SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

Date : Thursday 27 October 1988

Venue : 'Conference Room, SASA Experiment Station, Mount Edgecombe

P R O G R A M M E

Main concept : The effects of cutting cane at a younger age for the control of eldana.

08h45 - 09h00	:	Chairman's Report	
09h00 - 09h15	:	Effects on eldana - farm	Dr A Carnegie
09h15 - 09h30	:	Effects on eldana - surveys	L Smith
09h30 - 09h45	:	Discussion	
09h45 - 10h00	:	Effects on cane quality - rainfed	D McCulloch
10h00 - 10h15	:	Effects on cane quality - irrigated	R Dunley Owen
10h15 - 10h30	:	Discussion	
10h30 - 11h00	:	**TEA**	
11h00 - 11h15	:	Effects on sucrose production	M Murdoch
11h15 - 11h30	:	Effects on sucrose production	Dr G Inman-Bamber
11h30 - 11h45	:	Discussion	
11h45 - 12h00	:	Effects on flowering	K Nuss
12h00 - 12h15	:	Flower control	A King
12h15 - 12h30	:	Discussion	
12h30 - 14h00	:	**LUNCH**	
14h00 - 14h15	:	Effects on A + B Pools	F du Plooy
14h15 - 14h30	:	Effects on A + B Pools	N Frean
14h30 - 14h45	:	Discussion	
14h45 - 15h15	:	General discussion - Agronomic problems	

SOUTH AFRICAN SUGAR INDUSTRY

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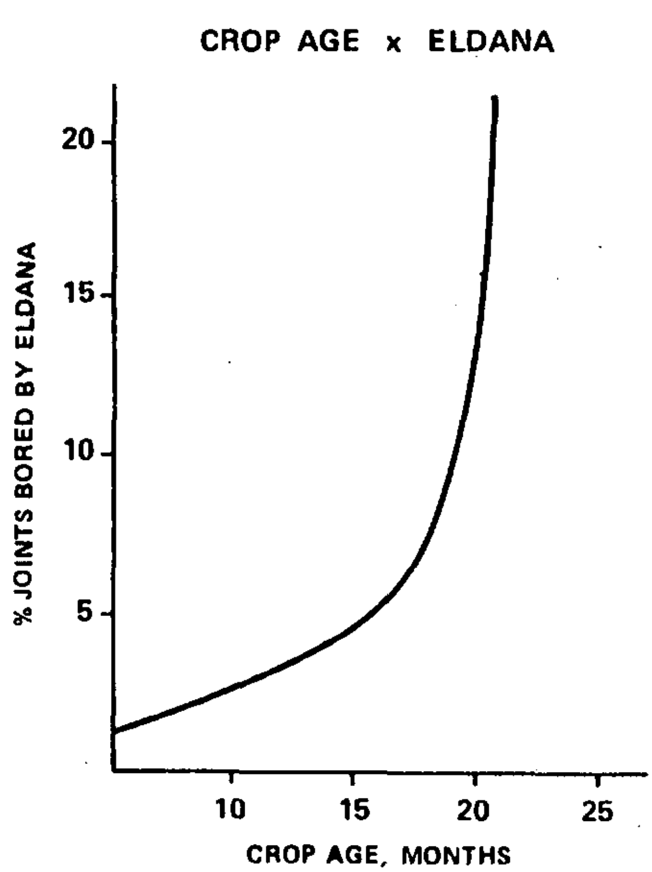
INTRODUCTION

Eldana borer re-appeared in our industry in the early 1970's, after an absence of about 17 years. To help plan control measures, we initially exploited the experience of workers in other parts of Africa where it has been a pest, and drew on our own experiences of 20 years earlier. Subsequently we initiated various surveys and experiments, and the importance of the cane age factor was quickly confirmed. Figure 1 was drawn from data obtained in the late 1970's from surveys in the Amatikulu area.

It was obvious that eldana populations are cumulative, and that particularly severe damage tends to occur after the cane is about 13 months old. The advantage of early harvesting was appreciated.

Fig 1 Relationship between crop age and eldana damage; (data from Amatikulu surveys 1978)



SOUTH AFRICAN SUGAR INDUSTRY

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EFFECTS OF AGE AT HARVEST ON ELDANA POPULATIONS : FARM OBSERVATIONS

by

AJM Carnegie

The "Whole Farm" project, which ran from 1984 to 1986, was an attempt by the Experiment Station to implement on a farm basis its current eldana control recommendations. It was hoped that the results from the chosen Gingindlovu farms, might be fairly compared with those from surrounding farms, on which such control measures were ignored. If fact, surrounding farms also were beginning to implement such measures, and discrepancies were less striking than they might otherwise have been. However, various points of interest arose, for example one of the most striking was the differences in eldana numbers between cane which was pretrashed and that which was not (Figure 1.)

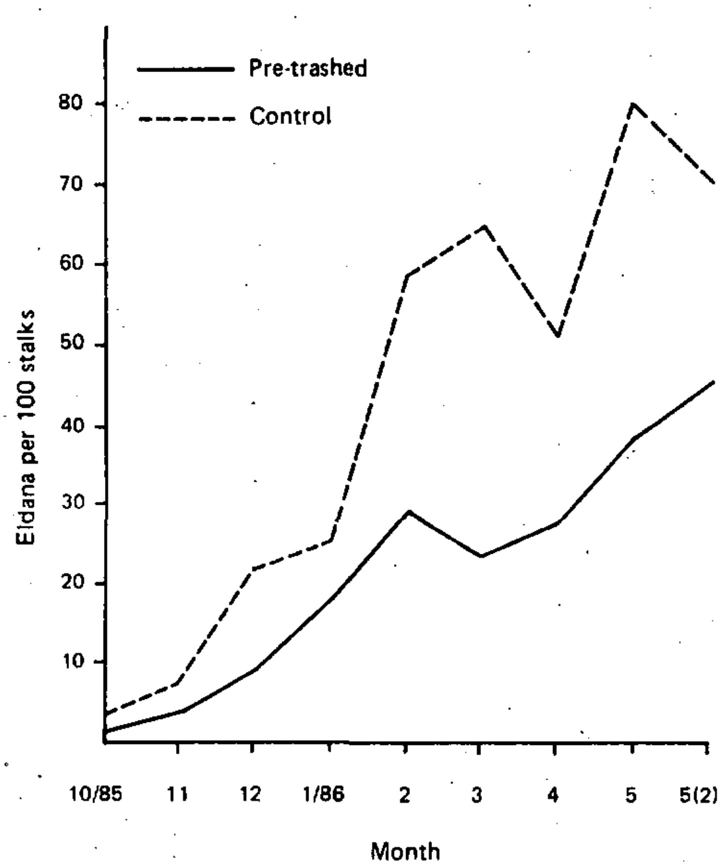

Figure 1. Effects of pre-trashing on eldana populations

From a comparison of eldana numbers obtained from mill surveys, it was demonstrated also that numbers were generally lower on the "treated" farm than on surrounding farms (Figure 2).

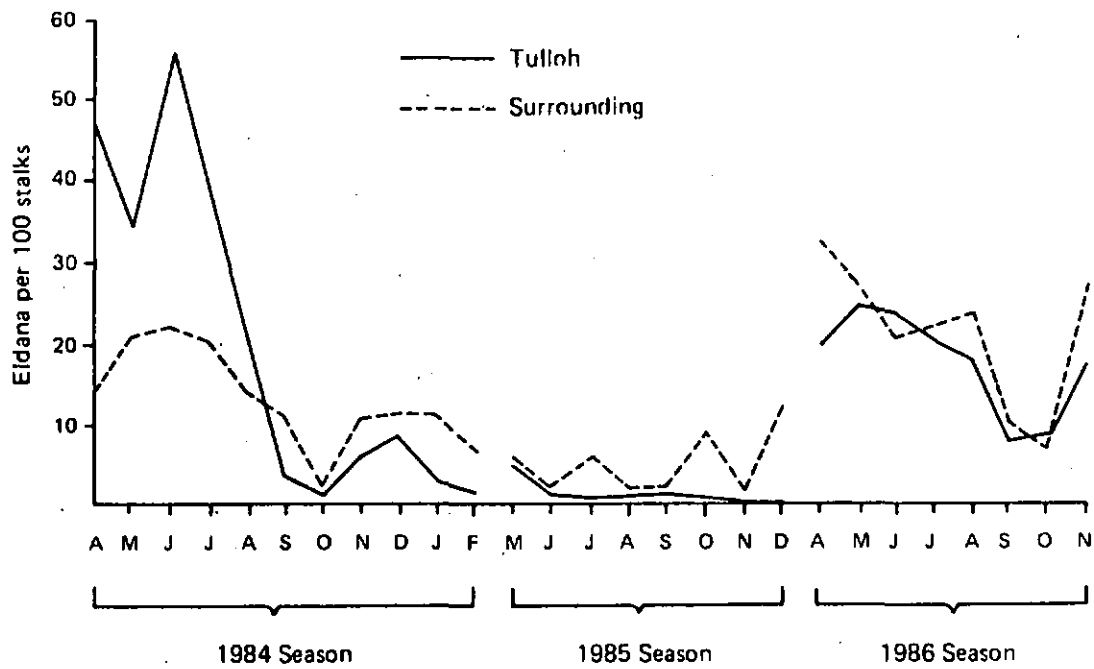

Figure 2. Eldana populations on Tulloh and surrounding farms (mill surveys)

This was particularly so during the first (1984) season, after which differences were less striking. Although the exercise involved the implementation of a number of disciplines, it is believed that age at harvest contributed to the differences recorded.

From Table 1 it can be seen that in the seasons before the project was started, a greater proportion of cane was cut on the chosen farm than on surrounding farms, but that by 1985 the differences were negligible.

Table 1: Proportion of cane cut annually on Tulloh and on surrounding farms

	% area under cane cut per season				
	1982-83	1983-84	1984-85	1985-86	1986-87
Tulloh	84	71	74	78	84
Surrounding farms	68	50	74	77	87

AJCM/dlz
26 October 1988

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EFFECTS OF AGE AT HARVEST ON ELDANA POPULATIONS : SURVEY DATA

by L Smith

INTRODUCTION

Factors affecting eldana levels and therefore damage caused by eldana, are numerous, including:

- seasonal fluctuations
- stress to the crop
- varieties
- N applications
- physical location (altitude, soils etc)
- **age of cane at harvest**

The measurable factors of eldana infestation as recorded during field surveys are threefold, namely: eldana larval population/100 stalks inspected, the % of the stalks that were bored and the physical amount of damage done within the stalks, referred to as % internode damage or % Stalk Red.

There appears to be a fairly close correlation between all three of these. As the % stalks bored increases, so do both eldana levels and % internode damage (Figure 1).

It is interesting to note the almost exponential nature of both curves, e/100 stalks increasing rapidly and in many instances exceeding 100 e/100 stalks. These rates of increase vary from area to area, eg at Umzimkulu, where similar curves were plotted, but where increase rate was greater (Figure 2).

Because of fairly wide fluctuations in eldana levels from year to year and even from month to month, the effect of cane age on eldana levels is not always apparent. For instance, at Sezela very young cane surveyed during mid-1987 had much higher levels of eldana than older cane surveyed during mid-1988:

	e/100 stalks (% stalks bored)	
Season Age of cane	1987 7 months	1988 11 months
Farm A	19 (41)	2 (20)
Farm B	9 (27)	2 (19)
Farm C	33 (55)	4 (20)

From millyard surveys at four mills over nine years, eldana numbers were compared with cane age at harvest. There was some correlation at Maidstone, Amatikulu and to a lesser extent Pongola. Results at Sezela show no correlation at all (Figure 3).

In order to determine meaningful trends it is necessary to limit information to a particular time of the year within a particular geographical area. The results of 569 surveys conducted on selected coastal farms at Sezela between March and May 1987 are as follows (Figure 4):

There was a consistent increase in eldana and damage levels with increasing age of cane.

The most meaningful results can be obtained when the same fields, within a single crop cycle, are surveyed more than once (Figure 5, 6 and 7).

In all three instances there were obvious increases in eldana and damage levels with increasing age of cane, and in fact in each individual field this trend was measured.

At Eston, in the Midlands South Region, eldana levels were compared for cane 16 months and younger, and 17 months and older, respectively from 1985 to 1988, with the following results (Figure 8).

The results obtained from eldana field surveys indicate conclusively that the effect of cutting cane at a younger age is to decrease both eldana levels and damage caused by eldana.

Figure 1. % stalks bored vs e/100 stalks and % stalk red. Sezela, January 1987 to October 1988.

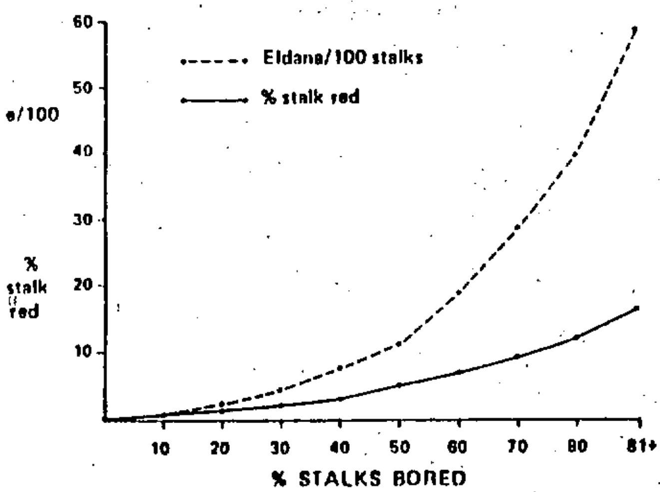


Figure 2. % stalks bored vs % stalk red at Sezela and Umzimkulu, November 1987 to October 1988.

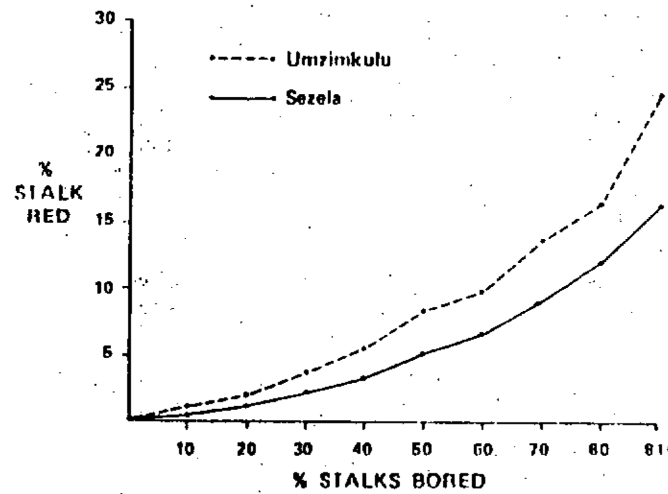


Figure 3. Average annual age at four mills vs millyard eldana survey results (1979 to 1987).

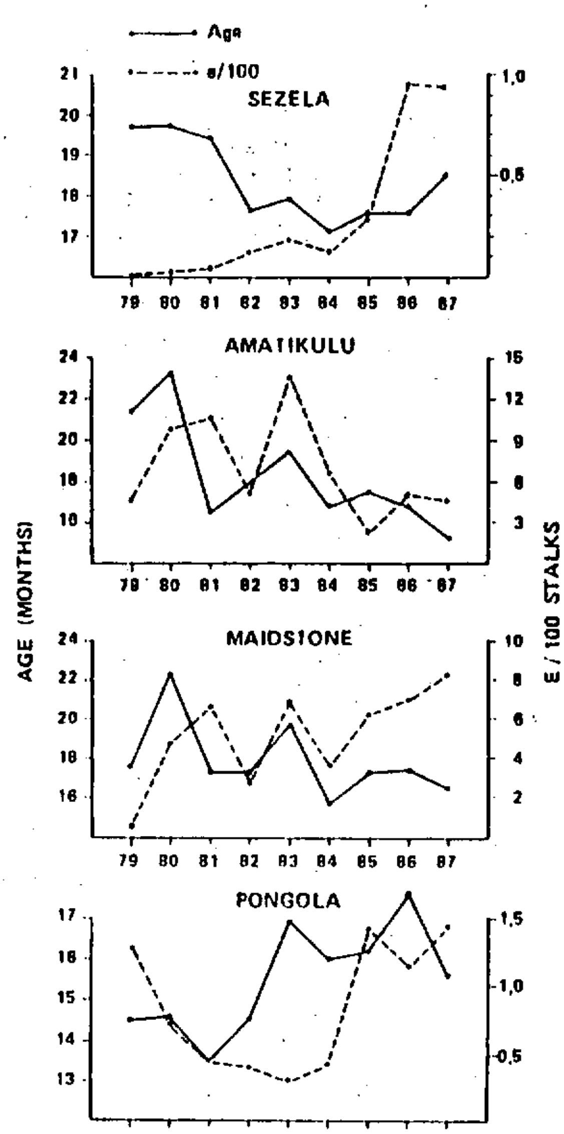


Figure 4. Age vs eldana and damage levels Sezela 1987.

