SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

PROGRAMME FOR ANNUAL MEETING

23 SEPTEMBER, 1971

9.00 a.m.	Chairman's report
	General Circulation of results
9.30 a.m.	Filter Cake - a review by Ken Alexander
10.10 a.m.	Game farming, by Clive Halse
10.45 a.m.	Tea
11.15 a.m.	Film - "Farmers scrapbook"
11.45 a.m.	Growth Stations, by Bruce Hulett
12.20 p.m.	Surface Irrigation in the U.S. by Colin Whitehead
1.00 p.m.	Lunch
2.15 p.m.	Film - "Mekong"
2.45 p.m.	A situation survey for Zululand South, 1970 by Quin Mann
3.30 p.m.	Film - "Look to the land"
4.00 p.m.	Close

SOUTH AFRICAN SUGAR INDUSTRY

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Review Paper No.6.

FILTER CAKE

by K.E.F. Alexander.

Introduction

To the sugarcane grower, the most important by-product of the sugar-factory is filter cake. Although the main fertilizing value of this material lies in its phosphorus content, filter cake contains an appreciable amount of nitrogen (not all of which is available to the plant), calcium, magnesium, sulphur, trace elements and organic matter. However, filter cake contains only a small amount of potassium. The material has been described by Deerr (1921)[12] as consisting of "cane fibre, sand, soil, etc., the coagulated colloids including cane wax and albuminoids, phosphate of lime, as well as other bodies".

In a sugar factory the mixed juice is usually treated with chemicals, a flocculant, and heat. Most of the impurities then settle out, and are removed in the form of filter cake. In South Africa this product is known variously as milo, miala, filter mud, mill mud, filter-press cake, filter-press, meulkoek, or scums. The term "filter-press" is obsolete since efficient rotary vacuum filters have long replaced the old filter-presses. Fresh filter cake contains roughly 75% moisture. Even by the time it is applied to the grower's fields, filter cake often still has a moisture content of about 50%, which fact must be taken into account when assessing the effects of treatments which include this material.

A South African cane crop which produces 1,6 million tons of sugar also produces about 700 000 tons of wet filter cake. Virtually all of this is returned to the cane fields, thus providing plant-available phosphorus equivalent to at least 15 000 tons of single superphosphate.

15 : 700
1 : 50

500 lb. requires only 12 tons
1 ton single requires 25 tons

See also page

Most South African cane growers do not pay for filter cake. Each grower is allocated a quota, based on the amount of cane he has delivered to the factory. The grower's costs therefore depend mainly on the expenses incurred in transporting and spreading the material. It is a bulky product which is often sticky and strong-smelling - contrasting markedly with the concentrated, dry, granulated, bagged fertilizers of inorganic origin. It is traditionally applied at rates varying from 20 to 80 tons per hectare; the rate depending mainly on whether it is applied in the furrow, or broadcast. In the latter case the filter cake is spread as evenly as possible over the soil surface and then incorporated by discing or rotavating. Furrow applications are more effective since a lower application rate can be used, but handling costs tend to be much higher than those for broadcast applications.

Apart from its manurial value, other properties of filter cake have been investigated. The material has been tested as a commercial source of wax (Anon 1942[3]; Anon 1942[4]; Balch 1947[8]; and Mukherjee, 1956[20]); as an aid in composting (Krumm, 1953[14]; Martin, 1942[18]; DeBarry, 1947[11]); as a processed feedstuff (Anon 1962[7]) and source of protein (Paturau, 1969[23]); as a source of carbon (Nagaraya and Jain, 1940[21]); for its effect on microbes in the soil (Owen, 1954[22]; Roth, 1971[26]); and for its physical and chemical properties on soils (Lugo-Lopez, Hernandez-Medina, and Cibes-Viade, 1953[17]). Crops such as pineapples, tobacco, sweet potatoes, tomatoes, cucumbers, and other vegetables have also been manured with filter cake (Riollano, 1943[25]; Medina and Lugo-Lopez, 1953[19]; Landrau and Samuels, 1953[15]; Samuels and Landrau, 1956[27]).

This review however, is concerned mainly with the direct use of filter cake and its effect on soils in sugarcane fields and in pots. Responses to its use may be due simply to the addition of nutrients such as phosphorus, calcium, silicon and trace elements. In heavy soils filter cake may assist with soil aeration and drainage. In sandy soils it improves the retention of moisture and nutrients. There are indications that it also assists in the control of nematodes.

Indirect effects of filter cake may be produced due to changes in the numbers of microbes living in the rhizosphere, with the balance being affected in favour of beneficial rather than harmful organisms. One cannot rule out the possibility that filter cake dressings may also assist in the control of plant diseases. Even soil temperature effects may play a part in the response of cane crops to treatment with filter cake. In an experiment at Powerscourt it was shown that root-zone temperatures were consistently higher for as long as four months after heavy furrow dressings of filter cake. All application rates gave excellent responses in this test, with the highest rate of 180 t/ha giving an increased yield of 45 t cane/ha. This represents a gross profit of more than R200 per hectare.

Analyses and Values

An early reference to the fertilizing and monetary values of filter cake in South Africa was made by Dymond 1923[13]. He gave the following figures for dry cake:

Organic matter	63,3%	
Ash	36,7%	
Soluble silica	4,7%	
Nitrogen	1,06%	
Phosphorus	0,63%	(P)
Potassium	Nil	

The Total value was estimated to be R1-86 per ton. Dymond stated that the material was usually applied on the sandier soils. It was broadcast at the relatively low rate of 13-18 t/ha and subsequently ploughed in.

In a report from the S.A.S.A. Experiment Station Chemistry Department (Anon, 1942[3]) it was pointed out that just over 80% of the P, Ca, and Mg in filter cake is available as plant-food, whilst almost

all the K is available. The fertilizing value of this locally produced waste-product was stressed at a time when war conditions limited the supply of conventional fertilizers. The average mineral content of filter cake from 20 factories was given as:

	N	0,81%
available	P	1,10%
available	K	0,16%
	Ca	9,77%
	Mg	0,79%

These nutrient values were converted later to monetary values (Anon, 1942[5]) as follows:

N - R1-60 per ton of filter cake, P - R1-29 and K - 15 cents, giving a total value of R3-03 per ton of dry cake. Methods of drying the wet material at the factory were mentioned as it was believed that growers might make more use of filter cake if it were dry.

In order to assess the current quality of South African filter cake, surveys were carried out in July and October, 1970. Filter cake samples were collected directly from the filters of all sugar factories in the Republic and Swaziland. The full results will be published separately (Alexander 1971[1]) but average results for the 22 factories were as follows:

Moisture content of the fresh material: 74,8%

Analysis of oven-dried filter cake:

	N	- 1,69%
Total	P	- 0,90%
Available	P	- 0,72%
Total	K	- 0,27%
Available	K	- 0,19%
	Ca	- 1,84%
	Mg	- 0,37%
	Cu	- 52 ppm
	Zn	- 69 ppm
	Mn	- 898 ppm
	S	- 0,19%

1·84 % Ca 1000 lb

18.4 lb Ca / lb

50 t = 920 lb. Ca. / Normal dressing given up to ½ ton Calcite lime

1 ton lime 2000 lb 40% 1000 lb.

On the average, therefore, one ton of dry filter cake contains 16,9 kg of N, 7,2 kg of available P, and 1,9 kg of available K. These nutrients, when converted to fertilizer equivalents, amount to 36,7 kg of urea, 36,7 kg of double supers and 3,8 kg of muriate of potash respectively. At 1971 prices, these ingredients would be worth R2-73, R2-37, and 17 cents respectively, or R5-33 per ton of the dry cake. In practice, by the time a grower off-loads his filter cake in the field, it has dried out somewhat, but still contains about 50% moisture. Thus all the analytical figures and monetary values quoted here should be halved in assessing the value of filter cake at the time of application. It is likely too, that the real value of the nitrogen in the material will be much less than the indicated value. Borden (1938)[9] concludes that virtually no value can be placed on nitrogen in filter cake. Trace element levels in filter cake are not high enough to warrant its use in an attempt to correct deficiencies of these elements in the soil, unless fairly heavy applications are made.

Samuels and Landrau (1956)[27] indicated the form of some of the minerals in filter cake. Nitrogen is present mainly in proteins, whilst phosphorus exists in complex organic combinations, such as phospholipids and nucleoproteins, and also in calcium phosphates.

Effects of wax

Owen (1954)[22] showed by means of pot-tests that the presence of wax in filter cake inhibited some of its beneficial effects on plant and bacterial growth. Using maize as the experimental plant, he reported on one test after six weeks of growth, as follows:

Medium	Height of plants in cm to first node	Number of bacteria/g of soil	Number of mould fungi/g of soil
Sand only	7,6	40 000	10 000
Sand plus f-cake	8,9	3 000 000	20 000
Sand + dewaxed f-cake	14,0	940 000 000	1 000 000

These results indicate that if a wax-extraction plant operating on filter cake were to be established in South Africa, its residues are likely to be of greater benefit to our cane fields than is the untreated material at present.

Field and pot responses

Samuels and Landrau (1956)[27] point out that not all filter cake applications give satisfactory increases in cane yield. On three Puerto Rican soils where it was applied together with normal N, P, and K fertilizers, very slight increases in cane yield were obtained over the yields when only inorganic fertilizers were used. On a fourth soil (Santa Isabel silty clay), yields decreased following the application of filter cake to both irrigated and unirrigated fields. On this soil (unirrigated), increasing amounts of filter cake in the absence of fertilizers led to consistently decreasing yields of cane. When the yield of sugar per hectare from the normal inorganic dressings was taken as 100%, the yield from inorganics plus 45 t/ha of filter cake was 96%; the yield from 90 t/ha filter cake alone was 87%; and the yield from 135 t/ha of filter cake alone was 80%.

