid ppm mixed juice	-	-	-	-	-	-	-	-	-	-	-	3.5	59.3	3.8	5.2	-	-
Flocculant ppm mixed juice	0.9	2.5	6.6	3.0	4.4	1.9	3.7	2.1	2.9	9.9	3.0	4.9	3.5	5.6	3.0	1.4	3.3
Tons lime per 1000 tc	# 2.0	-	# 1.4	0.8	0.7	0.7	0.6	0.4	0.6	0.7	-	# 0.6	0.5	0.5	0.6	0.5	0.7
Enzyme ppm sugar	-	-	-	33.7	-	-	10.1	9.2	-	27.9	15.8	0.6	12.3	2.5	.3.2	6.9	4.5
ADDITIONAL FUELS PER 1000 TC																	
Tons of coal	* 30.99	5.62	16.33	* 6.71	* 8.87	1.02	-	* 21.41	0.05	11.94	-	-	5.77	0.44	-	2.51	-
Tons of wood	-	-	-	1.66	0.06	-	0.68	0.04	-	4.20	-	0.26	0.78	0.21	0.27	0.40	-
Converted into bagasse **	123.95	22.46	65.32	28.84	35.55	4.09	0.82	85.70	0.19	52.80	-	0.33	24.01	2.02	0.32	10.53	-

* 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
Includes lime used in refinery

TABLE B2

CANE CRUSHED AND SUGAR MADE, CANE COMPOSITION, THROUGHPUTS AND TIME ACCOUNTS, PERFORMANCES AND LOSSES SWAZILAND, MALAWI AND ZIMBABWE MILLS (Season 1991–1992)