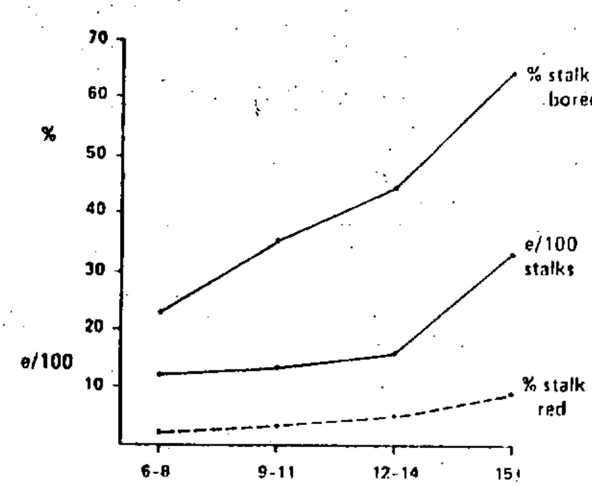


Figure 5. 23 Fields surveyed respectively at 8, 12 and 16 months, Sezela mill area (1987 – 1988).

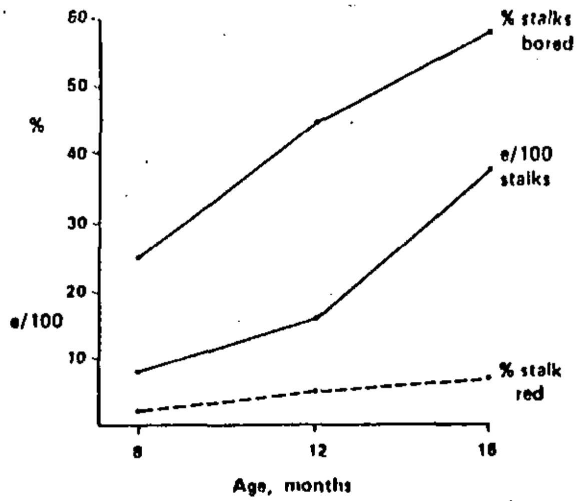


Figure 6. Five fields surveyed respectively at 11, 14 and 19 months, Umzimkulu mill area (1987 – 1988).

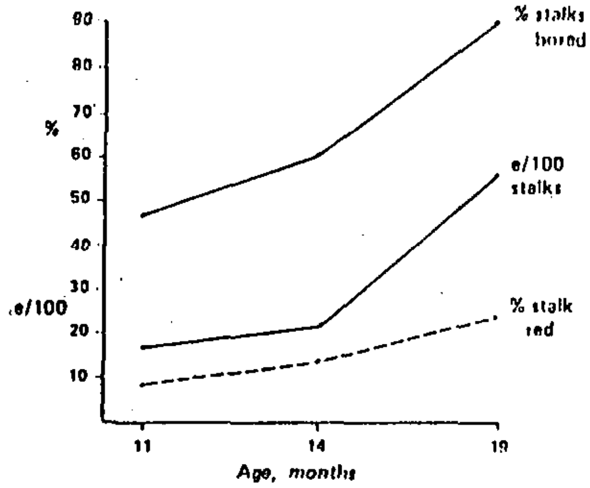


Figure 7. 166 fields surveyed respectively at 9,4 and 12,4 months. Combined Maidstone, Gledhow and Darnall mill areas (1988).

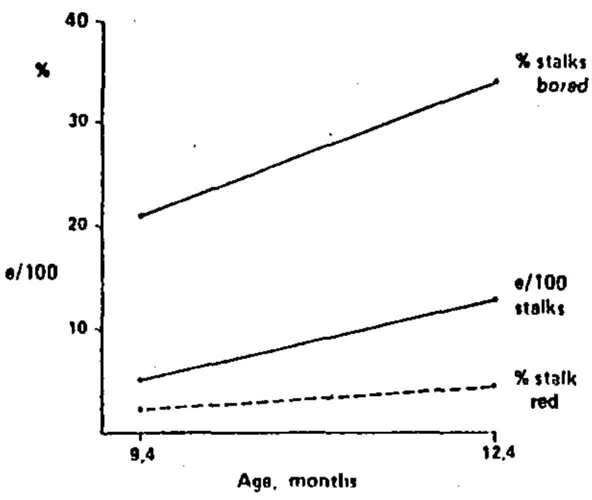
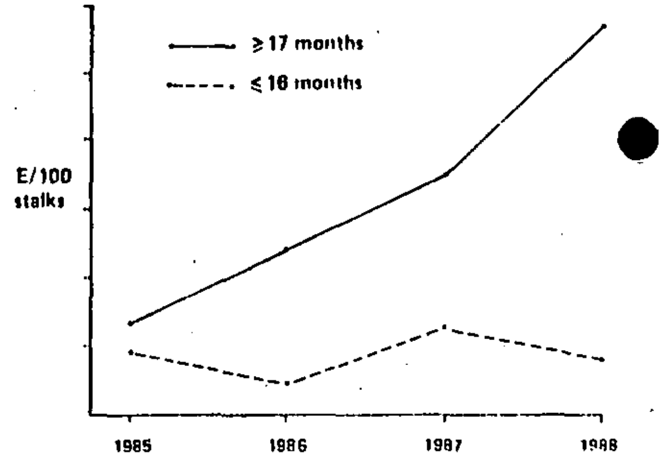


Figure 8. Average e/100 stalks in cane 16 months and younger and 17 months and older, Eston (1985 to 1988).



SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

THE EFFECTS ON CANE QUALITY OF CUTTING CANE ON A 12 MONTH CYCLE IN THE NORTH COAST REGION

D McCulloch

Introduction

The Darnall Coastal Estates (Darnall Estates) are largely dry land with an annual average rainfall of 1080 mm. The soils vary from very weak recent sands with a clay % of less than five (Fernwoods, Hutton), through to soils with a clay % of over 40 such as (Rensberg, Tambankulu). The total available moisture (TAM) of the soils vary from as little as 32 mm to over 100 mm.

Due to the high levels of eldana that have been experienced by the Darnall Estates in the carry-over cane, two managers made the decision to cut their whole crop annually. Comparisons made with other areas cutting older cane have shown that cane quality is lower at the beginning of the season on the Darnall Estates. However when comparing cane cut in this area seasonal cane produces better quality than carry over cane. See Table 1.

Table showing cane quality of seasonal vs carry-over cane on Darnall Coastal Estates

	Average	Rel sucrose	Purity	Fibre	Brix	Tons/ha month	Suc/ha	Suc/ha month
Carry over	16,5	11,6	77,7	16,0	12,6	4,7	8,1	,489
Seasonal	11,1	12	78,8	13,7	13,2	5,1	6,9	,616
Plant	14	12,2	78,1	14,8	13	5,1	8,8	,629

In addition to the chemical quality problems, seasonal cane can have physical quality problems, namely:-

- the cane has to be topped lower
- lower bundle weights
- spilt bundles in the cane yard

One big advantage of younger cane is that the cutters achieve increased productivity.

Solving the problem

The methods we have used to try and overcome the problem, are as follows:-

1. Cane is planted in the off-crop from January - March using filterpress. This helps to age the remaining seasonal cane, which has two advantages:-

   1.1 The remaining cane on the Estate can reach 13 months of age - the most profitable age to cut cane.

   1.2 The remaining cane is cut from May onwards with the subsequent ripening effect.

2. *One or two fields are cut at very young ages. These would be fields* that have grown well and have been chemically ripened, fields that have flowered profusely, or fields that have been serverely stressed.

3. Cane is ripened with the use of chemicals. At Darnall we have used Ethrel for the past two years. Observation plots have shown an improvement in the yield and an improvement in cane quality.

Table 2 **Results from using Ethrel**

	Year	Sucrose %	Tonnes/ha	Tonnes suc/ha	Purity	No. of fields	Rate of ethrel
Mean control Mean ripened	1987	12 12,6	88 87	10,5 11,2		2 2	1,5
Variance		+0,6	-1	+0,7			
Mean control Mean ripened	1988	10,9 11,8	68 71,5	7,2 8,5	78,1 82,1	4 4	1,6
Variance		+1,1	+3,5	+1,3	+4		

When ripening dryland it is important to get the rate correct. Ethrel should only be applied to those fields with a TAM of over 50 mm, as cane with a TAM of less than 50 mm is likely to be ripened through stress.

Table 3. **Showing the effects of TAM on ripened cane**

Tam	Observation	Positive/negative result to ripened cane
≥ 50	5	+ 4
≤ 49	2	- 2

Conclusion

With eldana present it can be of little doubt that it is uneconomical for a grower to carry-over large areas of cane. Cutting a shorter cycle means that the cane is being farmed more intensively and that there is less room for mistakes, the economics are far from forgiving. The cane grower must weigh up the benefits from cutting cane at a younger age, against the increased costs and management problems.

18 October 1988

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

RIPENER USE ON AN IRRIGATED ESTATE

by

R Dunley-Owen

Introduction.

For a number of years Crookes Brothers Limited (Riversbend Estate) in Nkwalini has been aiming at cutting its entire cane crop annually. The combination of irrigation and good growing conditions should enable sufficient growth for cane to be cut at 12 months.

The high costs of irrigation and cane transport (+-50 km), necessitated the use of ripeners to increase the inherently low sucrose content of young cane.

No formal or controlled trials were conducted but sucrose levels were monitored annually since the 1984 season when ripeners were first used and there is evidence that ripening has been financially beneficial.

Results.

Due to various factors such as extreme soil variability and the lack of suitable experimental facilities it was decided to conduct a large scale observational trial. It would have been ideal to determine e.r.s. but for practical purposes only annual sucrose levels were recorded and interpreted. Graphs of the data for the years 1984 - 1987 are attached and indicate Actual Sucrose Percentages per week. The first week on the graph is the first week of May and if standardised on the 1988 calendar, month ends would be as follows:

Week	Date
4	28/05
8	25/06
13	30/07
17	27/08
21	24/09
26	29/10
30	26/11
35	31/12
40	30/01
44	27/02.

On the graphs periods when ripened cane was harvested are enclosed between vertical lines.

Initially ripeners were applied in order to increase sucrose at the beginning of the milling season up to the period of normally high sucrose (broadly speaking from mid August to mid October). From 1985 attempts were made to increase the sucrose after this period as well.

Anomalous data was recorded and there are several instances where it is impossible to adequately explain these deviations.

The following observations and deductions were made from the data:

3/........

1984/85: Average Cane Age: 12,81 months.
The initial trial indicated a response to ripeners which seemed to induce a one percent sucrose increase.

The dramatic drop at the end of the season (mid January) had been noted both in previous and subsequent years and is one of the reasons growers in the area support the closure of the mill by the end of December. The mill opening date is not always finalised when spraying commences and can influence when to cut ripened cane and what ripener to use. The results indicate that ripening could have been continued through to week 20.

1985/86: Average Cane Age: 13,06 months.
Because of the 1984/85 season results the ripening programme was extended to the end of August and then recommenced at the beginning of November. The drop in sucrose for 4 weeks at the beginning of August is difficult to explain but could be as a result of our inadequate knowledge or incorrect management of Fusilade as a ripener as this product was an unknown quantity at this stage. Heavy rains at the end of October appeared to have caused a drop in sucrose. After this period Fusilade ripening initially boosted sucrose levels which later dropped back disappointingly. While this was again considered a period of learning with the use of Fusilade the possibility exists that sucrose could have been lower in this period had there been no ripening.

4/........

1986/87: Average Cane Age: 11,05 months.

Concentrations and ripening periods with Fusilade were varied this season. During the initial period attempts were made to ripen every two weeks because of heavy flowering. Flowering was also the reason why ripening was not continued as long as the previous year. However there is some evidence of increased sucrose noticeable at the end of the season and despite an early end to the season, sucrose levels dropped sharply after the ripening period.

1987/88: Average Cane Age: 12,24 months.

The harvesting of unripened cane on a recently purchased farm interrupted the early ripening programme of this year. The areas ripened in the first half of the season indicate an increase in sucrose. The unseasonal drop in the naturally high sucrose period was due to the floods, when burnt cane could not be removed from the fields up to 2 weeks before milling. The final ripening initially improved sucrose with the subsequent erratic results probably being due to the difficulties caused by the floods and subsequent heavy rains which constantly interfered with the timing of cutting.

5/........

Financial Returns.

In the absence of accurate trials the financial implications are difficult to quantify accurately but our results would seem to support the following rough guide:

In the 1987/88 season the S.I.C.B. produced comparative quality figures for Quota Groups (as well as Crush Groups). Riversbend Estate had an average Actual Sucrose Percentage 0,67 higher than the Quota Group for the entire season. While it cannot be said that this differnce was due solely to ripeners, it is felt that this 0,67% difference is significant, as the Estate harvests cane at a much younger age than the majority of other in Nkwalini growers. In addition some of the cane cut by the Estate was unripened (38% of the season).

Should the 0,67 increase in sucrose percentage be attributed to ripeners in the 1987/88 season the following increased revenue could be extrapolated:

Area ripened	:	674 ha (83% total area)
Average Actual Sucrose	:	12,4%
Total tons cane	:	68 636
Total ripener program cost	:	R38 600.

0,67% of 68 636 tons cane = 459 tons sucrose

All cane was A Pool and assuming R300/ton

Increased revenue	:	R137 700
Less ripener costs	:	R 38 600

Profits which could be accredited to ripeners: R99 100.

6/........

Other costs not accounted for would be minimal (labour for running markers and managers time).

It is felt that the above indicates that the 1987/88 ripener program was economically justified.

Conclusions.

This Estate will continue at this stage with its ripener programmes as follows:

1. Beginning of season (2 weeks): Ethrel (uncertainty of mill opening).
2. Following 2 - 3 weeks: Piggy back (Ethrel followed by Fusilade). At this stage Piggy back results are inconclusive and future results will determine how much this will be used.
3. Up to mid August: Fusilade.
4. Mid August to mid September: Ethrel (this period could be shorter).
5. November to end of Season: Fusilade.

7/........

Points of importance for ripener use are:

Accurate appraisal of each fields condition to ensure that growth is sufficient so that cost of ripening can be covered.

Timing of application and cutting must be carefully controlled.

Knowledge of response on different varieties (eg NCo376 reacts well while the N14 response is less positive).

Varying rates of ripener for different varieties and length of ripening period are under investigation and new ideas could be available.

Aerial application (fixed wing) availabilty and landing strip proximity.

Summary.

Despite the fact that the practice of ripening requires further refinement, observations over the past 4 years on Crookes Brothers Limited (Riversbend Estate, Nkwalini) indicate that it not only increases profits but also enables cane to be cut at 12 months with its attendant advantages.