Sen and Basu (1940)[28] performed pot tests using a soil low in nitrogen, phosphorus, and potassium, with peas and wheat as the indicator plants. One group of pots received filter cake at 1%, 5%, 10% and 25% of the weight of the soil. A second group received the same levels of filter cake, but with N, P, K and Ca in chemical supplements. The pots with 1% of filter cake (no supplement) gave the best results. No actual figures are quoted, but the yields decreased markedly with increasing filter cake dressings. The presence of the inorganic chemicals together with the cake caused a further decline in yield. The authors suggest that a possible reason for this depression was the influence of the large amount of

organic matter which might have caused the nitrogen of the chemical fertilizer to revert to an unavailable form.

The decomposition of this organic fraction was referred to by Locsin (1953)[16], who quoted a 5 to 7 month decomposing period for Hawaiian filter cake, but recommended an interval of only 2 to 3 months for the hotter and more humid Philippine conditions. When time was not allowed for decomposition to occur, filter cake applications resulted in heavy yields of lodged canes, which in turn produced juices of low quality. In the first experiment quoted by Locsin he showed clearly that under the prevailing soil conditions it was wasteful to use chemical fertilizers in addition to a heavy application of filter cake (50 - 100 t/ha). In his next experiment he showed that 100 t/ha of filter cake was not quite the equivalent of 455 kg/ha of Ammophos, but was superior to 375 kg/ha of ammonium sulphate. His next four experiments all showed positive responses to filter cake, which in one instance gave a 70% increase in sugar/ha, and in another gave a 45% increase. Locsin suggests that an ideal mixture to apply one month before planting would be 16 tons of filter cake, 8 tons of molasses, and 2 tons of mill ash per hectare. Such a dressing would be equivalent to the use of 1025 kg of ammonium sulphate, 1095 kg of single supers and 344 kg of muriate of potash per hectare. This seems a well-balanced application of waste products returned to the soil, but at today's high monetary value for molasses, it would not be an economic proposition.

An earlier comment (Anon, 1943[6]) is in agreement with Locsin's remarks on the necessity for the decomposition of filter cake prior to use. The author suggests methods for composting the product and indicates that the C/N ratio can be reduced from 23,7/1 to 11,5/1. The composted material was shown to be an excellent manure for a variety of crops, whereas fresh or partly decomposed cake was not.

Pineda (1955)[24] of the Philippines, no doubt extending the work reported by DeBarry (1947)[11] and by Locsin (1953)[16], states that a combination of filter cake, bagasse ash, molasses and distillery slops mixed in definite proportions gave good results when used on sugarcane. This product, called "Lomifer", gave increases in sugar yield ranging between 30 and 40%, whilst saving 32% in cost of materials when compared with commercial fertilizers. Due to the sharply increased prices of molasses and distillery slops, however, it was necessary to omit them from the Lomifer mixture. Small supplements of lime, ammonium sulphate and muriate were added instead. Experimental results on three estates showed that the filter cake mixture was superior to a standard "15-15-15" commercial fertilizer mixture. The former gave a 15% increase in germination followed by improved tillering. Cane yield was 9% higher, sugar yield 30% higher and savings on fertilizer cost were 70% compared with the commercial mixture.

Pineda supported Locsin by insisting that the filter cake be decomposed before use in the field. The material should then be mixed with bagasse ash and applied in the furrow at 6 t/ha, with the chemical supplements added later.

There are numerous other references in the literature to the use of filter cake in pot and field trials throughout the cane-sugar producing countries of the world. Results vary, depending on aspects such as soil type and analysis, climate, age and composition of filter cake, methed and rate of application, presence or absence of nematodes, and so on. Even when the experiments are all limited to one country, crop responses to filter cake dressings are far from uniform, as can be seen in the next section of this paper.

South African results

Recent local results of filter cake trials were reported by Allsopp (1966)[2] and Brown (1970)[10], who described interesting data obtained at Doornkop. They found that it is more economic to use filter cake on heavier soils with high organic matter contents, rather than on their lighter soils. Dressings of 22-45 t/ha when applied in the furrow were generally equivalent to 67-90 t/ha broadcast. Brown reports that the best responses were obtained on plant crops, with reduced responses where successive ratoons were treated. Virtually no residual effect was found on crops previously treated with filter cake. He concludes that no lasting benefits accrue to a crop from the use of the material. The same author presents evidence indicating a nematicidal effect of filter cake.

Many filter cake trials have been conducted in South Africa, most of them during the past 10 years. The results of all experiments where responses could be credited to filter cake alone have been listed in Table 1. Where more than one level of cake was tested, only the level nearest to 45 t/ha has been listed. It can be seen that, for the 26 trials involved, an average dressing of 55,7 t/ha of filter cake increased the yield from 15,12 to 16,12 tons sucrose/ha on the plant crop, with smaller residual responses on the first and second ratoons when these were included. This average increase of one ton sucrose per hectare includes several instances of yield depression, and is a combination of both furrow and broadcast effects. The result has been used to perform the following exercise which refers to the industry as a whole:

At 55,7 t/ha, an annual production of 470 000 tons of filter cake (50% moisture) could be used on 8 500 ha of replant cane fields to give an increased yield of 8 500 tons sucrose. At R45 per ton of sucrose, this would constitute a gross return of R382 500 to growers on the plant crop, with further returns on a reduced scale from the residual effects in succeeding ratoon crops. Put in another way, a grower can expect 81 cents worth of extra sucrose, on the average, for every ton of filter cake he uses on his plant crop, plus additional bonuses on the ratoons. Some fields will give much greater returns than this. It is unfortunate that the pre-trial soil analysis for 18 out of the 26 experiments quoted in the table exceeded 30 ppm phosphorus, which is the accepted critical level for P in South African sugarcane soils. It is also known that in many instances a dressing of about 25 t/ha of filter cake gave responses which were nearly as satisfactory as those from far higher dressings. Thus it is reasonable to predict that if our filter cake is applied only to low phosphorus soils, and used at the rate of 25 t/ha, it could produce an extra R1-60 worth of sucrose per ton of filter cake applied.

top-dressing response : usually only when P is deficient

Costs of application ; required - how are applied -

Extent of decomposition required

C. Whitehead Amelioration of soil - drainage problem unlikely

Heavy soils

✓ Normality :- peat Vs old with & without EDB

Professor

De-wax - glasshouse

Nem. / EDB

Fibre ash + sulfur.

Midlands

In two further experiments the effects of top-dressing with filter cake were studied. A first ratoon which was top-dressed with 22,4 t/ha of cake gave a yield of 13,35 tons sucrose/ha compared with 10,44 tons from the control. A fourth ratoon top-dressed with 44,8 tons cake/ha gave a yield of 17,29 tons sucrose/ha compared with 15,19 tons from the control. It does seem, therefore, that filter cake can also be applied as a top-dressing on cane with beneficial results, but more widespread experiments should be carried out in order to confirm this.

Conclusion

It is not possible to predict what effect an application of filter cake at a particular rate on a particular cane field will have. With all the multiple factors involved in the use of this variable product on our highly variable soils, one can say only that its use would be beneficial on many cane fields, especially those with soils low in available phosphorus.

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Table 1. Results of filter cake trials conducted in the South African sugar industry from 1958 to 1970

S.A.S.I.A.A. Catalogue Number	Tons F.C. per hectare	Broadcast (B) or Furrow (F)	Plant cane Control ts/ha	Plant cane + F.C. ts/ha	First ratoon Control ts/ha	First ratoon + F.C. ts/ha	Second ratoon Control ts/ha	Second ratoon + F.C. ts/ha
7	44,8	F	11,27	13,08	13,26	13,93		
8	35,8	F	18,14	19,22	13,06	13,80		
9	35,8	F	17,29	19,94	16,82	15,97		
13	89,6	F	10,48	14,47	7,50	7,80	11,33	12,57
14	89,6	F	14,22	14,69				
15	89,6	F	21,39	20,03	*	*		
71	89,6	B	23,09	23,79	9,36	10,68	6,56	6,85
72	44,8	F	11,40	12,52	16,64	17,74	4,32	5,35
75	44,8	F	12,50	11,63**	7,37	7,12		
98	112,0	F	6,14	8,24	6,68	7,48		
99	44,8	F	4,73	4,35**	4,37	4,28		
100	44,8	F	13,57	14,45	9,25	8,20		
154	44,8	F	24,93	28,00	13,75	17,79		
159	22,4	F	16,53	17,94				
291	44,8	F	15,97	19,13	21,03	21,41		
292	44,8	F	24,51	25,24	22,87	22,85		
"	67,2	B	24,51	27,24	22,87	24,57		
293	44,8	F	13,82	12,95				
"	67,2	B	13,82	11,85				
350	44,8	F	20,34	18,37	13,62	16,87		
351	44,8	F	7,86	9,30				
377	44,8	B	11,36	11,49	7,88	7,77		
378	89,6	B	17,76	18,73				
380	9,0	F	10,46	11,07				
385	44,8	F	12,45	13,84	20,43	21,62		
566	67,2	F	14,74	17,45				
Means	51,8	F	14,41	15,52			(21 Trials)	
	51,5	F			13,33	14,06	(14 Trials)	
	67,2	F			(2 Trials)		7,82	8,96
	71,7	B	18,11	18,62	(5 Trials)			
	67,2	B			13,37	14,34	(3 Trials)	
	89,6	B			(1 Trial)		6,56	6,85
Average	55,7	F&B	15,12	16,12	13,34	14,11	7,40	8,26

* No sucrose tests done on 1st ratoon, but cane yield was 11% higher on filter cake plots, reversing the plant cane depression.

** Higher filter cake applications gave positive responses in these trials.

Pere
Kolver

Predator - prey relationships.
Howlang - economics so far.

SOUTH AFRICAN SUGAR INDUSTRY AGRONOMISTS' ASSOCIATION

TRANSLATION

GAME FARMING AS A MEANS OF UTILISING NON-ARABLE LAND AREAS

by C.G. Halse

1. INTRODUCTION: In the Republic it is found that many farm units in which an intensive pattern of agriculture is followed, include a portion which can not be intensively cultivated. The reasons are obvious and can be attributed mainly to the following limiting factors:

   irrigation water, arable or workable soil, topography, climatic factors et cetera.

   Since, in addition, farming now follows the pattern of a business undertaking, the aim and object has become the achievement of maximum production, in other words the highest possible return for invested capital.