SYMBOLS OF FACTORIES	MH-A	MH-B *	MH-AVE	UR-A *	UR-B	UR-AVE	SM	NH-A *	NH-B	NH-AVE	DW	HV-A *	HV-B *	HV-AVE	TR-A *	TR-B *	TR-AVE
TONS SUGAR MADE AND ESTIMATED	-	-	178302	-	-	153451	158674	-	-	109044	82077	-	-	192279	-	-	136474
Refined % total sugar	-	-	-	-	-	41.23	-	-	-	48.31	78.34	-	-	11.65	-	-	-
Moisture all sugar	-	-	0.22	-	-	0.22	0.28	-	-	0.08	0.06	-	-	0.19	-	-	-
Pol all sugar	-	-	98.74	-	-	99.33	98.66	-	-	99.45	99.76	-	-	98.84	-	-	99.44
Tons cane crushed total			1365962			1307923				1018479				1552943			1244088
Tons cane crushed per tandem	700326	665636		778495	529428		1267311	428363	590116		650018	801752	751191		931979	312109	
Season started on			29.04.91			22.04.91	4.04.91			2.04.91	8.05.91			23.04.91			9.04.91
Season completed on			1.12.91			11.12.91	1.11.91			6.12.91	12.11.91			17.10.91			11.10.91
Number of crushing days	-	-	216	-	-	233	211	-	-	248	188	-	-	177	-	-	185
TIME ACCOUNT																	
Overal time efficiency %	90.40	85.22	87.81	84.34	88.21	86.28	84.91	80.41	85.50	82.96	91.66	95.91	92.28	94.10	92.32	76.15	86.31
Sched.stops% gross avail.time	3.75	3.96	3.86	2.74	2.53	2.64	3.69	5.72	5.50	5.61	5.19	2.51	2.68	2.59	3.55	11.19	6.39
Lack of cane % gross " "	1.84	5.18	3.50	4.11	2.79	3.45	5.55	5.72	3.54	4.63	0.01	0.00	0.00	0.00	0.87	1.17	0.98
Other stops % gross " "	4.01	5.65	4.83	8.81	6.46	7.63	5.86	8.15	5.46	6.81	3.14	1.58	5.04	3.31	3.26	11.49	6.32
Lost time % avail.crush.time	4.25	6.22	5.21	9.45	6.83	8.13	6.45	9.21	6.01	7.58	3.31	1.62	5.18	3.40	3.41	13.11	6.82
THROUGHPUTS PER CRUSHING HOUR																	
Tons cane	146.87	148.88	295.75	166.68	108.38	275.06	294.89	89.50	115.90	205.40	157.01	201.10	196.17	397.27	227.79	156.44	384.23
Tons fibre	20.28	19.69	39.97	22.40	13.98	36.38	37.25	14.10	18.49	32.59	23.05	28.55	27.86	56.41	33.59	21.92	55.51
Tons brix in mixed juice	23.40	23.62	47.02	25.13	16.24	41.37	45.55	12.61	16.32	28.93	26.46	33.39	32.32	65.71	37.12	24.30	61.42
Tons pol in mixed juice	-	-	40.97	-	-	35.02	39.16	-	-	24.84	23.00	-	-	55.52	-	-	54.75
Tons non-pol. in mixed juice	-	-	6.04	-	-	6.17	6.39	-	-	4.19	3.45	-	-	10.20	-	-	10.43
Tons of sugar produced	-	-	38.60	-	-	32.12	36.92	-	-	22.08	19.83	-	-	49.20	-	-	44.85
COMPOSITION OF CANE CRUSHED																	
Pol % cane	14.07	14.17	14.12	13.20	13.05	13.14	13.62	12.42	12.40	12.41	14.83	14.37	14.28	14.33	13.89	13.32	13.75
Fibre % cane	13.95	14.00	13.97	13.82	13.79	13.81	13.39	16.22	16.62	16.45	14.68	14.41	14.42	14.42	15.14	14.50	14.98
Brix % cane	16.35	16.44	16.40	15.72	15.57	15.66	16.06	14.61	14.57	14.59	17.03	17.28	17.14	17.21	16.86	16.42	16.75
Ash % cane	-	-	-	-	-	-	1.13	-	-	-	-	0.60	-	0.31	-	-	-
ERC % cane	12.39	12.49	12.44	11.41	11.26	11.35	11.87	10.77	10.76	10.76	13.16	12.35	12.29	12.32	11.83	11.22	11.68
ERC % pol in cane	88.01	88.14	88.07	86.44	86.28	86.38	87.14	86.71	86.74	86.72	88.72	85.94	86.01	85.97	85.18	84.20	84.94
EXTRACTION																	
Extraction (pol based)	98.45	97.74	98.10	97.26	97.51	97.36	97.51	96.97	97.16	97.08	98.79	97.51	97.51	97.51	97.83	96.10	97.41
Corrected reduced extraction	98.14	97.16	97.67	96.75	96.94	96.82	96.78	97.12	97.35	97.26	98.61	97.07	97.08	97.08	97.61	95.57	97.13
Imbibition % cane	54.32	45.90	50.22	50.66	43.32	47.69	37.24	42.14	40.10	40.96	46.89	49.26	52.59	50.87	57.62	51.80	56.16
Imbibition % fibre	393	347	371	377	336	361	295	268	251	258	319	347	370	358	391	370	386
Preparation index	93	93	93	91	91	91	90	85	87	86	91	93	93	93	91	91	91
Pol factor	100.01	99.29	99.65	99.95	98.81	99.49	99.91	-	-	-	99.22	99.96	99.96	99.96	-	-	-
Brix factor	101.48	100.84	101.17	101.86	100.94	101.49	100.40	-	-	-	98.76	101.02	101.02	101.02	-	-	-
RECOVERIES																	
Boiling house recovery (pol)	-	-	93.02	-	-	91.09	93.01	-	-	88.39	85.97	-	-	87.58	-	-	81.45
Overall recovery (pol)	-	-	91.26	-	-	88.69	90.69	-	-	85.80	84.94	-	-	85.40	-	-	79.34
Ton cane per ton sugar	-	-	7.66	-	-	8.52	7.99	-	-	9.34	7.92	-	-	8.08	-	-	9.12
Ton cane per ton 96 sugar	-	-	7.35	-	-	8.18	7.67	-	-	8.97	7.60	-	-	7.75	-	-	8.75
BALANCES																	
Pol lost % pol in cane																	
- lost in begasse (a)	-	-	1.90	-	-	2.64	2.49	-	-	2.92	1.21	-	-	2.49	-	-	2.59
- lost in filter cake (b)	-	-	0.14	-	-	0.10	0.22	-	-	0.21	0.09	-	-	0.12	-	-	0.15
- lost in final molasses (c)	-	-	5.35	-	-	7.56	6.50	-	-	10.42	-	-	-	9.41	-	-	-
- undetermined losses (d)	-	-	1.35	-	-	1.02	0.10	-	-	0.64	-	-	-	2.58	-	-	-
Boiling house losses(b+c+d)	-	-	6.84	-	-	8.67	6.82	-	-	11.27	-	-	-	12.11	-	-	-
Sum of all losses(a+b+c+d)	-	-	8.74	-	-	11.31	9.31	-	-	14.20	-	-	-	14.60	-	-	-
Non pol ratio	-	-	1.00	-	-	0.94	0.94	-	-	1.00	-	-	-	1.10	-	-	-

* Cane diffuser

TABLE C2

ANALYSIS OF BAGASSE, JUICES, FILTER CAKE, SYRUP AND FINAL MOLASSES SWAZILAND, MALAWI AND ZIMBABWE MILLS (Season 1991-1992)