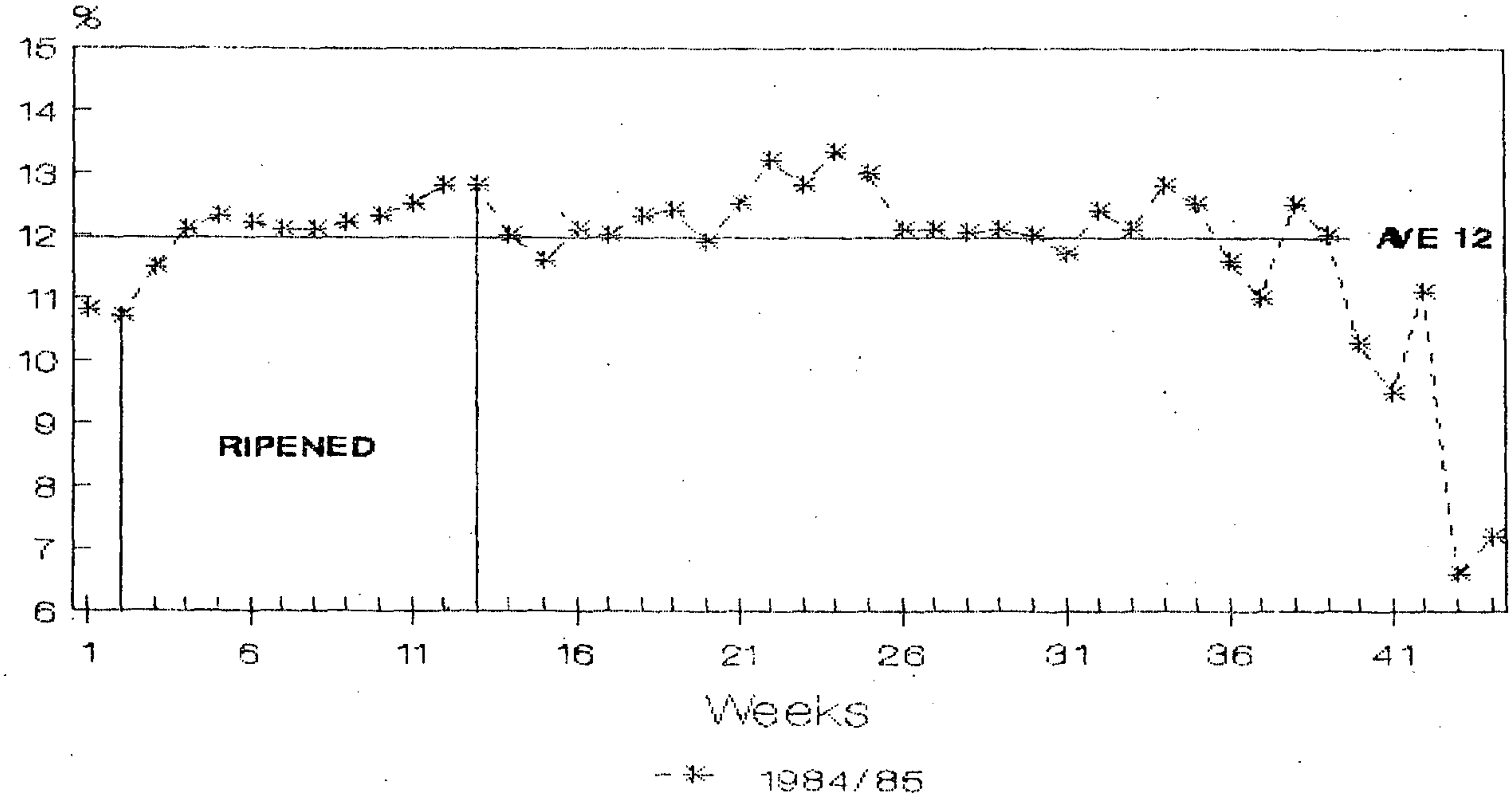
R. DUNLEY-OWEN

Crookes Brothers Limited

October 1988

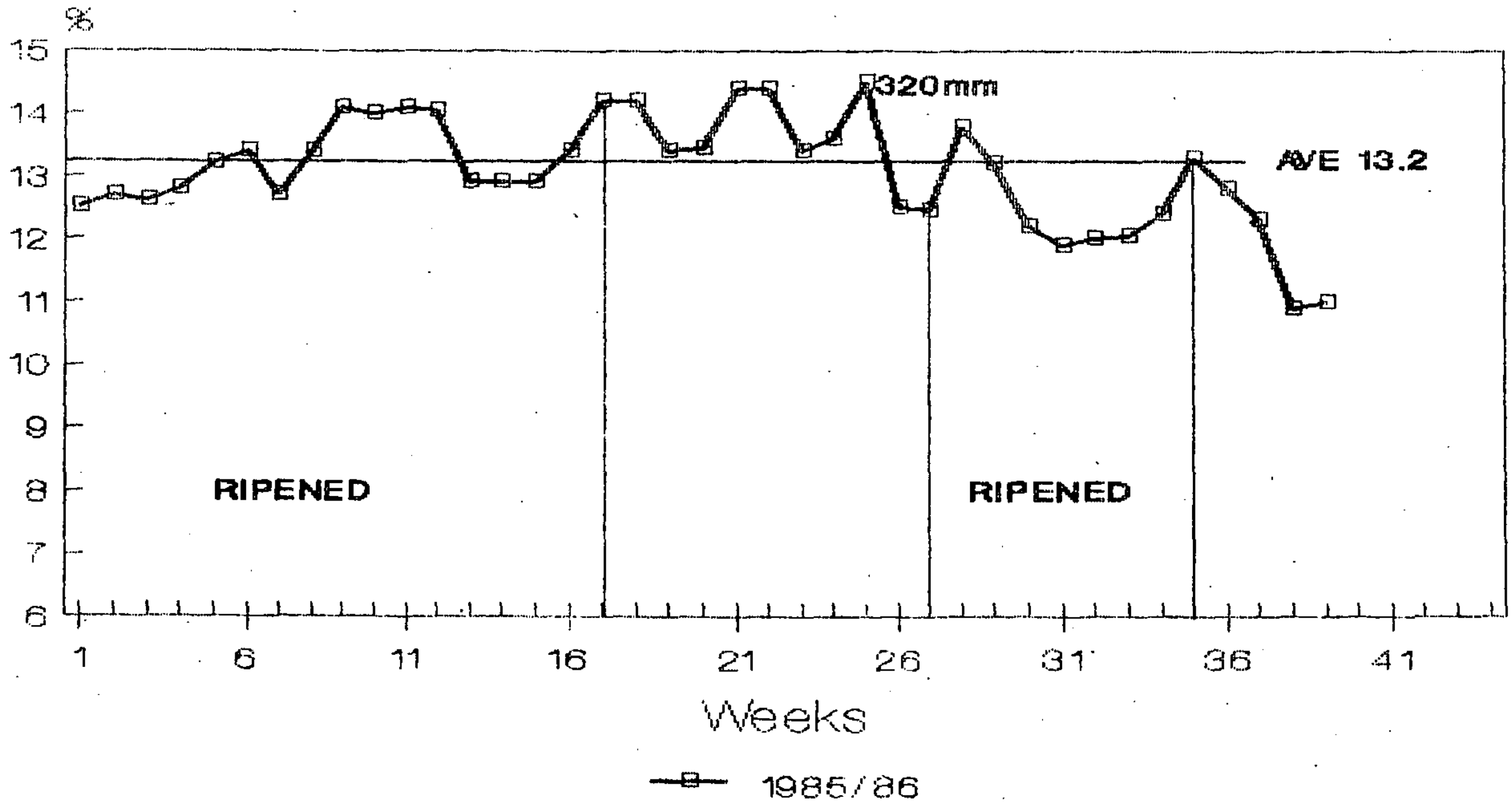
CBL Riversbend Estate 1984/85

Weekly actual sucrose %



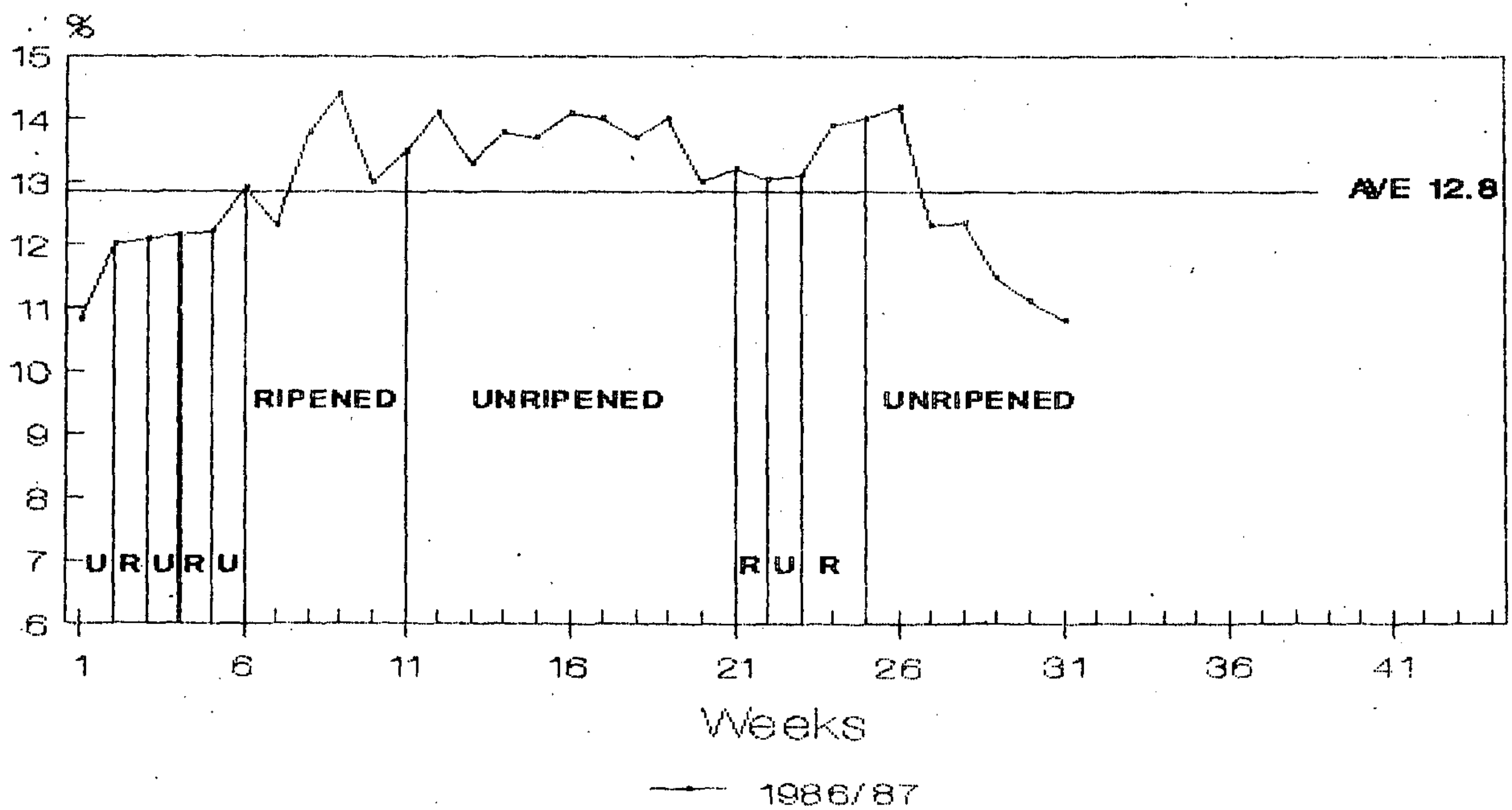
CBL Riversbend Estate 1985/86

Weekly actual sucrose %



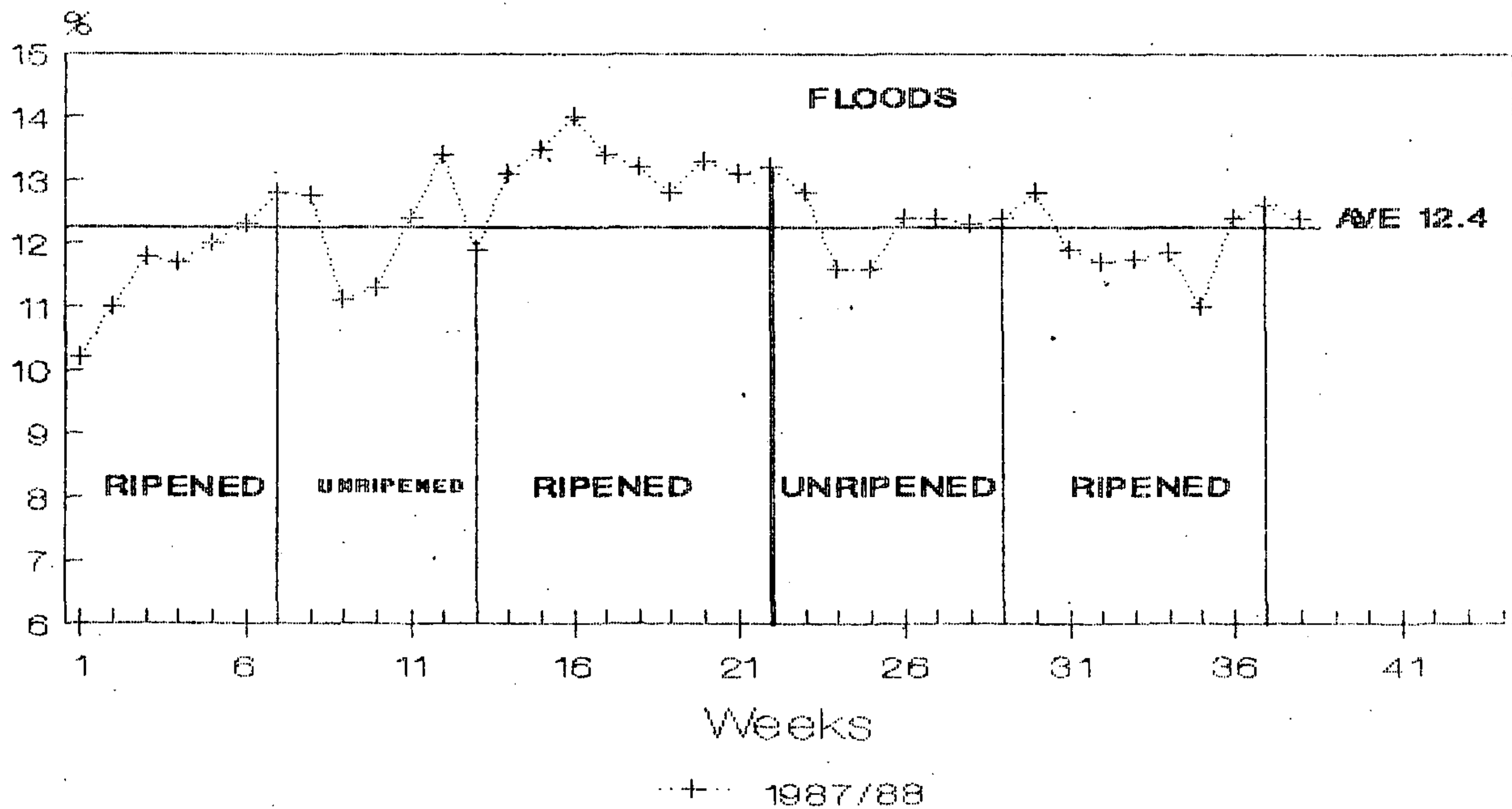
CBL Riversbend Estate 1986/87

Weekly actual sucrose %



CBL Riversbend Estate 1987/88

Weekly actual sucrose %



SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMIST'S ASSOCIATION

HARVESTING YOUNGER CANE : EFFECTS ON SUCROSE PRODUCTION

by MG Murdoch

Industry yield statistics

It is difficult to discern what the trend in yield of sucrose is in recent years. An interfering factor is the unusual number of extremes of climate that have been experienced. (droughts and floods)
Also the direct effect of eldana is difficult to gauge. Data are given in table 1 for the period 1968-1987.

It is fairly clear that :

- that the proportion of area harvested annually has increased.
- crops are being harvested at a lower tonnage more recently.
- the sucrose content seems to have declined.

As best as can be estimated the yield of sucrose (per hectare per annum) appears to be static.
Harvesting younger cane does not appear to have increased yields, but it may of course have stayed a fall.

Age effects

Sucrose yield is of course determined by the yield of cane and the sucrose content.
The increase in yield of cane (fresh mass) with age is thought to show some falling off after reaching some yield level or age.
The sucrose content increases to approach a maximum value.
If the reason for yields not continuing to increase linearly, is because of the rise in maintenance (respiration) requirements then it would seem logical that yield of (stalk) dry matter is a better criterion for when levelling off occurs than either age or yield of (fresh) cane.

Dry matter content may be as low as 20% in very immature cane, and normally seldom increases beyond 32 percent. The brix proportion of dry matter is usually

low in very immature stalk, but then seems to stabilse and shows little further increase in older stalk. (usually at about 53-57 percent for NCO376)
Purity can rise to as high as 90-95, resulting in a sucrose % cane of about 15,0 %, but can be as low as 70% in immature young cane.

The problem with young cane thus primarily whether the dry matter is favourably partitioned for sucrose. Since it is difficult to obtain an estimate of the age versus tons of dry stalk relationship, let us make a working supposition that young cane and old cane produce equivalent amounts of dry cane stalk within the range 15 to 25 tons/ha. (ie approximately 60 to 90 tons cane/ha)

If one can assume that the brix proportion of dry matter is similar between the older and younger cane then the ratio between the purities provides a first estimate of the loss incurred by harvesting the younger crop at its less mature stage.(eg 75 vs 85 purity represents a 12% loss)
It is preferable to use the sucrose proportion of dry matter, except that this is a less familiar measure.