   When positively utilized, the non-arable part of the farm usually forms a secondary industry which can vary considerably in direction and scope and is in many cases closely connected with the primary pattern of agriculture. Several factors are of importance in the decision to make positive use of non-arable areas of the farm; these include how it links in with the main farming unit, situation, environment, climate and the interest on capital investment which it can earn.

   Today, a large variety of commodities is available, out of which the producer can make his choice and which, by the nature of circumstances, will vary from farm to farm.

2. THE CHOICE OF TRANSVAALSE SUIKERKORPORASIE BEPERK:

   The main objective of the company, who are sugar millers in the Malelane - Komatipoort area of the Eastern Transvaal, is to produce sugar.

   Since the available areas which can be placed under irrigation are not all ideal for the production of sugarcane the Company uses land for the cultivation of citrus and subtropical plants such as lichis and mangoes. Vegetables are grown as a short term crop when sugarcane fields are being replanted.

   On account of climatic conditions, irrigation is essential for any intensive crop cultivation in the Lowveld. Irrigation water is thus one of the limiting factors - and for this reason it will generally be found that on many of the farms a portion is under intensive cultivation while another portion is more extensively used for cattle farming.

   Transvaalse Suikerkorporasie Beperk have seriously considered, and have already proceeded part of the way, in the utilisation for game ranching of such areas where crops cannot be grown.

3. WHY GAME RANCHING?

A number of factors contributed to this idea:-

(a) several types of game animals are commonly present in this part of the Lowveld. Part of the Company's property borders on the Kruger National Park and, especially on one of the farms, game occurred under natural conditions.

(b) On account of proximity to the Kruger Park, there was a reasonable possibility that some of the game from the Park would immigrate into neighbouring properties, especially where such game was protected.

(c) Considering that this part of the country has a relatively low rainfall, about 425 mm or 17" per year, and that the area, in addition, is subject to sporadic droughts, game has the ability to adapt itself to a surprising degree to the conditions.

(d) Foot and mouth disease which is now regarded as endemic in the Kruger National Park and which periodically causes neighbouring farms to be placed under quarantine on account of foot and mouth outbreaks, is not carried by zebra which has become a welcome solution to the problem of meat rations for Bantu workers. It is interesting that many Bantu prefer zebra to beef.

(e) Investigation has shown that game can produce and deliver more meat per acre than cattle, on account of the composition and food habits of the fauna which includes both grass and leaf eaters.

(f) Game does not only provide meat but also skins which today fetch high prices. This applies particularly to first class skins if they are well treated, tanned and worked. The economic advantages of game are thus not limited to the flesh; the hide is an important additional advantage which should not be left out of consideration.

4. ECONOMIC ADVANTAGES OF GAME RANCHING

(a) Weight of meat per hectare

Few data are available on this new farming enterprise, although it now arouses world wide interest. Prominent naturalists have visited African countries to discover how game and cattle ranching compare. They have discovered that a unit area can produce considerably more game meat than any other kind. Some investigators quote figures indicating that certain savannah areas in Africa can produce four times as much game, by weight, as can the best natural grazing in the United States of America.

This depends on the fact that game can make use of savannah more effectively by consuming everything from grass to the leaves and twigs of the tops of trees. This investigation naturally embraced all animals, including elephants, hippopotamus, rhinoceros, buffaloes, etc., which can wander freely over an area of hundreds of thousands of morgen.

The results of an investigation which we ourselves carried out are shown in Appendix A.

A comparative economic study between game and cattle ranching is reported in Appendix B.

(b) Game hunting

Game has today become a luxury. A former generation had plenty of opportunities for hunting but hunting has now become a luxury and luxuries naturally command luxury prices.

Prices charged by safari companies are now enormous. The following are the prices for taking prospective hunters on safari:

Numbers shooting	per day	for 30 days
One person	R140 - 00	R4 200 - 00
Two persons	R262 - 00	R7 880 - 00
Three persons (1 not shooting)	R290 - 00	R8 690 - 00

The following are paid for ordinary hunting fees for the various types of game:

Eland	R150 - 00
Kudu	R100 - 00
Zebra	R40 - 00
Red Hartebees	R 40 - 00
Impala	R 12 - 00

(c) Sale of living game animals

Since there is nowadays considerable interest among farmers and rich businessmen who own property, large sums of money are paid to obtain game animals which have become very scarce. The following prices are paid, or these values are attached to them:

Rhinoceros	R2 000 - 00 each
Eland	R1 200 - 00 (1 bull and 2 cows)
Kudu	R 200 - 00 per pair
Waterbuck	R 200 - 00 per pair
Sable Antelope	R 200 - 00 each
Giraffe	R 500 - 00 each
Zebra	R 120 - 00 each
Blue Wildebees	R 80 - 00 each
Impala	R 20 - 00 each

(d) Holiday resorts

There are at present various holiday resorts where game and nature are the inducements to holiday-makers. Prices naturally differ considerably depending on what the holiday-maker demands and on the facilities offered. In some resorts as much as R30-00 per day is charged and these resorts are still crowded with visitors.

(e) Values of meat and skins

Some of the game animals, especially those which are scarce, are in greater demand and obtain higher prices if they are sold alive: for example rhinoceros, giraffes, waterbuck, sable antelope, reedbuck, etc. Prices which can be obtained are shown in appendix C.

According to a recent newspaper article (Die Vaderland 21:12:1970) Botswana earns approximately R6 million per annum from the export of meat and hides. A company, Botswana Game Industries (Pty) Ltd., manufactured and exported articles made from game skin's to the value of R400 000-00 last year.

Like the production of many other agricultural products, game farming is not without problems.

Game ranching is a new development and investigation and research are as yet limited. As a result, one does not advance very rapidly towards the envisaged target since every step forward appears, in practice, to be an experiment.

Nevertheless it is extremely interesting and remains a challenge since one must live in close association with nature and its laws. Nature conservation becomes a reality. Patience, dedication and much love is wrapped up in the farming unit which, apart from the financial advantages which it may bring, because it is in and of nature, pleases the eye and brings peace and contentment to the innermost being.

5. PROCESSING OF MEAT AND SKINS IN PRACTICE

Although Transvaalse Suikerkorporasie Beperk possesses a reasonable assortment of game including rhinoceros, giraffe, blue wildebees, zebra, kudu, waterbuck, impala, reedbuck and smaller antelopes, the company considers concentrating on zebra. The background to this decision is based on sporadic outbreaks of foot and mouth disease.

(a) Meat processing

Since the Company employs a large number of Bantu staff for its various activities, zebra flesh is made available to the Bantu as ration meat. This represents a value of 40 c per kilogram. The Company has established its own butchery with a reasonably well equipped meat processing unit, including a refrigerator unit for the storage of carcasses.

Biltong and dry sausage are made from other types of game while the bony portions are issued as rations. Nowadays there is a great demand for game biltong and dry sausage since these have become luxury articles with a tremendous internal market. Biltong and dry sausage are sold to the public at a roadside stall for R1-50 and R0-80 per pound, respectively.

Tests have been made with the processing of zebra flesh into various meat products. Products such as salami, French polony, red Vienna sausages, meatpaste products, boerewors, dry sausage, biltong and smoked cuts have been manufactured with great success. The salami, in particular appears to be of outstanding standard and quality and is much better than salami made of beef.

6. TANNING OF SKINS

The Company has its own tannery in order to prepare all skins and curios. In the tannery the so-called chrome tanning process is used. This is very successful and yields products of outstanding quality. Third-grade skins, including those which have been rubbed or otherwise damaged, are usually processed into various articles such as handbags, belts, table mats, floor mats, rifle cases et cetera. The skins of other game are similarly processed into various articles. For example, the skin of blue wildebees, processed and lined with merino sheepskin makes an admirable rifle case.

The Company also undertakes tanning and processing of skins on behalf of other persons or organisations according to individual taste and demand.

7. CONCLUSIONS

Game ranching undoubtedly holds great potential from the economic point of view. The internal and export marketing of meat and skin products can develop into an interesting trade and industry, which may make a positive contribution as a source of income for agriculture.

APPENDIX A

GAME

Type of game	Number	Estimated slaughter weight	Pounds meat per 4 000 acres
Impala	1837	65 lb per carcass	119 015 lb
Kudu	452	250 lb " "	113 000 lb
Waterbuck	150	200 lb " "	30 000 lb
Zebra	500	300 lb " "	150 000 lb
Blue wildebees	183	250 lb " "	45 750 lb
Total			465 765 lb

CATTLE

Number of cattle	Mean estimated slaughter weight	Pounds meat per 4 000 acres
500	500 lb per carcass	250 000 lb.

SUMMARY

Game, mean carcass weight per acre	Cattle, mean carcass weight per acre
115 lb	62 lb

From the above it appears that game can produce practically twice as much per acre as cattle.

APPENDIX B

Comparison between cattle and game ranching in Rand.

	Cattle	Game (1970-71)
Capital invested	72 775	52 991 (1969-71)
Production costs	3 393	13 633
Income	20 000	37 919
Profit	16 607	24 286
Percentage or capital before interest	22%	45%
Percentage on capital after interest	12%	35%
Mean carcass weight per acre	62 lb	115 lb

APPENDIX C

Type of Game	Processed form	
	Meat	Skins and curios
1. Impala	R12.00 each	R6-00
2. Kudu	R45.00 each	R25-00
3. Zebra	R60-00 each	R70-00
4. Blue wildebees	R50-00 each	R25-00

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

GROWTH MEASUREMENTS AS AN INDICATOR OF YIELD AT HARVEST

by Bruce Hulett

INTRODUCTION

Since the recording of growth measurements is somewhat time-consuming, and at times the work may be a little uncomfortable, it may be of advantage to assess the value of such data at this time. The object of this paper is to revue the question, "Are growth measurements worth it?", and to discuss the techniques used at present; how these can be streamlined for the future; and how best to use any measurements taken in future years.

MATERIALS & METHODS

1 Darnall

It must be noted here that the growth measurements at Darnall were from one site only, and were not an average of several sites, the site simply being as close to the Agronomy laboratory as possible.