SYMBOLS OF FACTORIES	MH-A	MH-B *	MH-AVE	UR-A *	UR-B	UR-AVE	SM	NH-A *	NH-B	NH-AVE	DW	HV-A *	HV-B *	HV-AVE	TR-A *	TR-B *	TR-AVE
FINAL BAGASSE																	
Pol % bagasse	0.77	1.18	0.96	1.22	1.21	1.22	1.32	1.11	1.08	1.09	0.65	1.19	1.19	1.19	0.96	1.66	1.13
Moisture % bagasse	49.88	49.17	49.54	52.42	49.80	51.42	48.26	51.95	49.59	50.61	46.08	50.64	50.33	50.49	51.38	52.27	51.60
Fibre % bagasse	48.64	48.73	48.68	45.41	48.00	46.40	49.35	46.52	48.92	47.89	53.27	47.13	47.44	47.28	46.83	44.89	46.35
Bagasse % cane	28.38	27.15	27.78	29.60	26.87	28.50	25.60	33.86	32.61	33.14	27.56	30.12	29.94	30.03	31.49	31.21	31.42
Ash % bagasse	-	-	-	-	-	-	4.39	-	-	-	-	-	-	1.98	-	-	-
LCV in kJ per kg bagasse ##	-	-	-	-	-	-	7355	-	-	-	-	-	-	7369	-	-	-
MIXED JUICE																	
Mixed juice % cane	125.93	118.75	122.44	121.06	116.45	119.19	111.65	108.28	107.49	107.82	119.33	119.14	122.65	120.84	126.13	120.58	124.74
Brix % mixed juice	12.65	13.36	12.99	12.45	12.87	12.62	13.84	13.02	13.10	13.06	14.12	13.94	13.43	13.69	12.92	12.88	12.91
Apparent purity	86.97	87.32	87.14	85.17	84.93	85.08	85.98	85.46	85.56	85.52	86.94	84.42	84.53	84.47	83.40	82.42	83.16
Purity difference(MJ - DAC)	-0.36	-0.25	-0.31	-0.43	-0.68	-0.53	0.75	-	-	-	0.27	0.33	0.33	0.33	-	-	-
Suspended solids % mixed juice	0.11	0.65	0.37	0.31	0.77	0.49	0.68	0.43	0.62	0.54	-	0.18	0.18	0.18	0.31	0.41	0.34
CLARIFIED JUICE																	
Brix % clarified juice	-	-	13.06	-	-	12.63	13.44	-	-	14.83	13.50	-	-	14.18	-	-	12.85
Apparent purity	-	-	87.06	-	-	85.42	85.55	-	-	86.96	87.41	-	-	84.34	-	-	82.63
Purity difference(CJ - MJ)	-	-	-0.08	-	-	0.34	-0.43	-	-	1.44	0.47	-	-	-0.13	-	-	-0.53
Average pH	-	-	7.2	-	-	7.2	7.3	-	-	7.0	6.8	-	-	7.0	-	-	7.0
FILTER CAKE																	
Pol % filter cake	-	-	0.85	-	-	0.62	0.93	-	-	0.98	0.68	-	-	1.94	-	-	0.81
Moisture % filter cake	-	-	72.97	-	-	-	74.22	-	-	76.52	72.52	-	-	72.19	-	-	-
Filter cake % cane	-	-	2.34	-	-	2.06	3.19	-	-	2.70	2.02	-	-	0.85	-	-	2.57
Filter wash index	-	-	99.4	-	-	99.9	102.9	-	-	88.1	104.6	-	-	96.5	-	-	100.5
Purity diff.(CJ - filtrate)	-	-	1.09	-	-	1.06	0.93	-	-	3.01	-	-	-	-	-	-	0.86
SYRUP	-	-		-	-			-	-			-	-		-	-	
Brix % syrup	-	-	63.73	-	-	61.74	65.57	-	-	67.86	63.00	-	-	60.28	-	-	65.83
Apparent purity	-	-	87.50	-	-	85.97	84.97	-	-	86.80	87.67	-	-	84.46	-	-	82.83
Purity difference(Syrup - MJ)	-	-	0.36	-	-	0.89	-1.01	-	-	1.28	0.73	-	-	-0.01	-	-	-0.33
Average pH	-	-	6.2	-	-	6.4	6.3	-	-	6.7	6.2	-	-	6.1	-	-	6.2
FINAL MOLASSES																	
Refracto brix	-	-	85.54	-	-	83.75	84.01	-	-	78.10	-	-	-	80.71	-	-	-
Pol/refracto brix purity	-	-	28.37	-	-	32.60	31.64	-	-	39.49	-	-	-	33.37	-	-	-
Purity difference(true-target)	-	-	-	-	-	4.31	-	-	-	3.94	-	-	-	9.98	-	-	-
Reducing sugars % #	-	-	21.48	-	-	18.23	18.74	-	-	12.3	-	-	-	17.15	-	-	-
Sulphated ash %	-	-	-	-	-	14.74	16.19	-	-	16.34	-	-	-	11.90	-	-	-
Reducing sugars/ash ratio	-	-	-	-	-	1.24	1.16	-	-	0.75	-	-	-	1.44	-	-	-
Final mol at 85 brix % cane	-	-	3.13	-	-	3.58	3.29	-	-	3.85	-	-	-	4.75	-	-	-

* Cane diffuser
\# Reducing sugars determined by Lane & Eynon method.
LCV = 18309 - 31,14 Bx % bagasse - 207,63 moisture % bagasse - 196,05 ash % bagasse

TABLE D2

MASSECUITES, EXHAUSTIONS, CLARIFYING AGENTS AND ADDITIONAL FUELS SWAZILAND, MALAWI AND ZIMBABWE MILLS (Season 1991-1992)