Eldana

It is well known that the older the crop the greater the risk of losses due to the eldana borer.
An example of what can happen is given in table 2. These data were obtained from sampling commercial fields in the Amatikulu area. The weight of stalks and the increase in the number of internodes indicates the growth of stalk from November to May. However the sucrose content declined typically, and there was no gain of tons of sucrose. Clearly it would have been more productive to have harvested in November.

The frequencies of losses of a magnitude such as this, and of a lesser size need to be estimated.
The simplest indicator of loss appears to be the reduction of brix relative to fibre.
Using the data in the table as an example the ratio has fallen from 1.05 to 0.47, representing aloss of 55%.

The dilemma

From the production of sucrose point of view, one has the choice of incurring losses from eldana with older cane, or losses from unfavourable partitioning with younger cane.

The problem is not a simply a question of age at harvest alone. It has been pointed out the month of harvest is a severe complicating factor, namely, young cane is not far behind older cane during the peak sucrose period in terms of sucrose content, whereas it can have very poor characteristics in April and May. Also this is not consistent from one year to the next.

MGM/25.10.88

TABLE 1 - TOTAL INDUSTRY

YEAR	%HARV	TCANE /HA	TCANE /HA/YR	SUC %CANE	TSUC /HA/YR
68	54.6	75.3	41.1	13.11	5.39
69	55.9	80.1	44.7	12.88	5.76
70	50.1	73.4	36.8	13.61	5.00
71	59.9	84.6	50.7	12.97	6.58
72	56.7	86.3	48.9	13.26	6.49
73	57.1	79.2	45.2	13.08	5.91
74	57.5	84.3	48.5	13.08	6.34
75	55.2	84.2	46.5	12.60	5.86
76	59.1	89.2	52.7	12.43	6.55
77	62.9	82.6	52.0	12.84	6.67
78	58.8	85.0	50.0	12.64	6.31
79	60.8	79.6	48.4	12.96	6.27
80	56.3	63.5	35.7	13.34	4.77
81	66.5	74.3	49.4	12.30	6.07
82	66.1	73.1	48.3	12.86	6.21
83	59.4	55.3	32.8	12.33	4.04
84	66.9	81.9	54.8	12.27	6.72
85	65.0	70.6	45.9	13.13	6.03
86	67.5	66.3	44.8	12.80	5.73
87	68.7	76.9	52.9	12.00	6.34
MEAN	60.2	77.3	46.5	12.82	5.95

TABLE 2 - ELDANA EFFECTS

DATE	DM%	FIBRE%	BRIX%	BRIX/ FIBRE	BRIX% DM	POL %	PURITY
10.85	30.5	14.9	15.6	1.05	51.0	14.0	90.0
11.85	29.2	14.9	14.3	0.96	49.0	12.6	87.9
12.85	26.7	14.8	11.9	0.80	45.8	10.4	85.3
01.86	26.1	16.3	9.8	0.60	37.7	8.2	82.9
02.86	27.2	17.8	9.4	0.53	34.7	7.6	80.3
03.86	27.0	18.0	9.0	0.50	33.3	7.3	80.2
04.86	26.5	17.8	8.7	0.49	33.1	7.1	80.5
05.86	26.9	18.3	8.6	0.47	31.8	7.3	85.8
MEAN	27.5	16.6	10.9	0.68	39.6	9.3	84.1

TABLE 2 - ELDANA EFFECTS

DATE	ELD/100 STALKS	JTS.BORED /STALK	TOT.JTS /STALK	gCANE /STALK	gPOL /STALK
10.85	2.7	0.5	12.0	278	39
11.85	6.7	0.7	14.1	273	35
12.85	21.0	1.3	15.4	256	27
01.86	25.4	3.3	18.1	283	24
02.86	59.4	5.0	19.2	281	22
03.86	65.0	5.8	20.1	301	22
04.86	50.6	6.3	21.8	301	22
05.86	79.9	8.8	23.4	352	26
MEAN	38.8	4.0	18.0	291	27

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMIST'S ASSOCIATION

The effect of age at harvest on sucrose yield.

NG Inman-Bamber

How rapidly does my crop accumulate sucrose yield as it develops and at what stage should it be cut to avoid losses due a) to eldana and b) the natural ageing processes of the plant ?. Much attention has been devoted to point a) but quick answers are not available for point b). I hope to illustrate with data some principles of crop growth that may give an idea of what eldana is costing by forcing us to cut young cane. The freedom of the Agronomist's Association's unofficial forum is used liberally.

The mental image of a 12 month old crop maybe a 4 m tall stand of cane weighing 180 tons ha-1 or a short crop 1 m tall weighing 40 t ha-1 depending on where you live. Time per se is not relevant to crop physiology so we need to consider growth rate in relation to physiological growth stage, leaf count or some measure of crop size (mass, volume or height). How these things vary with age is relevant only because one has to plan a harvest schedule.

Comprehensive growth analysis data from Pongola (Rostron, 1972) and voluminous height data from rainfed variety trials indicate that cane mass and height of NCo376 increases most rapidly when the cane yield is about 40 t cane ha-1 (figure 1).

Cane yield is relevant only to the economics of harvesting and haulage so Figure 1 must be compared with Figure 2 which shows Rostron's sucrose yield data in relation to cane yield (curve 1). Curve 2 is the slope of curve 1 and it indicates that sucrose yield accumulated most rapidly when the cane yield was about 140 tons ha-1 which is materially different to the optimum crop size in Figure 1.

We are slowly building a mathematical model of the physiology of cane growth. Two models of total dry mass (biomass) accumulation have constructed largely from published data and these have been compared with independent growth data like that of Rostron's (1972). The following factors have been included in these models.

1. Interception of solar radiation by a developing leaf canopy.

2. Efficiency of photosynthesis in converting radiation to carbohydrate.

3. Effect of temperature and crop growth stage on this efficiency.

4. Allocation of carbohydrate to leaves, stalks and roots (see figure 3).

5. Respiration of leaves and stalk separately (Glover's model).

6. Effect of temperature on respiration (Glover's model).

7. Growth and maintenance respiration (Lorber's model).

For this discussion the effects of crop mass and time year on 1) dry matter content of stalks, 2) allocation of carbohydrate to fibre and to soluble solids (brix) and 3) juice purity have been considered empirically using Rostron's data. These effects are shown respectively in figures 4, 5 and 6. The associations between DM% and cane mass and between purity and cane mass were fairly clear and in both cases one curve for the period January to April or May and another for the rest of the year was justified as might be expected. The association between brix % DM and cane yield was not distinct. Factors affecting this component need to be investigated further but I used the weak association anyway. Lorber's model was applied to daily sun hour and temperature data during two of the growth cycles investigated by Rostron.

January start.

In figure 7 the modelled and measured total biomass for the crop starting in January 1970 are shown. The other components are derived from modelled biomass and there is good agreement between derived and measured sucrose yield because of the accuracy of the biomass prediction.

April start

The effect of starting the crop in April on modelled and measured yield components is shown in Figure 8. Total biomass was not measured in this crop. Sucrose yield was substantially overestimated probably because the model predicted a more rapid canopy development than one is accustomed to seeing at Pongola during winter. Canopy development is a weak link in the model at present.

The slopes of the modelled sucrose accumulation curves are also plotted in figures 7 and 8 to focus attention on the indication that the most rapid accumulation of sucrose occurred when the cane yield was about 140 tons per hectare in both crops. At this stage biomass was apparently increasing most rapidly, and allocation of dry matter to the stalk, to brix within the stalk and to sucrose in the juice was also increasing. Biomass accumulation tailed off when the crop reached about 160 to 170 tons per hectare because of the increasing amount of maintenance respiration.

One cannot entirely reject the result of these calculations as a guide to the optimum growth stage for rainfed cane. I do not think that any of these relationships will change markedly when we consider rainfed cane. Water stress of course will tend to shift the curves in figures 4 and 6 to the left. Biomass will accumulate less rapidly and ageing will reduce photosynthesis a bit more than in the irrigated crop.

I wonder if the lack of an upward yield trend in the industry, despite the release of superior varieties, is because we are forced to cut the crop before it reaches its most efficient stage.

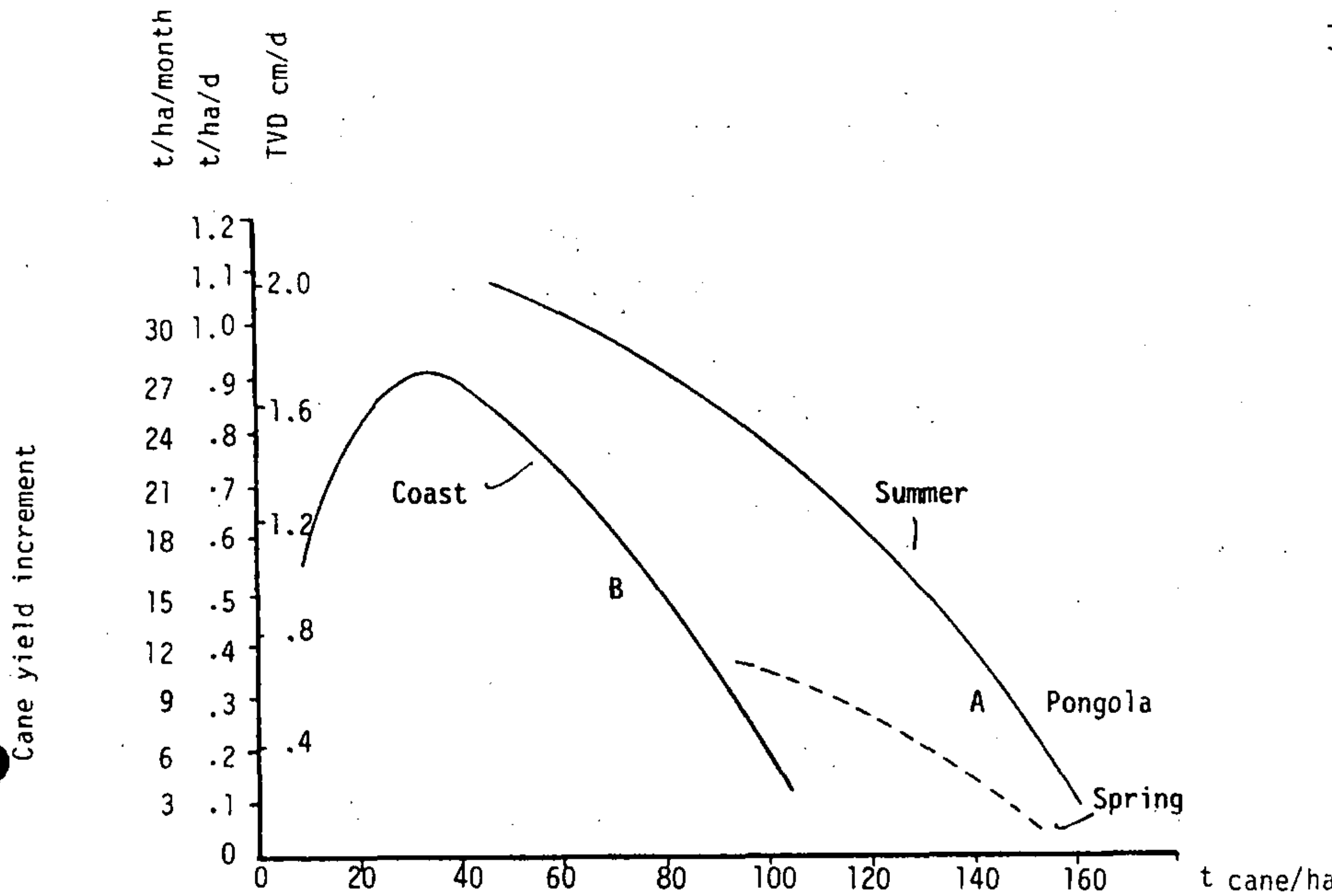


Figure 1 Increments in cane yield of NCo376 grown at Pongola (A) and stalk height increments (converted to yield) of NCo376 grown in the south (Mtubatuba to Paddock)(B) both during summer when soil water and nutrients were adequate.

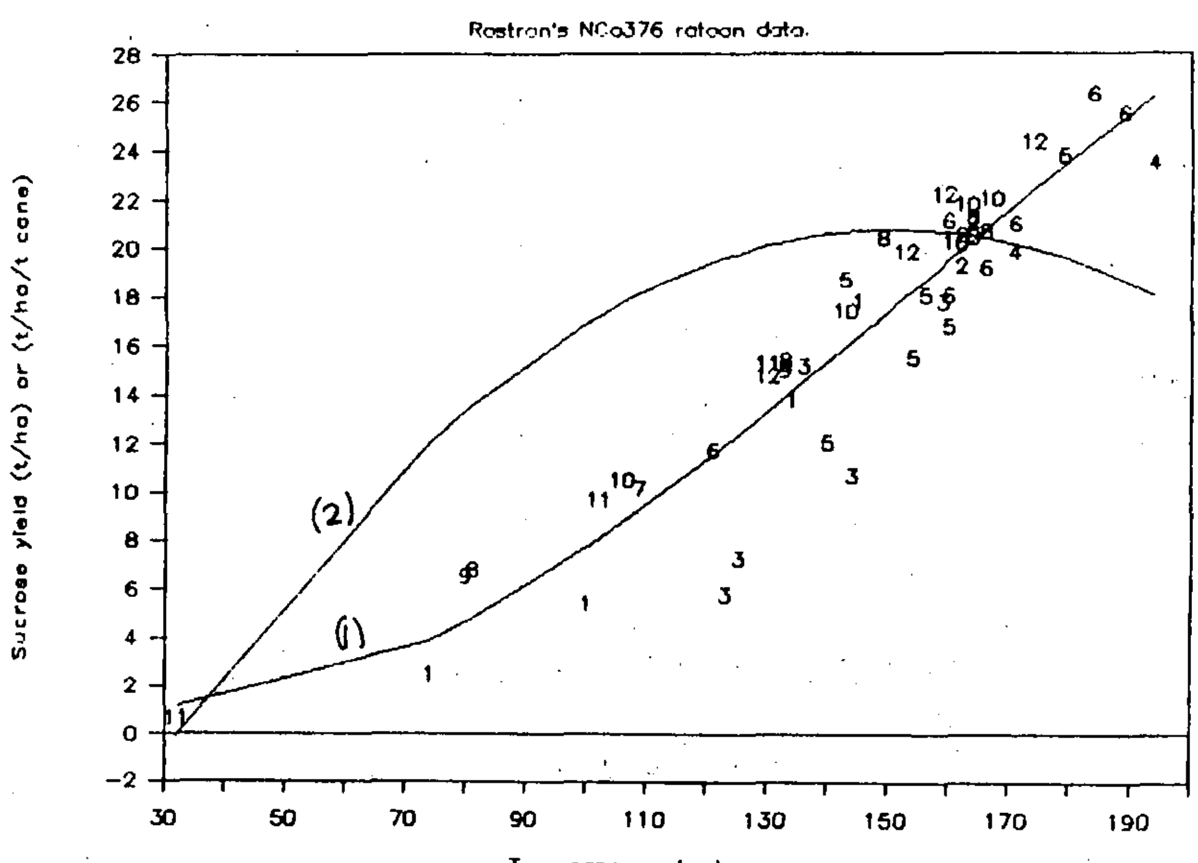


Figure 2. Sucrose yield in relation crop cane yield (curve 1) and slope of curve 1 (curve 2) using Rostron's measurements on NCo376 at Pongola.