No set pattern has been followed regarding ratoon or variety. As far as is known, in the first three to three and a half years measurements were taken on 3rd, 4th and 5th ratoon cane, and since then have been confined to plant or 1st ratoon. The variety has been NCo 376 in the main, although N55/805 has been used in the more recent years. The soil type has always been Table Mountain Sandstone.

The sites chosen over the years were said to be average for the field and uniform over the whole site. Ten stalks, five in each of two lines, were selected at random approximately five yards apart. The two lines in which the measured stalks appeared were separated by one line. These stalks were measured each week until the cane became lodged or too long. Cane was measured from approximately knee height to 6 feet and then a new site was chosen. Measurements were taken by a clerk from the Agronomy Dept., using a wooden staff graduated in inches and subsequently in centimeters. The cane stalk was measured from the top of a peg at the base of the stalk to the highest visible dewlap.

2 Mt. Edgecombe

Unlike Darnall, growth recorded at Mt. Edgecombe was an average of growth measurements taken on each Estate. An Indian assistant from the Agronomy Department chose the sites, while the actual measurements were made by the Estate clerk.

As at Darnall, the sites were chosen for evenness of stand and then ten stalks were chosen at random, spaced approximately three metres apart. Two sites were marked out on each estate, and located as near to the estates office as possible. Varieties were mainly NCo 376 and N55/805, and could have been irrigated or rainfed.

RESULTS

Note: The Mt. Edgecombe results represent the whole of Huletts Mt. Edgecombe land whereas the results from Darnall represent only the Darnall Estates and not those Estates at Kearsney.

The results shown in Figures 1 and 2 were obtained in the following ways:

a) Actual yield

The actual yields were extracted from monthly crop reports and represent the average yield of all cane harvested during that month.

b) Calculated yield (growth)

The yields were calculated by totalling up all growth increments for the life of the crop (using the average age for each month) and then multiplying this total growth by a factor, 0,5147 to convert to yield in Metric Tons per Hectare.

c) Calculated yield (rainfall)

These yields were calculated by totalling up the rain received by that crop (again using average age for each month) and then multiplying by a factor of 0,0882 to convert rainfall (mm.) to Metric Tons per Hectare.

Correlation coefficients were calculated for each season for both Darnall and Mt. Edgecombe as follows:

a. between actual yield and calculated yield (growth)

b. between actual yield and calculated yield (rainfall)

These are presented in Tables I and II

Table 1. Correlation between actual yield and calculated yield (growth)

Season	Darnall	Mt. Edgecombe
1967/68	.705	-
1968/69	.786	.857
1969/70	.759	.853
1970/71	.772	.910
Overall	.704	.819

Table 11. Correlation between actual yield and calculated yield (Rainfall)

Season	Darnall	Mt. Edgecombe
1967/68	.286	-
1968/69	.740	.605
1969/70	.299	.512
1970/71	.659	.837
Overall	.461	.741

DISCUSSION

The correlations between actual yield and calculated yield (growth), while not of a very high order, do show a consistency which is most encouraging. When these figures were first extracted it was expected that no correlation at all would be found at Darnall, where the growth of ten stalks were taken as being representative of approximately 4 000 Hectares of cane with varying soil types, varieties, ratoons and climatic conditions. The correlations at Mt. Edgecombe, on the other hand, were expected to be of a higher order since the growth was recorded on each estate and thus a far more representative sample of growth was obtained.

It is felt that if more sampling were carried out, or a system devised whereby a more representative sample could be obtained, that these correlations could be improved on quite considerably.

Yields calculated from rainfall data were also included as a comparison and it was found that most correlations were of a very low order and not at all consisent. It is felt therefore that growth measurements are definitely superior to rainfall when predicting yields.

With more representative samples of growth measurements would it not then be possible to predict the total crop yield for the following season? If this could be done, and it is felt that it can, a far more reliable estimate would be obtained and this would then make budgetting and planning of resources far less of a guessing game than it is at present. This would be of advantage not only from a company's point of view but also for the industry as a whole.

GDT/PMO/11.2.7/3
8th September, 1971.

FIGURE 1. - MONTHLY DATA FOR MEAN ACTUAL YIELDS AND ESTIMATED YIELDS AT SARIAM

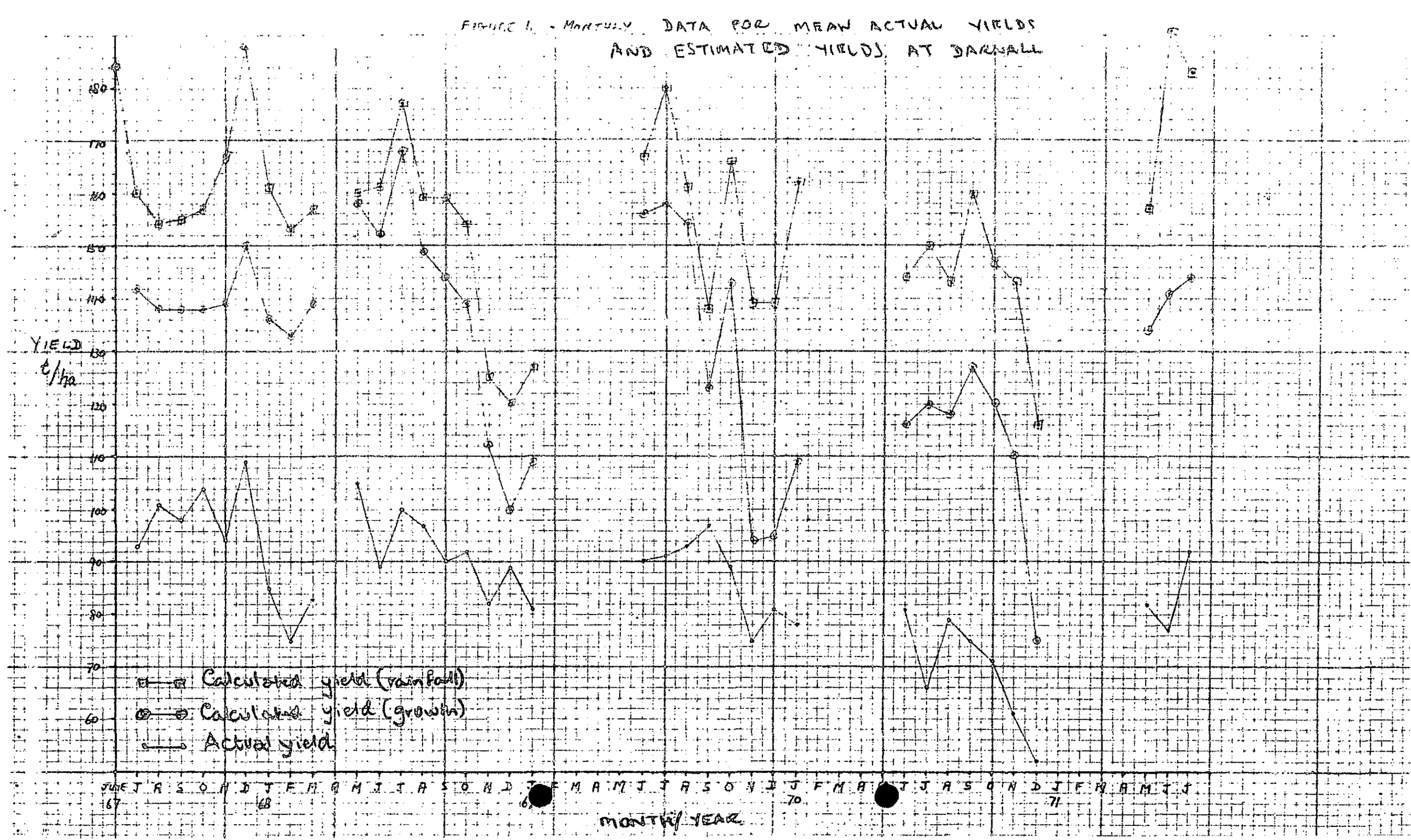
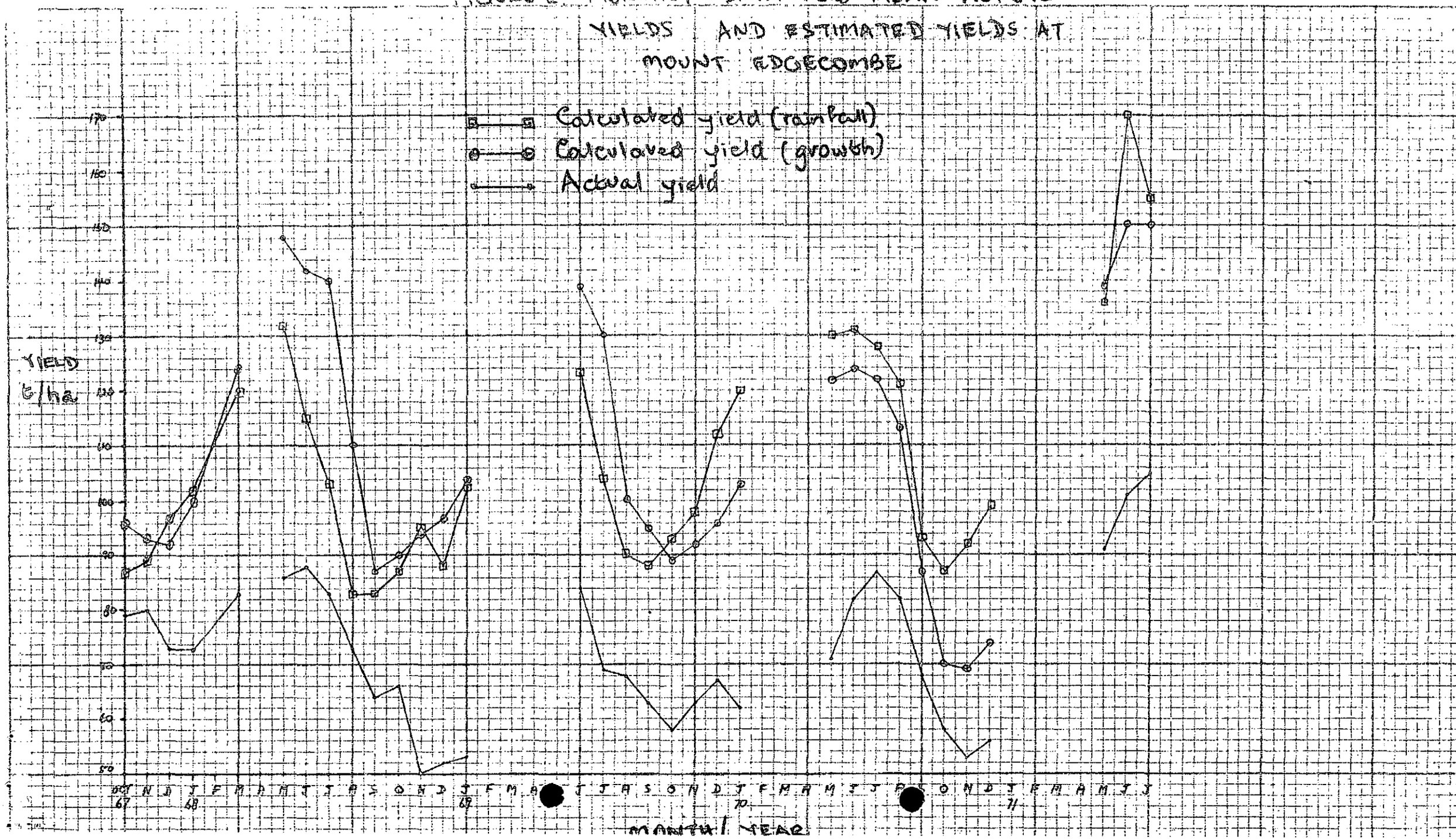