SYMBOLS OF FACTORIES	MH	UR	SM	NH	DW	HV	TR
A - MASSECUITE							
m3 per ton brix in mixed juice	0.97	1.05	0.96	1.24	1.22	1.05	0.93
Ref brix of massecuite	92.79	92.63	92.92	91.96	91.09	91.80	92.34
Purity of massecuite	86.92	85.61	85.38	86.23	90.02	86.63	84.68
Purity of A - molasses	66.29	69.04	65.26	73.52	78.34	69.30	65.53
Purity drop	20.63	16.57	20.12	12.71	11.68	17.33	19.15
Exhaustion	70.41	62.52	67.83	55.66	59.90	65.16	65.61
Purity of A-mass - pty syrup	-0.58	-0.36	0.41	-0.57	2.35	2.17	1.85
Purity of remelt	83.84	85.23	82.85	99.03	91.71	89.51	86.42
B - MASSECUITE							
m3 per ton brix in mixed juice	0.31	0.41	0.30	0.54	0.67	0.41	0.42
Ref brix of massecuite	94.67	94.23	95.74	95.64	92.18	93.45	93.31
Purity of massecuite	67.74	68.03	66.26	74.03	73.43	70.57	67.09
Purity of B - molasses	41.78	44.43	42.01	54.98	47.89	48.21	45.49
Purity drop	25.96	23.60	24.25	19.05	25.54	22.36	21.60
Exhaustion	65.82	62.43	63.11	57.16	66.75	61.18	59.06
C - MASSECUITE							
m3 per ton brix in mixed juice	0.21	0.22	0.21	0.33	-	-	-
Ref brix of massecuite	97.99	97.80	97.83	98.69	-	96.14	-
Purity of massecuite	50.31	52.33	51.77	58.90	-	54.73	-
Purity of C - molasses	28.37	32.60	31.64	39.49	-	33.37	-
Crystal content	30.01	28.63	28.81	31.66	-	30.82	-
Exhaustion	60.88	55.94	56.88	54.47	-	58.58	-
TOTAL VOLUME ALL RAW MASSECUITES							
m3 per ton brix in mixed juice	1.50	1.68	1.48	2.12	-	-	-
WHITE SUGAR MASSECUITES							
Kg sugar per m3 massecuite	-	762	-	570	614	-	-
Tons phos acid/1000 tons white sugar	-	-	-	0.61	-	-	-
Tons sulphur/1000 tons white sugar	-	0.10	-	0.19	0.13	-	-
Phos. acid ppm mixed juice	-	-	-	36.4	-	-	-
Flocculant ppm mixed juice	1.5	1.1	1.6	3.3	1.9	1.4	4.9
Tons lime per 1000 tc	0.4	# 0.7	0.4	# 1.2	# 1.3	0.8	0.6
Enzyme ppm sugar	-	-	-	-	4.8	-	-
ADDITIONAL FUELS PER 1000 TC							
Tons of coal	3.04	10.21	4.13	-	-	6.18	9.81
Tons of wood	-	-	-	-	0.15	-	-
Converted into bagasse	12.14	40.84	16.51	-	0.18	24.72	39.26

Includes lime used in refinery

TABLE E

COMPARATIVE MANUFACTURING DATA OF RECENT YEARS (SOUTH AFRICAN MILLS)

Season	1991/92	1990/91	1989/90	1988/89	1987/88
Throughput and time efficiency					
Tons cane per hour	275.87	268.96	265.24	265.10	268.02
Tons fibre per hour	40.02	39.50	38.81	39.57	39.53
Time efficiency	81.10	81.17	80.25	79.12	74.73
Cane					
Sucrose % cane	13.04	12.91	13.17	12.61	12.00
Fibre % cane	14.93	15.14	15.07	15.44	15.23
Mixed juice					
Sucrose purity	86.39	86.23	86.40	85.70	85.25
(Gluc. + Fruct.)/ash in M.J.	1.15	1.15	1.19	1.29	1.30
Milling					
Imbibition % fibre	375	368	366	355	357
Extraction (sucrose based)	97.95	97.75	97.67	97.60	97.63
Pol % bagasse	0.87	0.92	0.98	0.96	0.91
Moisture % bagasse	51.18	51.62	51.61	50.92	51.24
Bagasse % cane	30.82	31.54	31.49	31.64	31.41
LCV bagasse kJ/kg	7197	7022	7094	7165	7081
Avail. kJ in bag./kg brix in M.J.	14999	15136	15003	15792	16182
Recoveries					
Boiling house recovery (sucrose based)	88.88	88.50	88.74	88.33	87.84
Overall recovery (sucrose based)	87.06	86.51	86.73	86.21	85.76
Tons cane per ton sugar	8.77	8.92	8.72	9.16	9.67
Filter cake					
Pol % filter cake	1.20	1.15	1.08	1.05	0.99
Filter cake % cane	2.94	3.27	3.18	3.24	3.28
Final molasses					
Brix % final molasses	82.43	81.99	82.19	82.12	82.37
Sucrose/refracto brix purity	37.10	36.99	36.74	36.83	36.82
Tons fin.molasses at 85 bx % cane	3.67	3.70	3.69	3.73	3.70
Average sugar polarisation	99.59	99.58	99.57	99.55	99.54
Sucrose lost % sucrose in cane					
Lost in bagasse	2.05	2.25	2.33	2.40	2.37
Lost in filter cake	0.27	0.29	0.26	0.27	0.27
Lost in final molasses	8.86	9.02	8.76	9.26	9.64
Undetermined losses	1.76	1.92	1.98	1.86	1.96
Lost in boiling house	10.89	11.24	11.00	11.39	11.87
Total losses	12.94	13.49	13.33	13.79	14.24
M3 massecuite per ton Bx in M.J.					
A - massecuite	1.00	1.00	1.01	1.01	1.00
B - massecuite	0.33	0.34	0.34	0.34	0.35
C - massecuite	0.24	0.25	0.24	0.25	0.26
Total	1.56	1.59	1.59	1.60	1.61
Exhaustion of massecuites					
A - massecuite	66.69	66.36	65.74	64.71	63.87
B - massecuite	62.21	61.88	62.83	62.77	62.59
C - massecuite	54.68	53.89	54.65	55.38	54.55
Brix of syrup	64.60	64.68	65.40	64.68	64.95