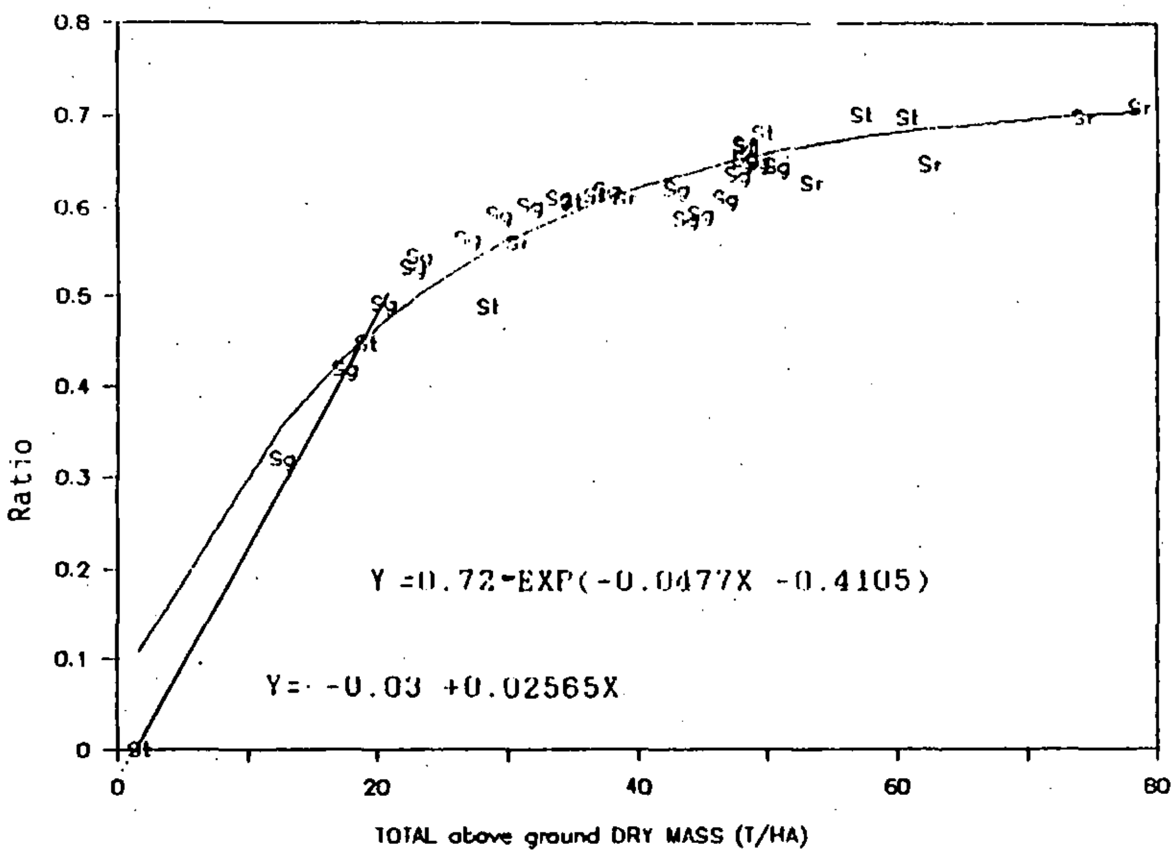


Figure 3 Ratio of stalk dry mass to total aerial dry mass (Sg.Sr and St) obtained by Gosnell (1968), Rostron (1974) and Thompson (1988) respectively.

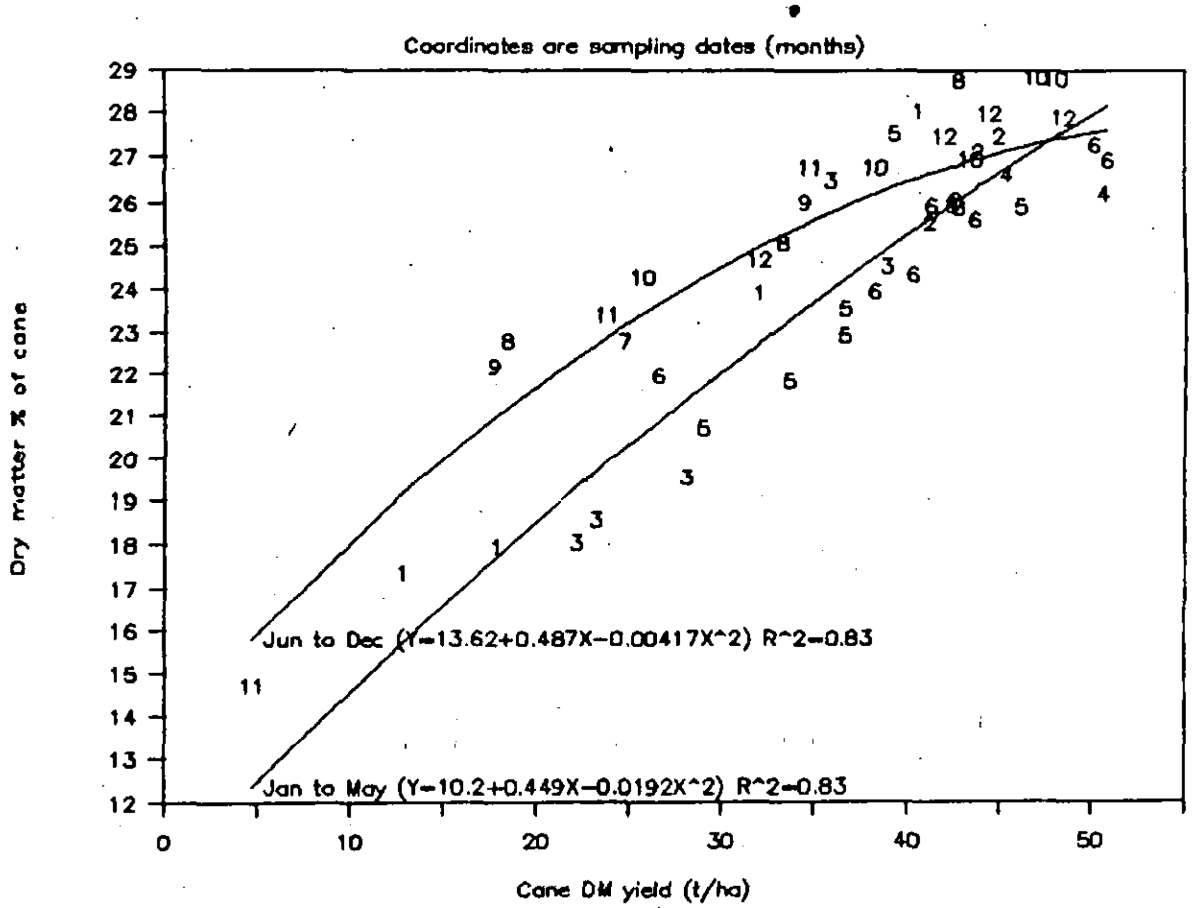


Figure 4. Dry matter % of cane stalks in relation to cane dry mass per hectare. Coordinates are the month of harvest.

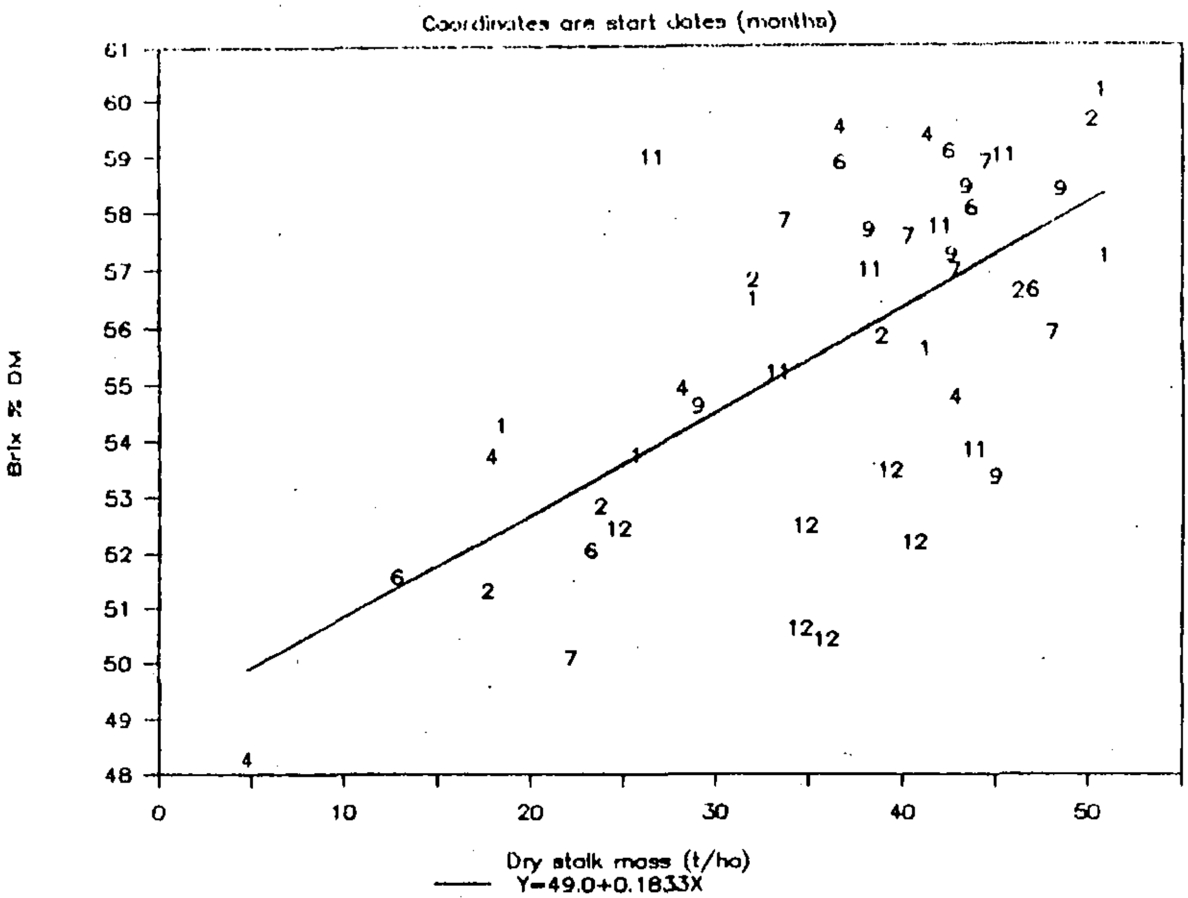


Figure 5. Brix % dry matter of cane stalks in relation to cane dry mass per hectare. Coordinates are the month of that growth started.

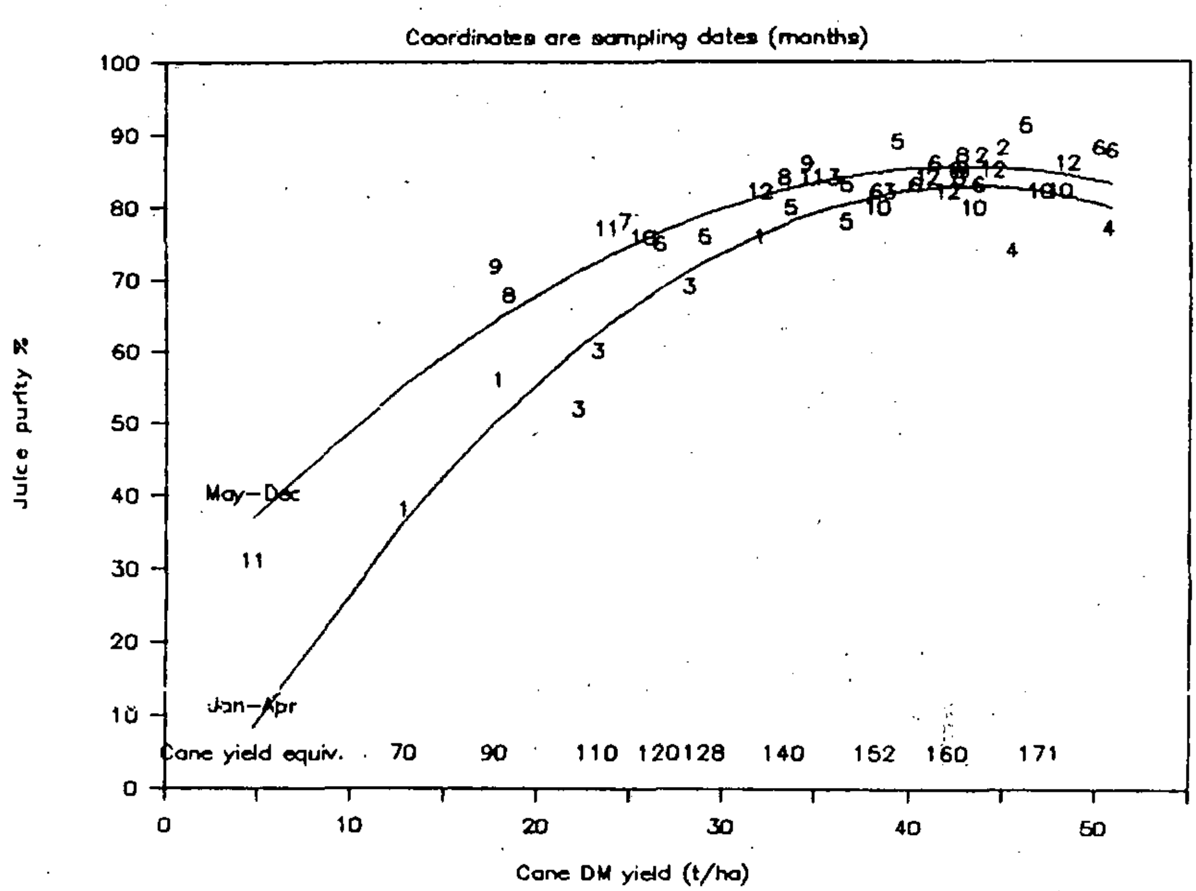


Figure 6. Juice purity % in relation to cane dry mass per hectare. Coordinates are the month of harvest.

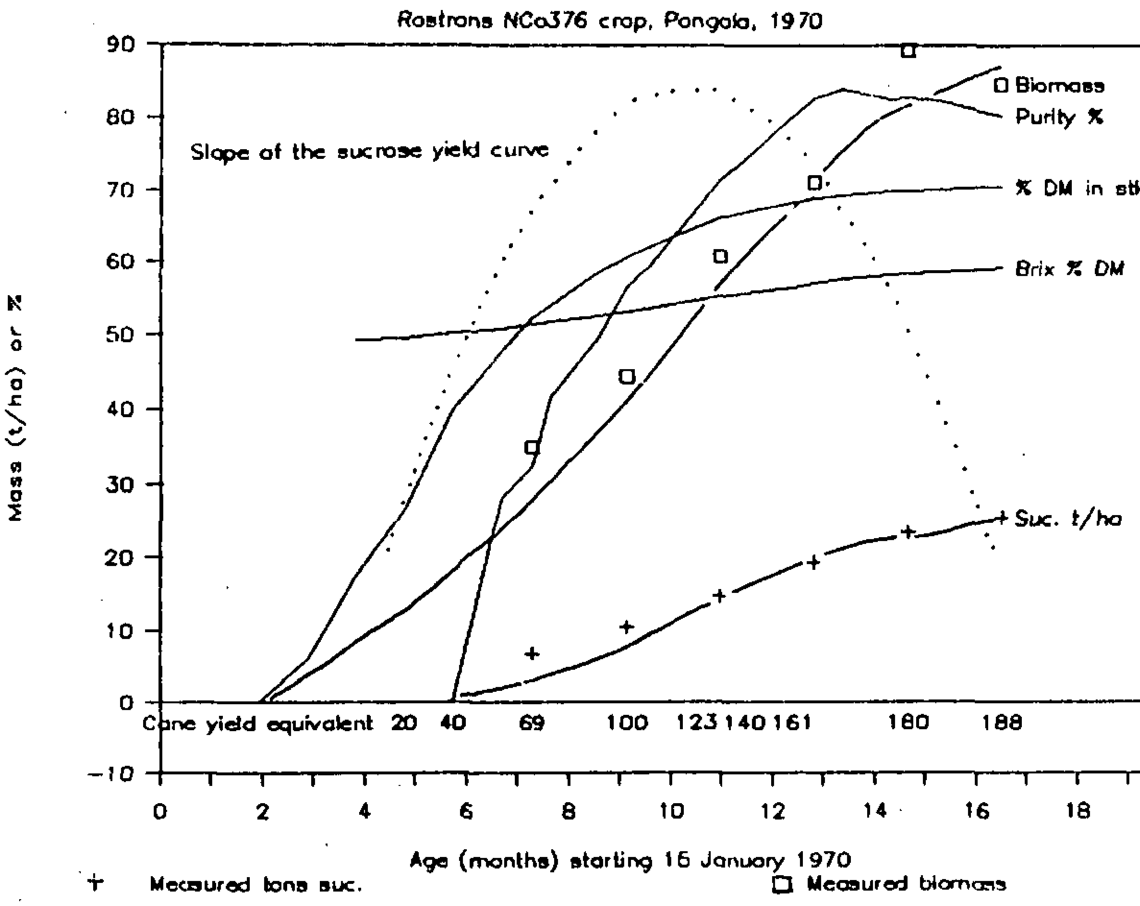


Figure 7. Modelled yield components and measured biomass and sucrose yield of a ratoon crop of NCo376 starting in January 1970 at Pongola (Rostron, 1972).