FIGURE 2. MONTHLY DATA FOR MEAN ACTUAL YIELDS AND ESTIMATED YIELDS AT MOUNT EDGECOMBE



SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

SOME IMPRESSIONS OF SURFACE IRRIGATION IN THE U.S.A.

by Colin Whitehead

Duration of visit: Two days, 7 and 8 June 1971.

Purpose: To discuss with Dr. Howard R. Haise of the Agricultural Research Service of the U.S.D.A. at Fort Collins, Colorado, recent developments in techniques of surface irrigation. Also to examine farm irrigation schemes in operation.

Background: The steadily worsening problems of waterlogging in irrigated areas, and the development of brak conditions in the semi-arid sector of the South African cane industry have, for some time, been a source of concern to the Experiment Station. In 1970, an extension campaign was launched, designed to create an awareness of these problems, and to encourage the installation of sub surface drains. In 1971, this was followed with a drive to improve standards of surface irrigation. Emphasis has been placed on the importance of measuring the amount of water applied, the need for effective design, knowledge of the intake capacity of the soil, the importance of sound land management, and the overall significance of economic efficiency in relation to scheme operation. Syphons, spile pipes, flumes and gated pipes were discussed, and these systems were demonstrated in the field.

The situation in Colorado and Nebraska

Surface irrigation systems are widely used in the U.S.A., as they are relatively cheap and reasonably efficient. The more important problems encountered with these systems in Colorado/Nebraska include economic difficulties associated with high labour costs - which is promoting a demand for automation - and wind erosion which results in an accumulation of debris and soil in the supply ditches. The solutions appear to be the accurate automatic control of water, the use of covered supply channels, improvement in operational management and the effective levelling and grading of land to permit uniform distribution of water. Where topography permits, surface systems are preferred for agricultural crops, as these supply water at a much cheaper rate than overhead systems. However, the high cost of labour has stimulated efforts to automate surface irrigation systems. The development of such automation appears to be an important function of the Agricultural Research Service of the U.S.D.A.

Syphon pipe system

This appears to be the most popular surface irrigation system for use with row crops on commercial farms. Syphons are used to deliver water to shallow furrows located between the rows of such crops as beans and sugarbeet. Meticulous care is taken in grading the land before planting and in forming the field furrows subsequently. Syphons are also used to flood carefully graded fields of such crops as wheat and barley - this irrigation technique being referred to as a border irrigation system.

Earth ditches with permanent and temporary checks are still widely used, but most of the farms seen had concrete supply ditches, which had been laid mechanically at a uniform grade, by U.S.D.A. contractors. The quality of construction is excellent, and 60% of the installation costs is covered by U.S.D.A. subsidy. Automatic gates developed by Dr. Haise were seen at a development and testing centre at Fort Collins, Colorado.

The most impressive feature of furrow irrigation systems seen on commercial farms was the uniformity of the water front as it moves down the row furrows. This repeated observation served to emphasise the critical importance of accurate land levelling and furrow construction.

No automated syphons were seen in operation.

Spile pipes

Only one example of a spile pipe irrigation system was seen, and as the field served was currently out of production, the system was not operational. The spile pipe channel was superbly constructed, again by U.S.D.A. contractors. This system is cheaper to operate than the more usual syphon pipe technique, but it has not achieved great popularity because the wind-borne soil deposits which form in the furrow are difficult to remove without damaging the spiles. Indeed, in the fields inspected, the plastic spile pipes used, had become brittle as a result of exposure to the sun, and some had then been broken as a result of ditch cleaning operations. This system, using aluminium pipes, would seem to be better suited to our needs than to the wind-blown plains of Colorado/Nebraska.

Gated pipes

These are considered by Dr. Haise to be the ideal solution for row crops in the Colorado/Wyoming/Nebraska area. Development of improved gated pipe systems has absorbed much of Dr. Haise's time during the last few years. Basic requirements for design stipulate that gated pipes should be:

1. Portable
2. Easily connected
3. Suitable for different row widths
4. Fitted with easy volume output control
5. Fitted with easily replaceable gates
6. Operated automatically
7. Maintained cheaply and easily
8. Of simple design.

Dr. Haise has developed a low pressure, large diameter, gated pipe system which embodies these requirements, and the Agricultural Research Service of the U.S.D.A. has applied for patents. The gates in the pipes are kept closed by air pressures of about 5 p.s.i. supplied by a small compressor to which they are connected by pressure hoses. This air pressure is released on command in specified sections of the pipe line and, where necessary, irrigation employing all sections of the pipe can be fully automated by using time clocks. Labour in fact can be eliminated, except for maintenance, and the need to turn water into the pipeline and to shut the pipeline down again.

A section of pipe, with a fitted gate of the type developed by Dr. Haise, is provided as an exhibit. While our labour costs do not justify a system of the type described, our current lack of skilled labour may do so. Indeed, one can visualise a situation on a South African cane farm where routine irrigation operations are carried out exclusively by the farmer himself, at a

cost no greater than that now involved with traditional solid set overhead systems.

Alfalfa valves

A solid set system with a single 9 or 12 inch diameter riser per field is involved. The top of the riser is located 6 inches to 1 foot above the ground surface. Water flow is controlled by a low pressure balloon valve of the type used for gated pipes, the valve being fitted between the seal to the riser and an adjustable cast-iron head.

The rate of water flow from the riser is controlled by adjusting the cast iron head. Water spills over the riser and floods the field uniformly. To ensure that the system operates efficiently the land must be accurately graded and levelled beforehand. Indeed, at the U.S.D.A. "Farm of the Future" in Nebraska, rolling land had been terraced in the manner one associated with rice paddies in Indonesia, cuts being up to 12 ft deep in places.

The use of alfalfa valves on properly planned and graded land permits complete automation of flood irrigation.

Conclusion

Developments in surface irrigation in the U.S.A. are being promoted by the need to overcome the effect of cost increases due to the rise in labour wages. These developments may be of use to us as a means of overcoming our very real shortage of skilled labour. In South Africa, the basic problem of channel construction remains a very real one. Contractors are needed for this type of work - and these have yet to be found.

For our purposes the spile pipe system has particular merit. Syphon pipe irrigation systems are somewhat easier to construct but more expensive to operate. Automated, gated pipes offer promising future prospects and they may in fact supersede other surface systems if they can be manufactured locally at reasonable prices.

16th September, 1971.

situation survey

zululand south 1970

by

q. v. mann

SITUATION SURVEY - ZULULAND SOUTH

by

Q.V. MANN

CONTENTS

SITUATION SURVEY

ZULULAND SOUTH 1970

1. INTRODUCTION

1.1 The area known as Zululand South stretches from the Tugela river in the South, to the Port Durnford forests in the North East and to Ntumeni in the North West. It embraces 35 079 ha of sugarcane land and an estimated total area of 51 000 ha. At current land value (calculated at R22 per metric ton of cane produced) this constitutes a capital investment in land of some R42 000 000 or an average price of land at R825 per total hectare or R1 200 per hectare of cane land.

1.2 Within this area there are 211 European-owned cane quotas and 54 quotas owned by the coloured descendants of John Dunn. Bantu growers in the Bantu areas are not included. For the purpose of this analysis the rest of this paper is concerned only with European growers who have been divided up into 13 liaison groups and 3 main areas.

1.3 Prior to 1963 agricultural extension was conducted throughout all Zululand by Mr. J.M. Robertson. Since that date extension activities have been the writer's responsibility, operating in the very much reduced total area.

1.4 In January 1970 a questionnaire was sent to the 162 farmers who are responsible for cane production on most of the European-owned land. From these were received 95 replies representing 59% of the farmers and 57% of the cane area. It may be argued that these 95 growers constitute a biased sample comprising most of the leading growers in the area. If this is true, temper these findings with this knowledge, but let it be said that many of the busiest and most successful farmers and leaders of the community in every respect were too busy farming to complete their forms.

1.5 To those growers who did take the trouble to wade through this lengthy examination, the writer wishes to express his sincere thanks for their interest and the wealth of information so unstintingly supplied. It is hoped that this summary of findings will be of interest to all growers in this area.

1.6 Throughout this analysis percentage figures quoted refer to the 94 growers who completed the questionnaire unless otherwise stated. Metric measures are used throughout.

2. PRODUCTIVITY

2.1 During the 1969/70 season this area supplied the two sugar mills within its boundaries, and a further four mills outside, with a combined total of 1 723 600 tons of cane at 13.08% sucrose. The growing season had been kind, so this crop represented 88.5% of mean peaks. A detailed breakdown of these figures showing liaison group averages and averages for

the three main areas is shown in Table I. All estimates in this table are based on the 59% who replied to the questionnairs.