TABLE F

AVERAGE MANUFACTURING RESULTS BY MONTHLY PERIODS FOR SOUTH AFRICAN MILLS (Season 1991-1992)

End of month period		27 APRIL 1991	1 JUNE 1991	29 JUNE 1991	27 JULY 1991	31 AUG 1991	28 SEPT 1991	2 NOV 1991	30 NOV 1991	28 DEC 1991	1 FEB 1992
Tons of sugar made and estimated	Month	39106	288945	286433	301200	389238	290787	325990	239439	103081	25273
	To-date	39106	328051	614484	915684	1304922	1595709	1921699	2161138	2264219	2289492
Tons cane crushed	Month	396178	2779393	2572426	2575644	3152392	2373122	2822685	2166912	987543	251111
	To-date	396178	3175571	5747997	8323641	11476033	13849155	16671840	18838752	19826295	20077406
Tons cane crushed per hour actual crushing	Month	230.58	280.81	283.67	279.58	279.63	267.09	269.99	272.46	274.48	349.96
	To-date	230.58	273.38	277.91	278.43	278.76	276.68	275.53	275.17	275.14	275.87
Sucrose % cane	Month	11.82	12.04	12.64	13.18	13.94	13.92	13.22	12.76	12.39	12.42
	To-date	11.82	12.02	12.29	12.57	12.94	13.11	13.13	13.09	13.05	13.04
Fibre % cane	Month	14.33	14.52	14.17	14.29	14.40	15.11	15.96	16.11	16.31	15.30
	To-date	14.33	14.50	14.22	14.24	14.29	14.43	14.69	14.85	14.92	14.93
Tons cane per ton sugar	Month	10.13	9.62	8.98	8.55	8.10	8.16	8.66	9.05	9.58	9.94
	To-date	10.13	9.68	9.35	9.09	8.79	8.68	8.68	8.72	8.76	8.77
Extraction (sucrose based)	Month	97.39	97.68	97.92	98.12	98.17	98.13	97.91	97.86	97.74	97.19
	To-date	97.39	97.65	97.77	97.89	97.97	98.00	97.98	97.97	97.96	97.95
Imbibition % fibre	Month	435	377	371	377	381	381	364	364	379	363
	To-date	435	384	379	378	379	379	377	375	375	375
Pol % bagasse	Month	1.00	0.92	0.89	0.84	0.87	0.85	0.85	0.83	0.83	0.99
	To-date	1.00	0.93	0.91	0.89	0.88	0.88	0.87	0.87	0.87	0.87
Moisture % bagasse	Month	53.36	52.40	51.80	50.96	50.68	50.43	50.45	50.81	51.12	55.24
	To-date	53.36	52.52	52.20	51.83	51.51	51.32	51.16	51.12	51.12	51.18
Boiling house recovery (sucrose based)	Month	85.33	88.00	89.76	90.09	89.90	89.37	88.86	88.12	85.56	83.22
	To-date	85.33	87.68	88.63	89.06	89.31	89.32	89.24	89.12	88.95	88.88
Overall recovery (sucrose based)	Month	83.11	85.97	87.89	88.40	88.26	87.70	87.01	86.24	83.62	80.88
	To-date	83.11	85.61	86.66	87.18	87.50	87.53	87.44	87.31	87.13	87.06
Mixed juice sucrose purity	Month	83.66	84.20	86.37	87.16	97.34	87.24	87.16	86.11	85.07	83.29
	To-date	83.66	84.14	85.15	85.79	86.25	86.42	86.55	86.50	86.43	86.39
Pol/sucr. ratio in mixed juice	Month	0.9806	0.9816	0.9848	0.9882	0.9910	0.9932	0.9965	0.9933	0.9890	0.9855
	To-date	0.9806	0.9815	0.9830	0.9847	0.9865	0.9878	0.9893	0.9897	0.9897	0.9896
Sucrose/refr. brix purity. in final molasses	Month	-	34.63	35.20	36.78	37.03	37.90	39.34	38.47	38.81	38.54
	To-date	-	34.94	35.04	35.55	35.95	36.28	36.79	36.98	37.08	37.10
Sucrose lost in final molasses % sucrose in cane	Month	-	9.52	8.26	8.22	8.14	8.45	8.95	9.44	10.54	12.46
	To-date	-	9.73	9.09	8.81	8.61	8.58	8.64	8.73	8.82	8.86
Undetermined lost sucrose % sucrose in cane	Month	-	1.94	1.67	1.27	1.54	1.71	1.64	1.85	3.32	3.23
	To-date	-	2.05	1.84	1.65	1.62	1.64	1.64	1.66	1.74	1.76
Pol/sucrose ratio FM	Month	-	0.8600	0.8707	0.8855	0.8988	0.9324	0.9663	0.9618	0.9437	0.9400
	To-date	-	0.8605	0.8647	0.8710	0.8788	0.8885	0.9022	0.9094	0.9115	0.9120