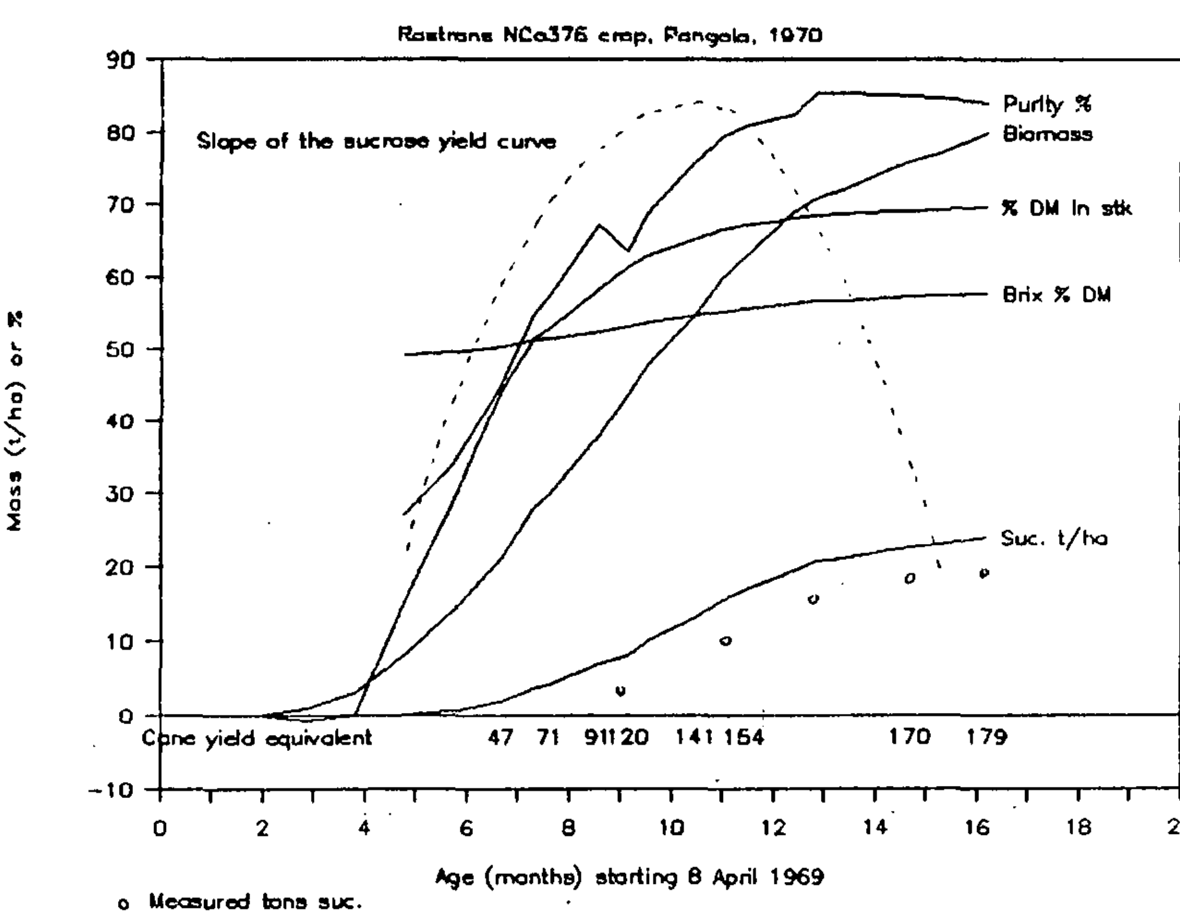


Figure 8. Modelled yield components and measured and sucrose yield of a ratoon crop of NCo376 starting in April 1969 at Pongola (Rostron, 1972)

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

Effects of flowering on yield of sugarcane

by K J Nuss

Sugarcane flowering is induced by the change in daylength from long days to short days in late summer, early autumn. In Southern Africa this occurs mainly in the month of March when the daylength decreases from 12,5 h to shorter days. In addition to the daylength, the following factors are important in flower induction:

a. Age of cane - for cane to flower, it must have at least six exposed internodes at the time of initiating in March. Thus the cane that is younger than five months in March usually does not flower.

b. Temperature - induction of flowering is prevented when the night temperature drops to 18°C. Four or more cold nights during induction reduces flowering and ten cold nights prevent flowering. It is for this reason that no or little flowering occurs in our high altitude areas.

c. Moisture - prior to and during the induction, sugarcane must be growing well with no stress due to the absence of water for flowering to be profuse. Flowering could be prevented by reducing irrigation during this period but at the expense of losing yield.

d. Variety - some sparse flowering varieties exist in the tropics but the yield of these in Southern Africa is below that of existing commercial varieties.

Flowering and quality and yield traits

Two trials were conducted at CFS in which flowering was prevented with night light breaks. No flowering occurred in the lighted plots and between 40 and 70% of the stalks in the control plots flowered. In Trial 1, five varieties were sampled in May, July, August, September and October while in Trial 2, N11 was sampled monthly from September to December.

In Trial 1, the purity of stalks from flowered (F) plots and non-flowering (V) plots were similar at all sampling dates. The fibre content was also similar with both samples being low (10%) in May and increasing to 12,3% in October. The fibre content increased during the crushing season and this was not due to flowering. The pol values increased faster in F stalks and by October had 15,8% pol compared to 14,9% in V stalks. This difference was not significant. Flowering had, if anything, a beneficial effect on quality traits in this trial.

The cane and sucrose yield in Trial 1 were also determined. In the V plots the cane yield increased from 96 tons cane in May to 111 tons in October and in the F plots the yield increased from 95 tons to 126 tons. Similarly the yield of pol increased from 12,0 t in V plots in May to 16,5 t in October. The F cane yield of pol was 11,3 t in May and 19,8 t in October. The sucrose yield of flowered cane increased at a faster rate from May to October than vegetative cane and the differences in October appear large but were not statistically significant.

In Trial 2, the fibre content in V stalks of N11 increased at a faster rate from September to December than in F stalks. The pol values in V stalks declined only marginally from 15,1% in September to 14,9% in December but the pol in F stalks decreased from 15.3% to 13.2% in that period. The yield of cane in lighted plots (no flowering) and F plots remained at about the same levels from September to December. Sucrose yield in flowered plots decreased from 11,4 t in September to 9,8 in December because the sucrose content decreased. In the non-flowered plots the sucrose yield remained constant during this period.

In December, it was observed that eldana occurred in the cane of trial 2. The percentage internodes damaged in V stalks was 8,7 compared to 12,6 in F stalks. Flowered stalks with eldana did not have any side shoots and from work in Mauritius, it appears that side shoots are essential to maintain the sucrose content. The effect of eldana on the results of this trial is not known.

Flowering and eldana

Eldana is usually found in the mature parts of the stalks and less in the upper, immature parts. Flowering increases the rate of maturity when compared to non-flowered stalks, although by a small margin only. If sugarcane maturity is anything to go by in susceptibility to eldana, then one would expect that eldana presence and damage would be marginally in greater in flowered stalks than in vegetative stalks.

KJN/lb
13 October 1988

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

THE CONTROL OF FLOWERING IN SUGARCANE AT DWANGWA, MALAWI

by AG King

INTRODUCTION

Dwangwa Sugar Estate comprises 5 500 ha and is situated on the shores of Lake Malawi (12'30" south and ± 480 m.a.sl.). The estate is surface irrigated and planted largely to the variety NCo376. Harvesting takes place annually between May and early December.

THE FLOWERING PROBLEM

1. Level of flowering

Climatic conditions prior to, during and after the floral initiation period (9 - 17 February) favour flower initiation and development resulting in consistently profuse and uniform flowering from year to year. Flower emergence starts in the middle of April and is generally completed by early May.

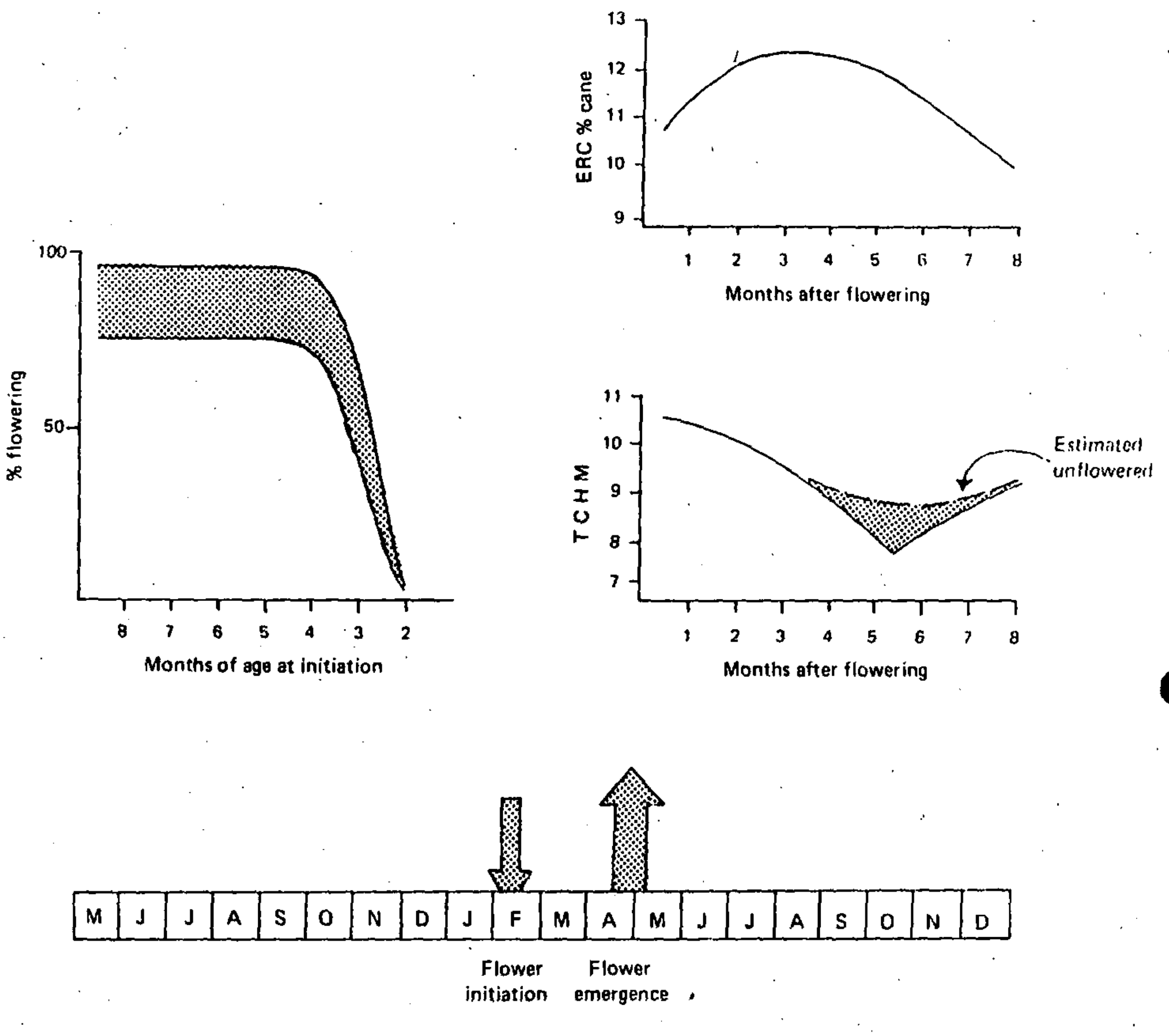
Cane harvested between May and October (ie more than 3,5 months at initiation) generally flowers heavily while that harvested later is progressively younger at initiation and consequently flowers less. (See Fig 1).

2. Effects of flowering

The adverse effects of flowering become apparent during August, about 3,5 months after flowering and become increasingly serious as the season progresses. Sugar yields (tonnes ERC/ha) can be reduced by as much as 20 - 30% in cane harvested during late September and October. Losses are caused largely by reduced cane yield (cessation of terminal growth and pith development) although cane quality is also affected (reduced sucrose and purity and increased fibre) - (see Fig. 1).

The effects of flowering on yield at Dwangwa are particularly serious since the cane can be very young at flower initiation and is only harvested many months after flowering. More importantly, the low latitude and altitude result in a warm winter which favours both continued growth of cane and accelerated deterioration of cane quality.

Figure 1: The effects of cane age on level of flowering and the effects of flowering on cane yield and quality at Dwangwa (3 year mean)



CHEMICAL CONTROL OF FLOWERING

Work on flower control started in 1980 with the herbicide, Gramoxone and later with Reglone. Application of these chemicals shortly before the floral initiation period (8 - 10 February) inhibited flowering effectively but also caused yield losses of as much as 10 - 20%. The need for a chemical with a less phytotoxic reaction led to the introduction of Ethrel into the trial programme in 1981.

3. Commercial trials

Large scale observation trials in 1981, 1982 and 1983 revealed that Ethrel had considerable potential as a flower control agent on NCo376 when sprayed shortly before initiation (6 - 9 February) and at 1,5 - 2,0 l/ha. However, flower control **was** dependent on age of cane at spraying and yield responses were complex and depended on date of harvest as well as level of control achieved. Results of these trials may be summarised as follows:

3.1 Effects of Ethrel on flowering

- Flower control was only effective on cane that was less than 4,5 months old at spraying ie October and November harvest.
- Flower control was progressively less effective the older the cane at spraying although subsequent flower **emergence** was delayed by 4 - 6 weeks.

3.2 Effects of Ethrel on yield

- Sugar yields of late harvested cane, where flower control was effective, were increased by 1 - 3 tons ERC/ha largely through an effect on cane yield.
- Sugar yields of mid-season harvested cane, where flower control was less effective, were variable (both cane yield and quality) and yield losses of up to 1 ton ERC/ha were observed in some instances.
- Sugar yields of early harvested cane where flower control was poor but where flowering was delayed, were increased by 1 - 1,5 tons ERC/ha due to a ripening response which was maintained until the end of July, 6 months after spraying.

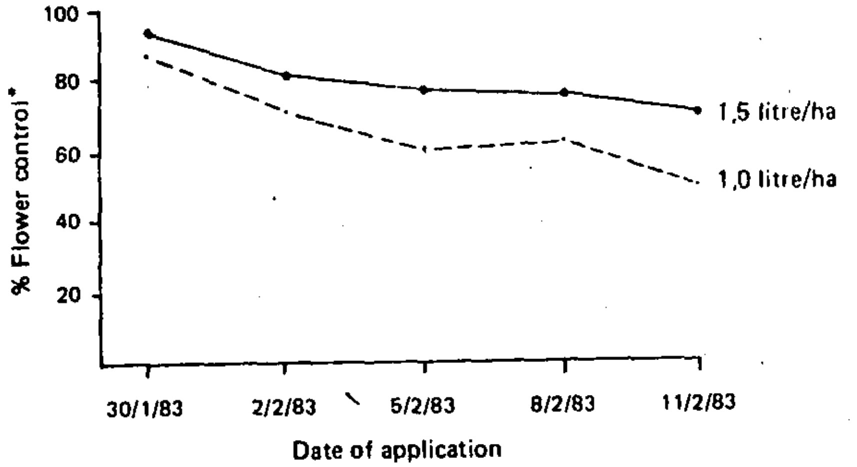
These results prompted the initiation of a series of small plot trials in 1983 with the objective of improving flower control with earlier applications of Ethrel, assessing the efficacy of lower rates of Ethrel and quantifying the effects on sugar yield more conclusively.

4. Small plot trials

Ethrel was applied on five dates between 30 January and 11 February 1983, at two rates (1,0 and 1,5 l/ha) on NCo376 that was between 2,5 and 6 months of age at spraying ie August - November harvest.

4.1 Effects of Ethrel on flowering

Figure 2: The effect of date of application and rate of Ethrel on % flower control. (Means of 3 trials)



$$* \% \text{ Flower Control} = 100 - \left[\frac{\text{F. sprayed}}{\text{F. control}} \times 100\right]$$

Table 1: The effect of cane age at spraying on % flower control. (Means of all application dates)

Treatment	Age of cane at spraying			Mean
	5,5 months	4,5 months	3,5 months	
1,0 l/ha Ethrel	51,8	63,8	84,2	66,6
1,5 l/ha Ethrel	61,2	79,6	96,1	79,0
Mean	56,4	72,0	90,5	72,8

4.2 Effects of Ethrel on yield

The application of Ethrel resulted in significant increases in sugar yield which were closely correlated to the level of flower control (r = 0,90 average of 3 trials) and were also dependent upon time of harvest.