TABLE I ZULULAND SOUTH 1969 PRODUCTION FIGURES

Liaison group	Cane area in ha	Estimated total area	Estimated area harvested	Est. % area harvested 69/70 (68/69)	Estimated age in months	Mean Peak tons suc	1969/70 Tons suc	1969/70 Tons cane	% Suc.	t Cane/ total cane area ha	Estimated t/cane ha/ crop	% t suc of mean peak
Mandini No. 1	2661	3830	1590	59½% (60%)	19	18400	16300	123600	13.21%	46.4	78	88.7%
Nyoni No. 2	2487	3510	1390	56% (54%)	19½	14450	12250	93200	13.15%	37.5	67	84.8%
Amatikulu No. 3	2824	3390	1890	67% (61%)	17½	18460	17220	132300	13.01%	46.8	70	92.3%
Heybridge No. 4	2819	3410	1540	54% (54%)	20	18960	16270	12300	13.24%	43.6	80	86.0%
Gingindhlovu South Average	10791	14140	6410	59½%	19	70270	62040	472100	13.16%	43.7	73	88.5%
Nyezane No. 5	3752	4540	2460	65½% (62½%)	17½	32920	27800	210800	13.20%	56.2	86	84.6%
Coastal sands No. 6	3746	4460	2580	69% (61%)	17	31500	27120	208000	13.04%	55.5	81	86.2%
Ibati No. 7	2673	3020	1790	67% (68%)	16½	24830	21720	164500	13.21%	61.6	92	87.5%
Mlalazi No. 8	2020	2410	1290	64% (72%)	16½	19160	16610	129800	12.81%	64.4	101	96.6%
Mtunzini Average	12191	14430	8120	66½%	17	108[illegible]0	93250	712100	13.10%	58.4	88	85.7%
Granite Hills No.9	1537	2380	880	57½% (58%)	19	10720	9480	69900	13.56%	45.5	78	88.5%
Eshowe South No.10	2418	3670	1520	63% (57%)	18½	20020	18880	151800	12.44%	62.7	100	94.4%
Eshowe North No. 11	2194	2940	1320	60% (54%)	19½	16090	16000	118300	13.53%	54.0	90	99.5%
Ntumeni East No. 12	1700	3320	910	53½% (50%)	21	12200	10050	80400	12.50%	47.3	88	82.1%
Ntumeni West No. 13	2866	7950	1570	55% (40%)	21½	16500	15770	119000	13.25%	41.6	76	95.5%
Eshowe Average	10705	20260	6200	58%	20	75530	70180	539400	13.01%	50.4	87	92.7%
TOTAL	33687	48830	20730	61½%	18½	254210	225370	1723600	13.08%	51.1	83	88.5%

2.2 The figures indicate that production has stabilized considerably. The effects of chasing mean peaks in recent years are largely over as most groups are now fairly well in balance and the age of cane at harvest has increased. The three groups still somewhat out of balance are the Coastal sands, Mlalazi and Ntumeni West. As would be expected, the climate, soils and topography influence the production figures considerably. High rainfall areas, deep soils and gentle topography have high productivity, as can be seen in the column on tons cane per total area under cane. Low rainfall areas, shallow soils, steep topography and high altitude or inland areas have lower productivity.

2.3 CONCLUSIONS: Registered quota area, mapped cane area and actual area under cane are all different. The grower has to know his area for efficient management, and is the one most likely to know the exact area under cane. It is strongly recommended that the industry obtain statistics on area under cane and area harvested each year from growers, and record these figures in schedule "A". Only then could the efficiency of the industry really be measured and accurate industrial estimates predicted. Productivity figures based on registered quota area or official mapped area (with large areas lying fallow or new areas established) are meaningless.

3. RAINFALL

3.1 It is intended to do a great deal more work on the available rainfall figures, as it is hoped to compile a detailed rainfall map of the entire area using every farm rain gauge there is.

3.2 Preliminary investigations into these figures reveal the interesting fact that the last five-year average rainfall is about 75 mm less than the long-term 30 to 50 year average for a number of recording stations in Zululand South. The last 10 year average is also about 50 mm less than the long term average, thus showing the magnitude of the dry cycle that has been experienced in recent years.

3.3 For the purpose of comparing crop productivity with rainfall, from one area to the next and (in future) from one year to the next, thirteen sets of rainfall stations have been selected which it is hoped will each be fairly representative of the liaison group they derive from. Monthly totals for two years are shown in Table II.

3.4 It has been found from experience that a fairly good correlation exists between seasonal rainfall (July of one year to June of the next) and the yield of cane per hectare for each area. Thus, knowing past performance of an area with known rainfall, fairly good estimates can be made relatively early in the cutting season, based on the current season's rainfall. From Tables I and II it will be seen that in Zululand South 1092 mm rain in the 1968/69 season produced an average 51.1 t cane/ha in the 1969/70 milling season or 4.68 t cane/100 mm rain. Seasonal rainfall was also 102% of long term average, producing 88.5% of mean peaks.

TABLE II Monthly rainfall for 13 stations in Zululand South (mm)

MONTH \ STATION	ST ANDREWS 1	PIERRE-FOND 2	AMATIKULU MILL 3	BROOKLANDS 4		RICHENEAU 5	ADOMAY 6	PROPAGATION FARM 7	FORT NAPOLEON 8		MORNING GLORY 9	NEATHERLY 10	GRATTON 11	ARCADIA 12	ARUNVALE 13		ZULULAND SOUTH AVERAGE
January	193	172	141	132		118	126	152	126		123	115	113	119	118		
February	122	111	70	76		122	82	112	147		127	187	125	149	147		
March	127	81	112	134		176	170	222	187		99	141	118	147	128		
April	46	42	47	56		59	31	54	37		43	25	42	22	11		
May	8	8	8	15		33	25	21	19		5	10	2	2	0		
June 1968	46	49	60	64		65	47	43	60		32	23	30	6	8		
July	2	0	5	0		4	7	16	26		0	0	2	1	8		
August	84	90	78	93		112	82	116	98		98	113	107	110	97		
September	91	79	78	78		91	74	79	66		103	89	80	51	50		
October	49	35	39	56		87	61	81	111		53	90	75	49	55		
November	121	95	110	100		128	148	140	162		114	132	90	78	85		
December	118	105	105	150		146	173	192	175		203	198	187	228	224		
January	43	34	40	54		51	28	46	68		68	71	52	59	59		
February	78	67	55	63		61	55	89	80		61	87	69	52	67		
March	291	232	250	273		310	289	281	372		261	279	266	292	234		
April	97	75	78	77		82	67	91	61		64	76	67	59	60		
May	60	68	74	62		105	82	96	122		53	51	42	57	58		
June 1969	28	23	19	19		54	51	63	50		25	29	23	19	13		
July	8	11	16	16		28	16	25	19		12	17	14	9	13		
August	1	2	5	8		8	14	34	12		6	19	7	6	1		
September	79	85	102	113		123	102	157	142		100	122	89	112	128		
October	140	134	155	184		172	141	189	162		140	200	147	180	167		
November	103	57	80	85		110	125	208	87		97	69	79	69	64		
December	66	73	68	125		104	105	145	91		94	146	35	123	122		
July 68 to June 69 Seasonal rainfall	1062	903	931	1025	980	1231	1217	1290	1391	1282	1103	1235	1060	1055	1006	1092	1118
Rain on crop (Est.)	1377	1237	1146	1507	1317	1518	1421	1559	1634	1533	1400	1521	1424	1627	1596	1514	1455
Average age of crop	19	19½	17½	20		17½	17	16½	16½		19	18½	19½	21	21½		18.7
Approx. Group Long average	1050	950	1000	1050		1200	1250	1250	1300		1050	1200	950	1150	900		1100
Seasonal % Long average	101%	95%	93%	98%		102%	97%	103%	107%		105%	103%	112%	92%	112%		102%

TABLE III Estimated rainfall on crop 1969/70 crop production and crop/rain efficiency for liaison groups in Zululand South

Liaison group	Estimated average t cane/ha/crop	Estimated average age	Estimated rainfall on crop	Crop rain efficiency t cane/ha/100 mm rain
1. Mandini	78	19	1377	5.67
2. Nyoni	67	19½	1237	5.42
3. Amatikulu	70	17½	1146	6.12
4. Weybridge	80	20	1507	5.31
Gingindhlovu South Average	73	19	1317	5.55
5. Nyalane	86	17½	1518	5.67
6. Coastal Sands	81	17	1421	5.70
7. Ibati	92	16½	1559	5.91
8. Mlalazi	101	16½	1634	6.18
Mtunzini Average	88	17	1533	5.74
9. Granite Hills	78	19	1400	5.57
10. Eshowe South	100	18½	1521	6.57
11. Eshowe North	90	19½	1424	6.32
12. Ntumeni East	88	21	1627	5.41
13. Ntumeni West	76	21½	1596	4.77
Eshowe Average	87	20	1514	5.75
Zululand South Average	83	18½	1455	5.71

3.5 As a measure of farming efficiency the yield of cane per unit area per 100 millimetres of rain (or rain plus irrigation) falling on the crop, is a very good yardstick.

As the average milling seasons opens in May and closes in December/January, it is necessary to average the rain which has fallen on the crop harvested during this milling season. For this purpose, September is selected as the mid-season point. To calculate the average rain which has fallen on the whole crop, first work out the

average age of the whole crop harvested. Then, starting from September, total the rainfall figures for the same number of months - working backwards.

Now, to calculate the efficiency factor, the total yield should be divided by the average total rainfall (in millimetres) and by the number of hectares involved. If the answer is multiplied by 100 this will give an efficiency factor expressed in tons cane per hectare per 100 mm water. (See Table II). Rainfall and crop efficiency for the various liaison groups is shown in Table III.