TABLE G

CANE VARIETIES AND RAINFALL
(Season 1991-1992)
PERCENTAGE BY WEIGHT

MILL	N 8	N 11	N 12	N 13	N 14	N 16	N 17	N 18	N 19	N 52/219	N 53/216	N 55/805	NCo 293	NCo 310	NCo 376	NCo 382	J 59/3	MIXED VARIETY	UNKNOWN AND OTHER	* RAINFALL mm
ML	-	0.1	-	-	80.1	-	5.6	-	8.3	0.2	-	-	-	-	-	-	0.1	0.3	5.5	356
PG	-	-	-	-	68.2	-	5.5	-	20.2	0.3	-	-	-	-	0.4	-	-	0.9	4.5	251
UF	-	0.1	10.0	-	23.9	-	10.4	1.4	4.2	0.1	-	0.2	-	3.7	38.7	-	0.1	6.9	0.3	502
EN	-	0.1	15.1	1.4	-	3.5	0.2	0.1	-	-	-	-	8.2	-	71.5	-	-	-	-	450
FX	-	-	4.8	-	7.2	0.1	2.5	1.9	0.2	0.1	-	0.1	-	0.3	32.9	0.1	-	1.7	48.1	696
AK	-	-	16.0	0.5	1.2	1.1	0.8	0.7	-	-	-	0.4	0.1	0.3	43.7	0.1	-	7.4	27.9	480
DL	0.1	0.1	11.3	1.7	2.1	3.8	0.6	1.1	0.1	-	-	0.7	-	0.2	73.1	-	-	5.3	-	582
MS	-	0.2	13.9	0.7	2.0	6.2	0.6	0.9	-	-	-	2.8	0.3	0.2	58.0	-	-	5.0	9.2	631
ME	0.1	1.8	18.8	0.8	1.0	3.8	0.1	0.7	-	-	-	1.5	7.0	-	59.3	-	-	4.4	0.7	534
GD	-	0.3	1.1	-	3.5	1.5	0.1	0.7	-	-	-	-	-	-	92.7	-	-	-	-	342
GH	-	-	18.6	0.5	1.8	3.0	0.3	0.8	-	-	-	1.7	0.2	0.1	54.9	-	-	3.8	14.2	430
NB	-	3.7	58.8	0.4	0.5	6.5	-	0.2	-	-	0.2	0.1	13.0	-	8.2	1.6	-	0.6	6.4	305
UC	-	1.0	51.5	0.3	0.2	6.6	-	-	-	-	0.1	-	29.2	-	9.9	0.5	-	0.2	0.3	408
IL	-	1.1	43.6	0.8	0.5	3.8	0.1	0.2	-	-	-	0.2	7.9	0.1	30.4	-	-	4.3	7.0	657
SZ	-	0.9	13.3	0.3	1.4	1.6	0.2	0.2	-	-	-	0.6	-	0.8	71.5	-	-	2.8	6.3	731
UK	-	0.1	19.2	0.8	2.2	1.2	0.3	0.3	-	0.1	-	-	2.7	0.1	45.3	-	-	1.4	26.3	653
Average SA Mills	-	0.5	16.4	0.4	14.8	2.3	2.0	0.7	2.1	0.1	-	0.6	2.6	0.4	40.1	0.1	-	3.2	13.5	-
MH	-	-	-	-	25.6	-	6.1	-	9.5	-	-	-	-	-	58.3	-	-	0.6	-	176
UR	-	-	-	-	36.5	-	4.2	-	9.0	0.5	-	-	-	-	42.0	-		7.4	0.4	398
SM	-	-	-	-	30.6	-	1.7	-	7.4	-	-	-	-	-	59.2	-	-	0.6	0.5	143
NH	-	-	-	-	73.3	-	0.2	-	0.8	-	-	-	-	-	19.9	-	-	1.0	5.0	201
DW	-	-	-	-	35.4	-	0.1	-	-	0.2	-	-	-	-	32.1	-	-	1.3	30.9	51
HV	-	-	-	-	12.8	-	-	-	-	0.1	-	-	-	-	86.5	-	-	0.0	0.5	-
TR	-	-	-	-	12.9	-	-	-	-	-	-	-	-	-	85.3	-	-	0.0	1.8	19

* Rainfall during the crushing season

TABLE H

TRANSPORT SUMMARY SOUTH AFRICAN MILLS
(Season 1991-1992)
PERCENT OF CANE TRANSPORTED

MILLS	ML	PG	UF	EN	FX	AK	DL	MS	ME	GD	GH	NB	UC	IL	SZ	UK	AVERAGE
SOUTH AFRICAN RAILWAYS	-	-	26.6	-	15.1	-	-	-	-	-	-	-	-	-	-	-	3.5
TRAMS	-	-	72.9	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3
ARTICULATED TRUCK DRIVEN VEHICLES																	
- Interlink	-	-	-	-	58.2	56.4	5.4	35.2	58.0	-	-	30.9	14.7	93.5	19.3	22.4	27.7
- Tri-Axle	-	-	-	-	3.0	-	12.2	44.3	9.8	-	49.5	0.5	3.5	0.9	-	-	8.9
- Hilo	88.6	17.6	-	-	10.6	14.7	47.1	0.7	2.7	27.8	25.6	7.9	2.9	5.4	62.6	12.3	25.3
RIGID CHASSIS VEHICLES																	
- Truck	-	-	-	-	-	0.9	-	-	-	3.0	-	9.4	18.2	-	16.1	59.7	5.6
- Lorry	-	-	-	7.0	-	0.1	4.0	0.2	5.5	13.9	0.5	15.6	29.0	-	1.9	2.0	3.0
TRACTOR DRIVEN VEHICLES																	
- Hilo	-	14.1	-	-	-	4.8	1.2	4.0	3.4	5.2	18.4	4.4	4.1	-	-	0.9	3.4
- Rig	-	-	-	92.9	12.8	19.7	26.2	6.2	15.5	41.6	5.6	28.2	13.7	-	-	1.4	10.7
- Interlink	11.4	68.2	-	-	-	3.2	3.6	9.1	4.9	8.2	-	2.7	13.5	-	-	1.0	6.8