Yield responses ranged between 2 and 5 tons ERC/ha (15 - 30%) and were due largely to increased cane yield. Cane quality was also improved by between 1 - 1,5% ERC due to increased sucrose and decreased fibre content.

4.3 Conclusions

These trials confirmed the promising results of observation trials and more importantly that:

- Earlier applications of Ethrel improved flower control, resulting in satisfactory control in cane that was over 4,5 months of age at spraying (ie August and September harvest). There were indications that flower control could be improved further by even earlier applications of Ethrel (± 2 weeks before the start of initiation).

- The lower rate of 1,0 l/ha was almost as effective as the higher rate of 1,5 l/ha when applied at least 10 days before the start of the initiation period. When application occurred closer to the initiation period the higher rate gave more effective control.

- Yield responses from controlling flowering in late cut NCo376 at Dwangwa could be substantial. There was no evidence of yield losses observed in observation trials in 1982.

DISCUSSION

These results, together with those from recent work in Hawaii[1], Sudan[2], and Brazil[3] have confirmed that Ethrel can prevent flowering very effectively when applied 1 - 3 weeks before the start of the initiation period and at the rate of 1 - 2 l/ha.

The decision to use Ethrel for the control of flowering depends on the extent to which flowering affects yield, as well as the intensity and regularity of flowering itself.

In the lower latitudes, where climatic conditions often favour flowering and where the adverse effects of flowering are more pronounced[4], Ethrel has become an important management tool, especially where varieties which are prone to flowering are grown for their otherwise superior agronomic characteristics.

In higher latitudes, such as in South Africa, the effects of flowering are less important (probably only affecting cane cut late in the season or due to be carried over) and the potential for Ethrel use is consequently less. The situation is further complicated in these areas by the variable nature of flowering itself. The use of Ethrel would, therefore, need to be accomplished by a reliable means of predicting flowering intensity.

A method has been developed in Hawaii where it has been used commercially for a number of years to assist growers in deciding whether flower control is necessary or not[5]. The method involves consideraion of the following aspects:

- The flowering habit of each variety
- The effects of flowering on each variety
- The historical record of flowering in each field (aspect, elevation, etc)
- The absence of moisture stress in the crop for a period of 2,5 months prior to initiation. If the precipitation (rainfall and irrigation/ evaporation ratio during this period is less than 0,6 - 0,7 heavy flowering is not expected.

If all of these factors point to high flowering intensity, the fields are assigned a priority for treatment based on the age of the crop at initiation. A similar method could be developed for the South African context although more emphasis would have to be placed on the effects of minimum temperatures on flowering.

In the absence of a reliable prediction "model" the risk factor involved with the use of Ethrel can only be offset if a ripening response also develops. It may be possible to use Ethrel in this way in the northern irrigated areas where the ripening responses from Ethrel can be sustained for considerable periods. Application would have to take place in late February to control flowering in October and November harvested cane. The resultant spray-harvest delay (8 - 9 months) is longer than that currently recommended for ripening with Ethrel, however, and this matter is being investigated in more detail this year in Swaziland.

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SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMIST'S ASSOCIATION

The effects of cutting cane at a younger age for the control of Eldana and its effects on A and B Pools

by

FRANCIS DU PLOOY

1. INTRODUCTION

The introduction of the A and B Pool marketing system for the sugar industry in 1985/86 as well as the prevalence of Eldana, has resulted in growers having to re-assess their farming operations.

2. MAJOR OBJECTIVES

(i) To maximise Net Farm Revenue for the new management regime.

(ii) To reduce Eldana levels in order to produce the Best Quality cane possible.

(iii) To maximise the Gross Margins per hectare of land cultivated.

3. MANAGEMENT DECISIONS AS A RESULT OF ELDANA AND A & B POOLS

(i) What area does he wish to keep under cane?
(ii) Is it economical to produce B Pool cane?
(iii) What farming practises are required, in order to reduce the incidence of Eldana activity?
(iv) What is the future of S.A. as an exporter of sugar?
(v) Should he look at other enterprises?

A growers objective must be to ensure that his A Pool is achieved. This is purely an economic decision and can be seen from Table 1 in the Gross Margin Analyses.

In order to achieve this he must decide exactly what area under cane he requires to ensure that his A Pool is met. When deciding this he must take into account adverse climatic conditions as well as having to contend with the Eldana problem.

We are aware that the only conclusive evidence on the control of Eldana is to cut cane at a younger age. We must, therefore, take cognicence of this in deciding what area to retain under cane. At New Guelderland Sugar Estates the incidence of Eldana/100 stalks is significantly lower than that of the average of our Group. This can be attributed to cutting approximately 90% of the area under cane over the past four years.

2/........

This has also resulted in the improvement to the quality of cane as shown on Table III.

Production of B Pool Cane

The decision on whether to produce B Pool cane is purely economic.

Table I shows the Gross Margin Analyses of the various soil forms for both A and B Pool.

Please note that these costs are applicable to NGSE for the year 1986/87 in accordance with our own costing system. Each grower would therefore have to do his own analyses to obtain the Gross Margin for his farm.

From these costs one can then make decisions on whether to delay the re-planting of certain fields or whether to reduce the rates of fertilizer levels applied, or whether or not to apply nematicides.

The Question of Other Enterprise

It is important to maximise the Gross Margin per area of cultivated land.

In the case of New Guelderland Sugar Estates where we already had timber plantations, comparisons were made on the Gross Margins of B Pool cane and timber.

From Table II it can be seen that the return on timber was greater than B Pool cane and that we therefore chose to replace these areas showing negative Gross Margins with timber. These happened to be the weaker sandier type soils which were furthermost from the mill and therefore the transport and ratoon maintenance costs were higher than other soils. It is also these soils which require re-establishing, more frequently than the better type soils.

The Future of S.A. Sugar Markets

Obviously, when considering these aforementioned decisions, one needed to make long term predictions on a number of matters.

Firstly, one needed to consider what the short, medium and long term future prospects were in terms of the possible sanctions of S.A. Sugar in the light of the current political problems. One also needed to hazard a guess as to what the future export price of sugar might do over the years.

4. CONCLUSION

Having made these predictions and looked at the comparisons of the possible future of the timber markets we can then perhaps justify our decisions to:

3/........

(a) Produce only A Pool cane on the minimum area of land required to achieve this.
A greater degree of emphasis was placed on producing a better quality of cane. We believe we have achieved this if we look at Table III showing Sucrose %, Fibre % and Purity % levels in comparison with our mill group.

(b) We believe that it is not economical to produce B Pool cane, unless we are faced with having to carry over cane from one season to another, which, of course, would have disastrous results on the incidence of Eldana and the quality of the cane we wish to produce.

(c) We have decided to re-establish some 8% of cane area to Forestry.

(d) We perceive that the future markets for export sugar is a fairly pessimistic one.

FDP/jg
14/10/88

TABLE I

NEW GUELDERLAND SUGAR ESTATES (PTY) LTD

CANE ENTERPRISE GROSS MARGIN ANALYSIS

SOIL TYPE	INHOEK	BONHEIM	RISPAH	GLENROSA	CARTREF	LONGLANDS	FERNWOOD	WILLOWBROOK	HUTTON	KATSPRUIT	WESTLEIGH	OAKLEIGH	KROONSTAD
AREA	14.5	443.7	53.9	547.1	73.9	170.1	121.7	47.4	30.5	62.9	26.5	5.3	32.7
HARVEST COSTS (Rand/Ton)													
NGSE Harvest costs	6.17	6.32	7.57	6.67	7.22	7.22	7.82	6.97	7.71	7.57	6.97	6.97	7.67
Transport	1.42	3.18	1.70	1.54	1.67	1.67	4.07	3.60	4.07	1.54	3.60	1.54	1.44
	7.59	9.50	9.27	8.21	8.89	8.89	11.89	10.57	11.78	9.11	10.57	8.51	9.11
RATOON MAINT. COSTS (Rand/Ton)													
Labour & machines	60	65	80	65	60	60	30	60	80	60	60	60	60
Fert & herbicides	315	315	325	325	305	305	345	305	345	305	305	305	305
Nematicide							230		230				
	375	380	405	390	365	365	655	365	655	365	365	365	365
LAND PREP. COSTS (Rand/Ton)													
Labour & machines	1550	1450	1400	1550	1450	1450	1000	1450	1000	1450	1450	1450	1450
# of ratoons+1 plant	14	15	8	9	8	8	4	8	6	12	12	14	12
OVERHEAD COSTS (Rand/Ton)													
Field Overheads	125	125	125	125	125	125	125	125	125	125	125	125	125
General Overheads	323	323	323	323	323	323	323	323	323	323	323	323	323
	448	448	448	448	448	448	448	448	448	448	448	448	448
YIELDS & PRICES													
Av annual yield tc/ha	64	68	49	59	58	58	46	60	50	56	67	57	52
Cutting cycle(months)	12.9	13.6	14.7	14.9	14.5	13.8	14.2	13.9	13.9	14.3	13.8	15.0	14.0
A pool price (R/ts)	299	299	299	299	299	299	299	299	299	299	299	299	299
B pool price (R/ts)	162	162	162	162	162	162	162	162	162	162	162	162	162
% sucrose	12	12	12	12	12	12	12	12	12	12	12	12	12
SASA Transport (R/tc)	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40
GROSS MARGIN (Rand/HA/Annum)													
Income-Harvest Costs													
A pool	2155	2160	1568	1950	1878	1878	1351	1842	1474	1607	2057	1867	1672
B pool	1105	1044	763	982	926	926	596	857	654	885	957	931	819
Income-Harvest & Ratoon Maintenance Costs													
A pool	1807	1825	1237	1636	1576	1561	798	1527	909	1501	1739	1575	1360
B pool	756	709	433	668	624	608	43	542	88	578	639	639	506
Income-Harvest,R/Maint & Land Prep Costs													
A pool	1704	1740	1094	1498	1426	1403	557	1370	765	1400	1634	1492	1256
B pool	653	623	290	529	474	451	-169	385	-56	477	534	557	402
Income - Harvest,R/Maint,Land Prep & Allocated Overhead Costs													
A pool	1256	1292	647	1050	978	955	139	922	317	952	1186	1044	808
B pool	205	175	-158	81	26	3	-616	-63	-504	29	86	109	-46

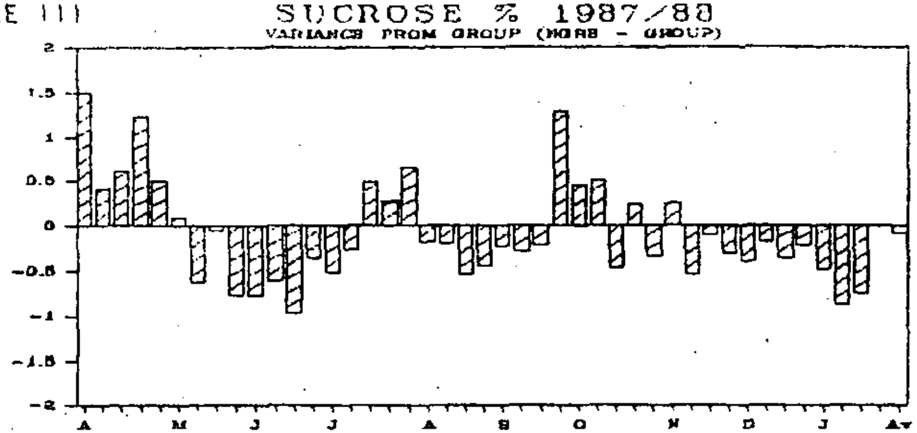
TABLE II

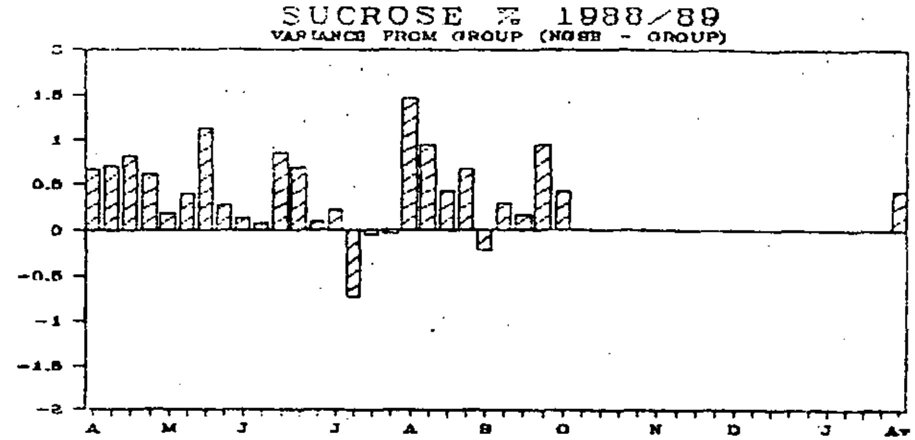
NEW GUELDERLAND SUGAR ESTATES (PTY) LTD.

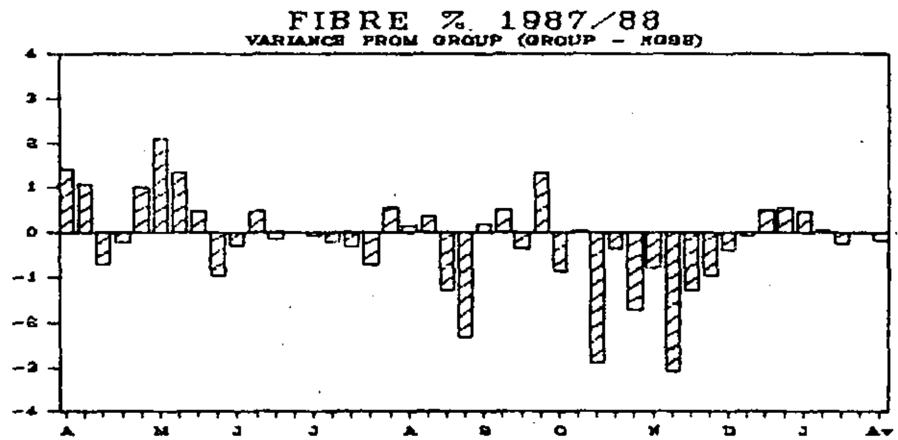
GUM ENTERPRISE GROSS MARGIN ANALYSIS

SOIL TYPE	INHOEK	BONHEIM	GLENROSA	FERN-WOOD	HUTTON
AREA	19.3	5.2	21.7	112.0	136.0
HARVESTING COST (Rand/Ton)					
NGSE Harvest costs	18.82	18.82	18.82	18.82	18.82
Transport	6.25	6.25	6.25	6.25	6.25
Total	25.07	25.07	25.07	25.07	25.07
SILVICULTURE COST (Rand/Ton)					
Labour & machines	478	478	478	478	478
Fert & herbicides	148	148	148	148	148
Total	626	626	626	626	626
LAND PREP. COST (Rand/Ton)					
Labour & machines	892	892	892	892	892
Other overheads	5	5	5	5	5
General Overheads	323	323	323	323	323
Total	1220	1220	1220	1220	1220
YIELDS & PRICES					
Av yield T/Ha	150.0	150.0	120.0	230.0	250.0
Cutting cycle(yrs)	8.00	8.00	8.00	8.00	8.00
Price (R/Ton)	50.72	50.72	50.72	50.72	50.72
GROSS MARGIN (Rand/Ha)					
Income-Harvest costs	3848	3848	3078	5900	6413
Income-Harvest costs & Silviculture costs	3222	3222	2452	5274	5787
Income-Total costs	2002	2002	1232	4054	4567
GROSS MARGIN (RAND/HA/ANNUM)					
Income-Harvest Costs	481	481	385	737	802
Income-Harvest & Silviculture Costs	403	403	307	659	723
Income-Harvest, Silviculture & Allocated Overhead Costs					
GROSS MARGIN (RAND/HA/ANN	250	250	154	507	571