Having attempted to eliminate the effects of variable total rainfall on the crop and the different ages at which cane is harvested, what should be evident in Table III is the effects of soils, topography, temperature, cloudiness and that all important and controllable factor MANAGERIAL ABILITY. The high rainfall groups still come out on top probably because here the rain is less erratic. The two Eshowe groups head the list probably due to the deep soils and gentle topography. It is hoped also that a high standard of managerial ability plays a part. Amatikulu group is surprisingly high and part of this at least must be due to the concentration of supplementary irrigation in this area. Could it also be that the effects of conservation planning are beginning to have their effect? It this were so, higher figures should show in the Mandini and Nyoni groups as well. The Ntumeni groups are understandably low due to the high altitude and/or the greater distance from the sea. Steep topography and light soils may also play a part.

3.6 CONCLUSIONS: Rainfall is a cane farmer's bread and butter. It is also his chief topic of conversation whether in short supply or in excess. The writer is of the opinion that a measure of rainfall efficiency as expressed in terms of tons cane produced per 100 millimetres of rain on the crop, could become as important a diagnostic aid to trouble shooting in the future as the clinical thermometer is to the physician. Research workers at the Experiment Station have, for some time, claimed that one inch of rain should produce one short ton of cane per acre. By conversion, this should now read 100 millimetres of rain should produce 9 tons cane per hectare. Even the best farmers in the best areas have to go a long way to approach this goal. But it is worth aiming for and every rung up the ladder would mean increased returns.

4. SOILS AND TOPOGRAPHY

4.1 Based on a simple qualitative assessment of the replies received:

2% of growers have a very limited knowledge of their soils.

24% possess inadequate understanding and knowledge.

43% have a fair understanding of broad soil associations based on parent material, texture and/or colour.

25% recognise most of their soils and classify them on parent material, texture, colour, fertility and position in the topography.

2% of growers know the series names of their soils and understand most of their limitations and advantages.

4% did not answer the questions in this section.

4.2 Average percentage slopes and average area of primary land units (i.e. that area of land served by a single primary waterway and bounded by primary crests) have been determined from a critical examination of the 1:50 000 topo-cadastral survey maps. On each farm the average contour spacing for cultivated lands was estimated in order to determine their average percentage slope - and on each large catchment area, representing similar topography, the number of primary land units were counted and divided into the total catchment area to determine average primary land unit area. Summarized findings of this examination appear in Table IV.

4.3 CONCLUSIONS

4.3.1 Growers have shown that they are interested in knowing more about their soils, and an educational programme should be embarked upon to teach each grower to recognise his soils. It is considered worthwhile that every farmer should know the series names and the agricultural qualities of at least all those soils occurring on his farm.

4.3.2 By apportioning whole groups into different slope criteria from Table IV it is concluded that 62% of all cane land is easily worked by wheel tractors (less than 10% slope), 21% is worked with some difficulty (10 to 15% slopes), 12% with extreme difficulty and only 5% cannot be worked across the slope even by four wheel drive tractors (more than 30% slope). It is expected that very similar proportions would be determined even if a more detailed field-by-field analysis were conducted. This would seem to indicate that though slope is of paramount importance to individual farmers with steep farms, it is not as important to the industry as a whole as is often stated.

5. VARIETIES

5.1 The percentage area of established commercial cane varieties in the various liaison groups is shown in Table V (data are straight means of percentage figures from 94 growers). The marked figures are, in the writer's opinion, either surprisingly low or surprisingly high.

5.2 This situation is by no means static as is illustrated in Table VI which shows the percentage of different varieties planted in 1969-70 season.

In the two coastal groups, reliance is being placed almost entirely on N55/805 and NCo376. At high altitude NCo376 is first but this is followed fairly closely by NCo293 and N55/805. N53/216 and CB36/14 are also being planted in appreciable quantities.

5.3 Growers opinions on the relative merits of the varieties is also revealing and the present popularity of varieties by liaison groups in shown in Table VII.

TABLE IV Estimated average percentage cultivated land slopes and average primary land unit areas for the liaison groups in Zululand South

Liaison group	Estimated average % cultivated land slopes	Estimated average primary land unit areas
		ha
1. Mandini	10%	11
2. Nyoni	8%	13
3. Amatikulu	9%	12
4. Weybridge	7%	17
Gingindhlovu South	8½%	13
5. Nyezane	4%	23
6. Coastal Sands	8%	12
7. Ibati	6%	20
8. Mlalazi	9%	8
Mtunzini Average	6½%	16
9. Granite Hills	30%	6
10. Eshowe South	11%	15
11. Eshowe North	13%	13
12. Ntumeni East	24%	7
13. Ntumeni West	19%	14
Eshowe Average	18%	11
Zululand South Average	11%	13

TABLE V Estimated percentage area of commercial cane varieties in Zululand South

CANE VARIETY / LIAISON GROUP	Co 331	NCo 310	NCo 292	NCo 293	NCo 376	NCo 382	N50/ 211	N51/ 168	N51/ 539	N53/ 216	CB 36/14	CB 38/22	N55/ 805
1. Mandini	–	2	–	–	82 H	2	1	½	1	½ L	½	–	10
2. Nyoni	–	6	6 H	–	65	3	5	2	6	1	–	–	3 L
3. Amatikulu	–	3	2	–	71 H	3	2	2	6	1	½	½	8
4. Weybridge	–	7	–	–	67	7	4	2	½	– L	½	–	12
Gingindhlovu Average	–	4	2	–	71	4	3	2	3½	½ L	½	–	8
5. Nyezane	1	6	–	–	63	1	5	1	–	– L	1	–	20
6. Coastal Sands	–	7	–	–	65	11 L	5	–	–	– L	1	–	10
7. Ibati	–	2	–	–	78 H	2	3	½	½	½ L	1	½	11
8. Mlalazi	–	15	–	–	61	10 L	1	–	–	– L	–	–	11
Mtunzini Average	–	8	–	–	67	6	4	½	–	– L	1	–	13
9. Granite Hills	1	16	–	1	70 H	–	1	–	1	2	1	–	7
10. Eshowe South	–	3	–	9	57	1	6	–	–	16	4	–	4
11. Eshowe North	–	3	–	36	33	5	11	–	–	5	2	–	5
12. Ntumeni East	–	7	–	18	62	5	4	–	–	1 L	1 L	–	½ L
13. Ntumeni West	–	3	–	32	47	10	4	–	–	1 L	– L	–	3
Eshowe Average	–	6	–	19	54	4	5	–	–	5	1½	–	4

TABLE VI Percentage of varieties planted in 1969/70 season.
(Data percentage of actual area of varieties planted by 94 growers)

CANE VARIETY / LIAISON GROUP	NCo 310	NCo 292	NCo 293	NCo 376	NCo 382	N50/ 211	N51/ 539	N53/ 216	CB 36/14	N55/ 805	N6
1. Mandini	-	-	-	25	-	-	-	6	-	69	-
2. Nyoni	4	-	-	58	9	-	-	-	-	27	-
3. Amatikulu	2	3	-	44	1	-	2	2	2	38	6
4. Weybridge	-	-	-	36	-	-	-	-	1	59	3
Gingindhlovu Average	1½	1	-	41	2½	-	½	2	½	48	2
5. Nyezane	1	-	-	33	-	1	-	-	-	63	2
6. Coastal Sands	-	-	-	35	8	-	-	3	-	51	2
7. Ibati	-	-	½	58	-	-	½	2	-	39	-
8. Mlalazi	-	-	-	41	-	-	-	7	6	46	-
Mtunzini Average	-	-	-	42	2	-	-	3	1½	50	1
9. Granite Hills	1	-	-	55	-	-	-	½	-	43	½
10. Eshowe South	-	-	7	33	-	-	-	20	14	25	
11. Eshowe North	-	-	26	27	-	2	-	13	11	20	-
12. Ntumeni East	3	-	39	42	4	-	-	7	3	2	-
13. Ntumeni West	5	-	40	37	-	-	-	9	3	6	-
Eshowe Average	2	-	22	39	1	½	-	10	6	19	-

Table VII Numerical merit assessment of varieties by growers.

(Data processed by weighted means of 91 growers opinions)

NUMERICAL ORDER / LIAISON GROUP	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1. Mandini	N55/805	NCo376	CB36/14	N53/216	N51/539	N51/168				
2. Nyoni	NCo376	N55/805	NCo310	N53/216	NCo382	N6				
3. Amatikulu	NCo376	N55/805	N6	N53/216	NCo310	NCo292	NCo382	N51/539	N50/211	
4. Weybridge	N55/805	NCo376	N6	CB36/14	N50/211	N53/216	CB38/22	N51/168	NCo310	
	(NCo376) (N55/805)		N6	N53/216	(NCo310) (CB36/14)		NCo382	N51/539	N50/211	N51/168
5. Nyezane	N55/805	NCo376	N6	N50/211	CB36/14	N51/168				
6. Coastal Sands	N55/805	NCo376	NCo382	CB36/14	N53/216	CB38/22	N6	NCo310	N50/211	
7. Ibati	(NCo376) (N55/805)		NCo310	CB36/14	NCo382					
8. Mlalazi	NCo376	N55/805	NCo382	CB36/14	N53/216					
	N55/805	NCo376	CB36/14	NCo382	N53/216 N6		NCo310	N50/211	(N51/168) (CB38/22)	
9. Granite Hills	(NCo376) (N55/805)		NCo310	N6	N53/216	N51/168	NCo293			
10. Eshowe South	N53/216	N55/805	NCo376	CB36/14	N50/211	NCo293	(NCo310) (NCo339)		N6	
11. Eshowe North	NCo376	NCo293	N55/805	N53/216	CB36/14	(NCo310) (N50/211)				
12. Ntumeni East	NCo376	N55/805	NCo293	CB36/14	NCo310	N6				
13. Ntumeni West	NCo376	NCo293	N53/216	N55/805	NCo310	CB36/14	(NCo292) (N6)			
	NCo376	N55/805	NCo293	N53/216	NCo310	CB36/14	N6	N50/211	N51/168	(Nco292) (NCo339)

5.4 CONCLUSIONS: This summary of the variety situation in Zululand South is considered invaluable to grower and extension staff alike as individual pet likes and dislikes are tempered by the mass of practical experience and average grower opinion.

5.4.1 NCo376 is still undisputed "king" of the varieties though more N55/805 was planted than NCo376 in the coastal areas this year.