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 Suc/brix Purity	Boiling House Recovery	Overall Recovery
	Pol	Fibre	Tel Quel	96 Pol Sugar	Pol based		Pol	Moisture	Cane	Fibre	Purity Pol based	Reducing Sugar Ratio	Chem.suc.	Pol based	Pol based
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
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	4.3	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 onwards data are suc. based	Sucrose				Suc.based						Suc.based		GLC suc.	Suc.based	Suc.based
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
1984	12.27	15.62	9.43	9.11	97.42	2.12	0.99	51.35	51.5	344	85.69	5.76	37.0	88.23	85.96
Average 1975 - 1984	12.66	15.71	9.23	8.91	96.57	2.90	1.31	52.20	48.8	324	84.98	5.51	37.9	88.25	85.22
1985	13.13	15.38	8.88	8.57	97.47	2.25	1.04	51.64	52.9	358	84.55	6.71	36.3	87.51	85.30
1986	12.80	15.24	9.08	8.76	97.66	2.03	0.95	51.27	54.3	368	85.44	6.15	36.7	87.70	85.65
1987	12.00	15.23	9.67	9.33	97.63	1.94	0.91	51.24	52.6	357	85.25	6.28	36.8	87.84	85.76
1988	12.61	15.44	9.16	8.83	97.60	2.04	0.96	50.92	53.0	355	85.70	5.60	36.8	88.33	86.21
1989	13.17	15.07	8.72	8.41	97.67	2.11	0.98	51.61	53.5	366	86.40	4.36	36.7	88.74	86.67
1990	12.91	15.14	8.92	8.60	97.75	1.98	0.92	51.62	54.1	368	86.23	5.15	37.0	88.50	86.51
1991	13.04	14.93	8.77	8.42	97.95	1.85	0.87	47.07	54.4	375	86.39	-	37.1	88.88	87.06

TABLE K

EQUIPMENT AND POWER USED FOR RAW SUGAR PRODUCTION SOUTH AFRICAN AND SWAZILAND MILLS

SYMBOL OF FACTORIES		ML	PG	UF	EN	FX A	FX B	AK	DL	MS A	MS B	ME
EXTRACTION PLANT												
Total installed power	kW/tfh	116	155	182	131	171	172	146	183	135	216	165
Cane preparation	kW/tfh	86	97	98	49	117	117	92	85	96	95	80
Mills:Total roller volume	m3/tfh	0.11	0.36	0.32	0.61	0.31	0.31	0.49	1.04	0.19	1.30	1.26
Diffuser:Screen area	m2/tch*	(C) 0.98	(C) 1.74	(C) 1.32	(B) 1.10	2.82	<(C)>2.81	(C) 1.76	o -	1.85	(C) -	-
CLARIFICATION AND EVAPORATION												
Juice heaters:Heating surface	m2/tch#	11.3	9.1	7.9	10.7	8.6		7.3	5.5	6.5		6.8
Clarifiers:Volume	m3/tch	(E) 2.6	(E) 0.9	(T) 1.2	(E) 2.6	(T) 1.1		(E) 3.0	(E) 1.6	(E+T) 1.8		(E) 3.8
Evaporators:Heating surface	m2/tch	31.0	45.9	44.1	41.9	52.4		37.1	33.3	44.6		38.9
Filters:Screening area	m2/tch	0.31	0.70	0.63	0.66	0.60		0.42	0.60	0.63		0.70
BOILING HOUSE							&				&	
Vacuum pans:Volume	m3/tch	1.4	1.5	1.5	2.1	0.5	1.0	1.5	1.1	0.3	1.0	0.5	1.8
Crystallizers:Volume A	m3/tch	1.07 -	0.76 0.94x	1.03 -	0.81 0.51x	-	1.47x	1.51 1.00x	1.27 -		1.38	0.29x	1.32 -
Volume B	m3/tch	0.37 0.47x	0.76 1.36x	0.77 -	0.51 0.71x	-	0.98x	0.36 0.88x	1.03 -		-	0.58x	0.79 0.53x
Volume C	m3/tch	0.37 1.42x	0.62 1.51x	1.12 0.54x	2.75 -	-	1.85x	0.47 1.87x	- 1.98x		0.15	1.54x	0.53 1.59x
CENTRIFUGALS												
Batch:A - massecuite	D3H/tch**	66.6 ### 20.3	140 ###	56.2	86.5	29.9		53.6	48.8	40.8		52.3
Continuous:B - massecuite	W2V/tch##	164	160	153	290	164		141	183	99		179
C - massecuite	W2V/tch	229	355	183	339	247		412	270	312		333
STEAM AND POWER GENERATION												
Electricity	kW/tch***	74.5	46.4	57.1	57.1	57.2		22.3	41.7	74.4		56.7
Boilers: M.C.R. Tons steam/tc		1.23	0.94	0.77	0.96	0.82		0.64	0.94	0.93		0.99