TABLE III


SUCROSE % 1987/88
VARIANCE FROM GROUP (NOSB - GROUP)
A M J J A S O N D J Av


SUCROSE % 1988/89
VARIANCE FROM GROUP (NOSB - GROUP)
A M J J A S O N D J Av


FIBRE % 1987/88
VARIANCE FROM GROUP (GROUP - NOSB)
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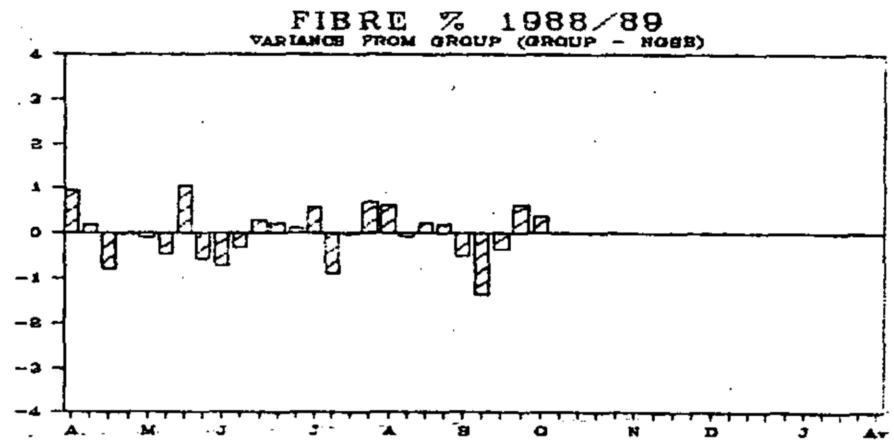
FIBRE % 1988/89
VARIANCE FROM GROUP (GROUP - NOSB)
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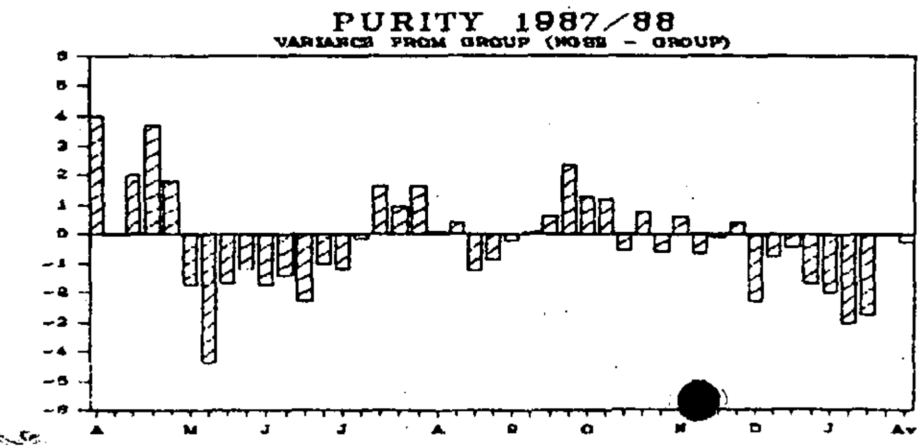
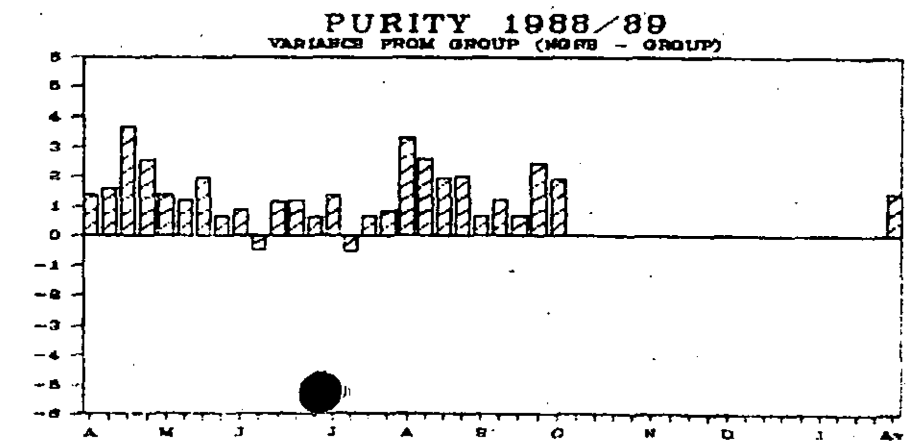

PURITY 1987/88
VARIANCE FROM GROUP (NOSB - GROUP)
A M J J A S O N D J Av


PURITY 1988/89
VARIANCE FROM GROUP (NOSB - GROUP)
A M J J A S O N D J Av

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

24 October 1988

CHANGE IN FARM AND FINANCIAL MANAGEMENT

By N H FREAN

Introduction

The introduction of the 2 pool marketing system has made farmers consider certain basic ecoonomic prinicples that have been taken for granted. For the first time cane farmers have faced the market and had to make a decision regarding the production of B Pool cane.

Economic Realities

Yesterday's decisions are today's realities.

The challenges facing farmers today are:-

a) How to incorporate new technology profitably into the existing organization;

b) How to be sufficiently flexible, mentally and financially to adjust the management of resources to meet changed economic circumstances and varying climatic conditions.

In the first instance, inflation has masked poor management efficiency and cash flow problems. eg. Overdrafts are now common place and tolerated at ever increasing levels. Do not use inflation as a crutch - plan for it, because it is here to stay for the forseeable future. That means for example the efficient and effective use and replacement of resources and inputs.

Strategy Management

Farmers need better financial advice not only on farming matters but information on pension plans insurance, banking, stocks and investments. At a farm management level, farmers should be looking at the aspects such as risk management, time management, cash management, information management and strategy management. The latter involves the relationship between the enterprise and its environment. Strategy is the match between an organisation's skills and resources the environmental opportunities, and risks it faces and the purposes it wishes to accomplish.

Strategy management involves the indetification, formulation, implementation and evaluation of strategies. It is a continuous process in the organisation. It gives direction during changing circumstances and should be regularly revised.

Information Management

Farmers need to develope an information management system to support and help his decision making. eg. The computer must be used as a decision advisor and not merely a mechanism to accumulate information.

Risk Management

This involves risk identification and evaluation, and the choices of how to handle the most advantages or the least distructive risks. This may involve excessively high costs. The ideal is to obtain equality between risk control, own finance and insurance.

As a result of current uncertain market conditions, droughts, floods and high interest rates, farmers are faced with more instability, and uncertainties than ever before. Additional debt has diminished the farmers ability to withstand adversity. Risk management is a continuing challenge for the farmer.

Agricultural Marketing

"The dilema of world agriculture is that although we live in a world economy, no country is willing to expose its agricultural sector to rigors of truely free trade in agricultural products. Consequently each country diligently protects its agricultural producers with a set of domestic farm programmes and trade policies at the expense of domestic consumers. The result is an across the board over-investment in agricultural productivity in the developed countries of the world". quote Prof. J.Bullock.

Because no "free trade" exists, farmers are faced with the daunting task of trying to make rational production decisions regarding production of B Pool cane without any proper guidance on an irrational market.

The B Pool (world) price exposes the farmer to the true value of his marginal production and the related marginal costs. Thus the high cost producer can reduce his risk by reducing production, and produce mainly or only for the A Pool or local market.

The following table is an example of the price variations of A and B Pool sucrose on which a farmer may base his strategy management. 3.

VARIATION OF THE ESTIMATED 1988/89 SUCROSE PRICES WITH THE WORLD MARKET SUGAR PRICE

BASED ON SEPTEMBER 1988 SUCROSE PRICE CALCULATION

$ R/US$	R	2,472000
MAR '89		9,730000 cents / lb
A POOL	R	303.75 /ton
B POOL	R	249.04 /ton
IND LOAN	R	96 288 479
TOT LOAN	R	116 258 992

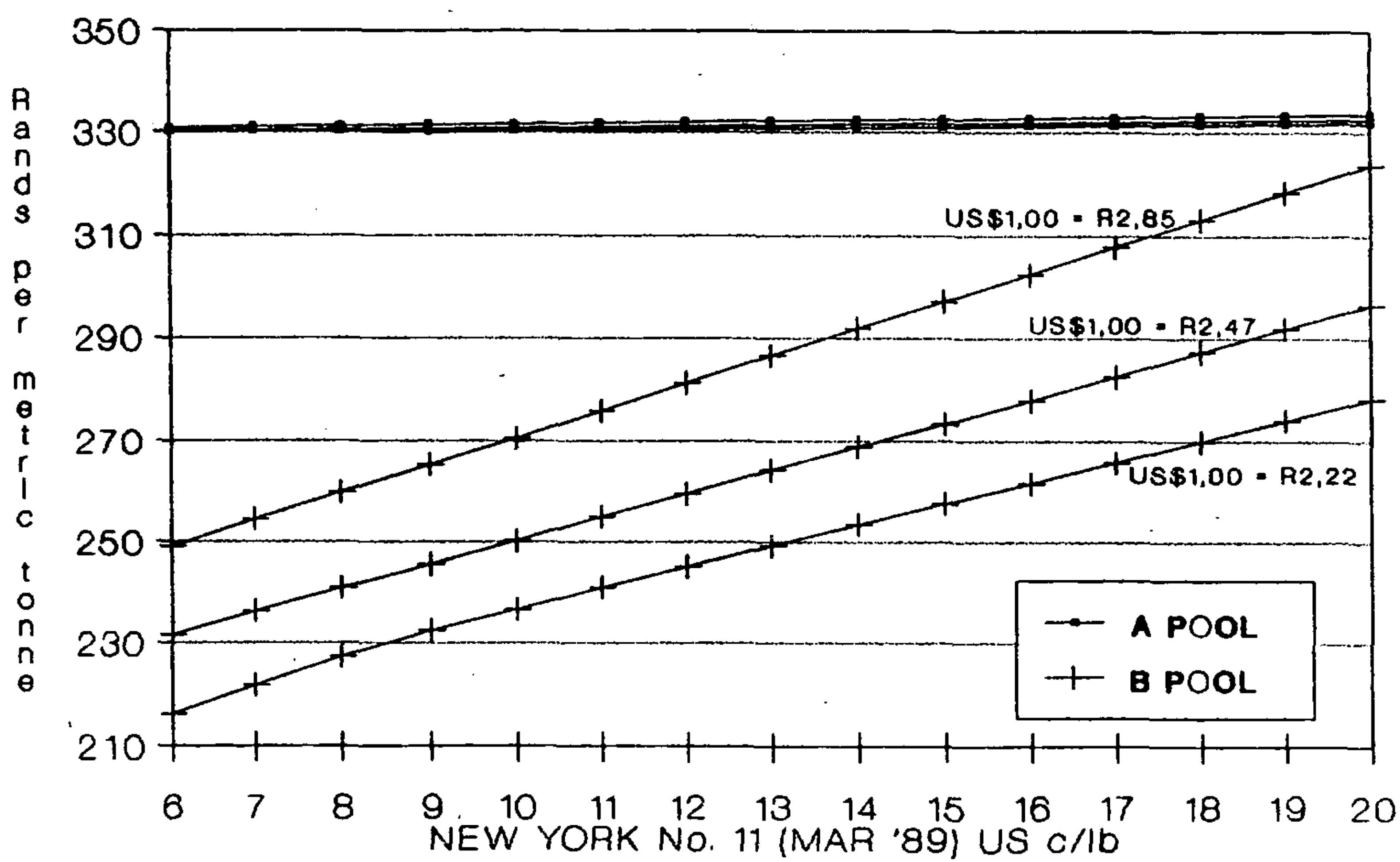
EXCHANGE RATE : US$1.00 =	R 2,85000		R 2,220000		R2,472000	
NEW YORK NO.11 MAR/MAY 89 USc/lb	SUCROSE PRICES (RAND PER TONNE)					
	A POOL	B POOL	A POOL	B POOL	A POOL	B POOL
6	330.75	249.11	330.49	216.12	330.06	231.62
7	330.96	254.48	330.32	221.75	330.25	236.30
8	331.17	259.85	330.16	227.38	330.43	240.97
9	331.38	265.22	330.10	232.55	330.61	245.63
10	331.59	270.58	330.26	236.74	330.79	250.29
11	331.79	275.94	330.43	240.93	330.98	254.95
12	331.99	281.30	330.59	245.12	331.16	259.61
13	332.19	286.62	330.76	249.29	331.34	264.24
14	332.40	291.92	330.92	253.44	331.52	268.85
15	332.60	297.21	331.08	257.58	331.70	273.46
16	332.80	302.50	331.24	261.72	331.87	278.06
17	333.00	307.79	331.41	265.86	332.04	282.66
18	333.20	313.07	331.56	270.00	332.22	287.26
19	333.40	318.36	331.72	274.14	332.39	291.85
20	333.60	323.63	331.88	278.27	332.57	296.45

PROMOTION

Production without proper marketing is a losing battle.
The amount of promotion varies widely from product to product depending on a number of factors.

3.a.

SUCROSE PRICE VARIATION
A & B POOL on SUGAR PRICE (SEP 88)



Butter is an example of the virtual demise of a product,due mainly to a failure in proper marketing of a product faced by a competitor, margarine.

Government inteference in the USA has resulted in High Fructose Corn Syrups having the largest share of the sweetener market, at sugar's expense.

How should the farmer decide on B Pool production, knowing that the price will be influenced by the dictates of the combined residual efforts of domestic farm policies of the major exporting countries, where large and easily stored surpluses exist?

B Pool Production Decisions

In the short and medium term the decision may be made quite easily, by using the fundamental economic concept that the Marginal Income must cover Marginal Costs.

First Decision; to cut or not to cut cane?
Costs involved here are all the extraction costs, ie. cutting, infield transport, transhipment, mill haul and levies.

Second Decision; what ratooning costs should be incurred? If the B Pool covers extraction costs, what is left over for ratooning?

Decisions 1 and 2 are short term, but the 3rd decision is long term, and begs the question, should the field be replanted?

A second fundamental economic principle should be used here, and that is the question of "Opportunity Cost", or the substitution of an Alternative Crop. This would imply a permanent change to another enterprise such as timber instead of cane on B Pool land.

A short to medium term substitute would be an Alternate crop; this would imply an intended return to cane production after one or two seasons of cash cropping or even a long fallow period.

The Implications of Cutting Younger Cane on B Pool Production

After considering all these theoretical implications, one must realise that cutting younger cane results in higher yields per hectare per year in the long run.

Therefore the decision to produce or not to produce B Pool cane, as a long term decision, must be taken.

The next decision, if any, is what to do with surplus B Pool land?

Cutting cane at a younger age leads to wide seasonal fluctuations in cane yields with consequential disruptions in seasonal cash flows. This requires careful and disciplined cash flow management with more effective control. This means better and more detailed records which will have to be interpreted correctly and analysed, with professional help.

This trend is already developing, which was evident from the results of a research project conducted in the Natal Midlands by G Chadwick. It was shown that due to changes in the external environment (ie. technical, economic and political), farmers with greater business orientation were emerging, who are requiring new sets of information needs, such as details of daily prices on futures markets and other statistical information.

The results showed that the farmers in the"High User Information Services",category, tended to be younger, were better educated, were more experienced in farming and farmed larger areas than those classified as low users. The low information user was older and still lived in the era where the product price was determined by the cost-plus method. He was finding it difficult to "face the market."

Within the high user catagory, two distinct groups of farmers exists

a) The production orientated farmers, and
b) the entrepreneurs.

The former specialise in one or a limited number of enterprises where they focus on maximising production levels. They make frequent use of technical services, particularly extension officers.

The latter groups focus on the economic and financial aspects of their enterprises. They make use of professional accountancy firms and commercial farm consultants. They are more receptive to ideas such as changing enterprises, vertical intergration and investigating new marketing channels.

The following F.R.S table shows that cutting younger cane produces more sucrose. This means more B Pool sucrose, which results in a lowering of the average income per ton of sucrose which requires better and more skillful management, which will require a greater amount and more detailed information from outside as well as within the farm. This requires better information gathering and analysing systems, and the ability to understand the results or have them interpreted by professionals.

By facing the market the farmer is being stimulated to became a better manager.

F.R.S. DATA

AVERAGE YIELDS OF CANE CUT AT DIFFERENT AGES FROM DARNAL, GLEDHOW & MAIDSTONE MILLS FOR 5 YEARS 1983/84 TO 1987/88

AGE MONTHS	AREA CUT HA	TONS PER CUT	SUCROSE PER HA. PER MONTH	TONS CANE/HA /100 mm RAIN	KGS.N PER	SUCROSE KGS PER KG N	KGS N PER TON SUCROSE
11	1039	8,2	0,75	7,2	137,2	59,7	16,78
12	1863	9,2	0,76	6,8	137,4	67,0	14,93
13	1980	8,9	0,69	6,1	136,0	65,4	15,28
14	2028	9,1	0,65	5,6	137,6	66,1	15,12
15	1431	9,2	0,61	5,0	141,5	65,0	15,38
16	984	8,9	0,56	5,0	146,0	61,0	16,40
17	998	9,5	0,56	5,2	142,2	66,8	14,97
18	956	10,4	0,58	4,0	139,0	74,8	13,36
19	739	10,1	0,53	5,0	139,6	72,3	13,82