SYMBOL OF FACTORIES		GD	GH A	GH B	NB	UC	IL	SZ A	SZ B	UK	TOTALS SA MILLS
EXTRACTION PLANT											
Total installed power	kW/tfh	156	298	198	198	178	192	191	186	184	190(M) 165(d)
Cane preparation	kW/tfh	67	229	95	97	96	111	122	119	91	90(M) 105(d)
Mills:Total roller volume	m3/tfh	0.76	0.48	1.35	1.07	0.58	0.30	0.39	0.38		1.15(M) 0.35(d)
Diffuser:Screen area	m2/tch*	(B) 1.61	2.49	(C) -	-	(C) 1.72	(C) 1.79	2.21	<(C)>2.17	-	1.92(C) 1.37(B)
CLARIFICATION AND EVAPORATION											
Juice heaters:Heating surface	m2/tch#	7.6	8.2		6.9	9.3	9.5	15.9		7.3	10.8
Clarifiers:Volume	m3/tch	(E) 2.2	(E+T) 0.9		(E) 3.1	(E) 2.0	(E) 1.9	(E) 1.1		(E) 2.5	2.4(E) 1.4(T)
Evaporators:Heating surface	m2/tch	24.2	44.2		41.7	31.7	44.6	63.6		35.0	53.2
Filters:Screening area	m2/tch	0.60	0.67		0.70	0.56	0.48	0.34		0.56	0.69
BOILING HOUSE				&					&		&
Vacuum pans:Volume	m3/tch	2.0	1.3	0.4	1.3	1.5	1.0	0.9	1.5	0.5	1.7	1.6	0.95
Crystallizers:Volume A	m3/tch	2.12 -	2.39	-	- 1.51x	1.07 -	0.76	1.28x	0.46	1.82x	0.51 0.98x	1.40	1.56x
Volume B	m3/tch	1.68 -	1.60	-	0.56 0.56x	0.54 0.79x	-	1.58x	0.41	1.21x	0.51 0.98x	0.80	1.09x
Volume C	m3/tch	1.97 -	-	1.44x	0.28 1.67x	0.54 1.18x	-	2.08x	0.32	1.62x	0.47 1.37x	0.63	1.93x
CENTRIFUGALS											
Batch:A - massecuite	D3H/tch**	85.8	41.4		38.1	68.2	54.6	37.3		43.6	60.1
Continuous:B - massecuite	W2V/tch##	160	137		172	144	207	188		155	200
C - massecuite	W2V/tch	243	380		273	415	306	338		310	376
STEAM AND POWER GENERATION											
Electricity	kW/tch***	57.3	49.2		59.6	34.0	50.4	51.4		45.4	66.0
Boilers: M.C.R. Tons steam/tc		0.61	0.84		0.88	1.11	0.92	1.05		0.95	1.13

SYMBOL OF FACTORIES		MH A	MH B	UR A	UR B	SM
EXTRACTION PLANT						
Total installed power	kW/tfh	165	249	202		237
Cane preparation	kW/tfh	96	113	92		92
Mills:Total roller volume	m3/tfh	0.36	1.03	1.50		1.01
Diffuser:Screen area	m2/tch*	1.54 (C)	-	1.29 (C)		-
CLARIFICATION AND EVAPORATION						
Juice heaters:Heating surface	m2/tch#	9.9		7.8		5.5
Clarifiers:Volume	m3/tch	(E) 1.8		(E) 2.3		(E) 3.2
Evaporators:Heating surface	m2/tch	41.5		36.5		29.0
Filters:Screening area	m2/tch	0.50		0.47		0.48
BOILING HOUSE					&	
Vacuum pans:Volume	m3/tch	1.6		1.1	0.3	1.2
Crystallizers:Volume A	m3/tch	1.58 -		0.74	0.49x	0.69 0.46x
Volume B	m3/tch	1.03 -		0.25	0.25x	0.23 0.23x
Volume C	m3/tch	0.74 1.54x		0.49	1.61x	0.46 1.51x
CENTRIFUGALS						
Batch:A - massecuite	D3H/tch**	60.9		43.3		37.1
Continuous:B - massecuite	W2V/tch##	112		126		129
C - massecuite	W2V/tch	190		187		222
STEAM AND POWER GENERATION						
Electricity	kW/tch***	22.0		40.0		57.6
Boilers: M.C.R. Tons steam/tc		0.62		0.70		0.56

* C-Cane diffuser, B-Bagasse diffuser

** D-Basket diameter, H-Basket height

*** Electricity generated by steam driven prime movers
E-Conventional clarifiers, T-Trayless clarifiers
M-Average milling tandems. d-Average diffusers

\# Excluding diffuser juice heaters

\## W-Speed of rotation, V-Volume of cone formed by basket

\### Continuous 'A' centrifugals

& Continuous pans

x Water cooled crystallizers