5.4.2 At high altitude NCo376 and NCo293 are both very sound varieties while N55/805, N53/216 and CB36/14 are all useful.

5.4.3 NCo382 is used less than was expected on the recent sands and very light soils.

5.4.4 N50/211, always controversial and never very prominent, seems to persist but is not being replanted much.

5.4.5 N51/168 and N51/539 have both been rather disappointing in their ratooning ability and in truck weights (bulk density).

5.4.6 N53/216 is a variety that is worthy of greater attention by all growers. Out of 86 comparative crops, mostly plant crops and 1st and 2nd ratoons harvested by the Experiment Station in recent years, N53/216 was the only variety that, on average, out-yielded NCo376 in tons sucrose per hectare. Its hairiness and reputed poor ratooning ability in the early season cannot outweigh this achievement.

5.4.7 CB36/14 is finding a useful nitch for itself at high altitudes, particularly in valley bottoms and frost traps, where it can be harvested annually during late winter.

6. FARM PLANNING AND CONSERVATION

6.1 There is no doubt that farm planning has had a major impact on the majority of cane growers in Zululand South during the past 10 years.

6.2 From a comparison of 1955 and 1966 aerial photographs, it was quite evident that though many growers had previously tried constructing conservation terraces within fields and were all largely aligning their crop rows across the slope, only nine or ten growers had really looked at their farm layout critically and decided to improve it.

6.3 Today it is known that 87 quota holders are actively engaged in improving field layout, crop extraction roads and soil and water conservation measures on their farms. This means new shapes to fields, new roads, new drains and waterways, new terraces, blocking off homogeneous soil types or land slopes, closing badly eroded or badly aligned roads and drains, stabilizing existing waterways and building dams.

6.4 From the questionnaire, 81% of growers claim to have improved their road alignment during the last 5 years. 68% of all land

replanted during the last 5 years is said to have been done in accordance with conservation principles. 66% of growers claim that farm planning is essential, 25% that it is worthwhile, 8% that it is too costly and only 1% that it is too much trouble.

6.5 It is also claimed that 86 km of grassed waterways have been constructed during the last five years and coupled with this there is an estimated 500 km of conservation terrace. This is still less than half the estimated requirement that should have been necessary on the 8 000 ha of land said to have been planted on conservation principles but it is nevertheless an enormous stride forward.

6.6 In 1960 there were about 30 farm dams with more than 5 000 m^3 capacity and a combined capacity of 1 550 000 m^3.

6.7 Today there are 55 such dams with a combined capacity of 3 470 000 m^3 and a further 17 new smaller farm dams. There are 5 or 6 big farm dams either under construction or on the drawing board that alone will account for more than 1 200 000 m^3 of stored water.

6.8 Built largely at the farmers' own expense, all these dams constitute a significant contribution to the country's stored water resources.

6.9 CONCLUSIONS: Conservation is a battle well on the way to being won. A sufficient number of growers have already got the bit so firmly between their teeth and are so convinced of the long term benefits of farm planning that they will carry with them all but the most stubborn. A tremendous amount of work remains to be done and there are very real problems to face, particularly in areas of steep topography. Unfortunately, there is not enough research backing for a lot of what is being recommended. Further research and experience may change even basic ideas but the decision to change, and change for the better, has already been made by the majority of growers. Provided the directives from the Minister of Agriculture are rational and the rulings just, no great setbacks to implementing the very far-reaching Soil Conservation Act are expected.

7. LAND PREPARATION

7.1 Despite the firm stand taken by the Experiment Station that deep land preparation has not shown increases in cane yields sufficient to warrant its cost and that rarely were there benefits from subsoiling ratoon cane, this subject remains as controversial as ever.

7.2 50% of growers claim to have increased depth of land preparation during the past 5 years to an average of 44 cm. The remaining growers prepare their soils to an average depth of 26 cm. Light sandy soils are prepared deeper than heavier clay soils but there are no major differences in depth of land preparation between liaison groups. There are growers from each school of thought in each area.

7.3 47% of all growers favour very deep (+ 60 cm) land preparation, 27% are not in favour of very deep land preparation mostly on economic grounds and 26% are not committed either way.

7.4 At least 20% of the growers who favour deep land preparation are against soil inversion.

7.5 40% of growers favour subsoiling old ratoons. 11% of these have changed their minds toward this practice as a result of recent findings. The majority of the group either prefer to believe their own experience and observation, or the root laboratory work has impressed them more than the deep land preparation trials.

7.6 53% of growers do not favour subsoiling old ratoons and 29% of these have changed their attitude towards this practice as a result of recent findings, so there have been more growers who have stopped subsoiling than those who have started.

7.7 The remaining 7% are either undecided or sometimes subsoil for specific reasons.

7.8 The lists of soil working implements used in land preparation were difficult to analyse but it is hoped that the following comments are pertinent. Surprisingly the controversial rotavator appeared on the lists of 47% of growers. Bulldozers, tow scrapers or graders figured on 19% of the lists, which indicates that many growers consider land shaping, levelling and planing to be part and parcel of land preparation. The use of chisel-type ploughs seems to be making slight inroads into the use of conventional disc and mouldboard ploughs. A number of large, single-furrow reversible mouldboard ploughs have been introduced, chiefly for their ability to throw soil uphill on relatively steep slopes and to prepare soil fairly deeply with standard tractors.

7.9 CONCLUSIONS: The controversies over deep or shallow land preparation, inversion of topsoil or chisel ploughing and whether or not to subsoil ratoons are all very healthy. They signify an intelligent desire on the part of the growers to learn and progress. What is right or wrong, good or bad is still by no means settled but at least the farming community is aware of what is being done and critical of their own techniques.

8. PLANTING

8.1 9% of growers plant all their crops mechanically. A further 11% plant some of their crops mechanically.

8.2 33% of growers claim to use a fungicidal dip at planting and a further 37% claim to do so sometimes. These figures seem high from the writer's experience and may even be an exaggeration, because growers know what they ought to be doing.

8.3 The average depth of furrowing out at planting is claimed to be:-

Less than 20 cm deep by 37% of growers
20 to 30 cm deep by 45% of growers
30 to 40 cm deep by 15% of growers and
more than 40 cm deep by 3% of growers

Many growers have good reasons for moderately deep furrowing but there seems little justification for deeper than 30 cm.

8.4 Quite shattering is the fact that 7% of growers quite openly claim to furrow out as deep or to a greater depth than that which they prepare their soils. In other words the cane sett is laid right on hard, unprepared soil!

8.5 It is very gratifying that 82% of growers claim to have made preparation for planting from heat treated stock in the 1970-71 season. This figure too is unexpectedly high and should probably be interpreted that 82% of growers have planted or will plant some land from heat treated seed this season - not their entire commercial area.

8.6 The percentage area replanted during 1968/69 season, that planted during the last five years and the calculated crop cycle time, are all shown in Table VIII.

8.7 CONCLUSIONS: It is hoped that in the not too distant future over 80% of growers will not only be using heat treated stock or seed but will be using certified clean seed for all their replanting programmes. It is felt that there is a need to change the emphasis from straight heat treatment of seed to seed selection and seed preparation. Though now practised by only a minority group it is also felt that very deep furrowing out should be actively discouraged. The percentage area replanted annually is high but this is so for four reasons:-

a) the changing variety patterns
b) recent series of dry years
c) scramble to increase production and build mean peaks
d) the impact of farm planning

Only one surprise was revealed in the figures for percentage area replanted annually and that was the relatively low figure for Group 6 on the coastal sands. It was previously thought that this group would replant a much bigger area annually because of the poor ratooning ability of cane on these soils.

9. FERTILIZER USE

9.1 A total mass of 12 780 tons of fertilizer was claimed to have been purchased by the growers answering the questionnaire, suggesting an estimated consumption of about 22 000 tons per annum for the whole of Zululand South. The average rate of application was 933 kg/ha. Potash was the most-used individual plant nutrient and 4:1:6(31) and 1:0:1(47) were the most popular mixtures. Working on average type of fertilizer used, 933 kg is estimated to cost R46.60 per ha per crop, or R30.20 per total area under cane or 59c per ton cane on the 1969-70 crop. (See Table IX).

9.2 Average F.A.S. recommendations during the last two years in Zululand South have been approximately 120 kg/ha N, 10 kg/ha P and 200 kg/ha K. This is equal to 710 kg/ha of concentrated fertilizer and would cost about R38 per ha per crop or R24.60 per total hectare under cane or 48c per ton cane based on the 1969-70 crop.

TABLE VIII Zululand South percentage areas replanted and crop cycle times

Liaison group	% area replanted ... 1968/69	% area replanted 1964/69	Calculated crop cycle (years)
1. Mandini	15.0	68	7 to 8
2. Nyoni	14.5	52	9 to 10
3. Amatikulu	16.0	74	6 to 7
4. Weybridge	17.0	60	8 to 9
Gingindhlovu South Average	15.6	64.5	7 to 8
5. Nyezane	15	65	7 to 8
6. Coastal Sands	17	51	9 to 10
7. Ibati	15	69	7 to 8
8. Mlalazi	15	53	9 to 10
Mtunzini Average	15.5	59.5	8 to 9
9. Granite Hills	17	72	7
10. Eshowe South	13.5	48	10 to 11
11. Eshowe North	12	68	7 to 8
12. Ntumeni East	11	67	7 to 8
13. Ntumeni West	13	50	10
Eshowe Average	13.3	61	8 to 9

TABLE IX Fertilizer used and estimated costs for liaison groups in Zululand South

Liaison group	Mass of fertilizer applied per hectare	Concentration of fertilizer	Estimated cost per hectare per crop	Estimated cost per total cane area	Estimated cost per ton cane
	kg				
1. Mandini	1070	Low	R48-80	R30-80	66c
2. Inyoni	765	High	R38-20	R23-50	63c
3. Amatikulu	670	High	R33-50	R23-00	49c
4. Weybridge	903	Low	R38-90	R23-30	53c
Gingindhlovu South Average	852		R39-85	R25-15	58c
5. Nyezane	1065	High	R53-20	R36-50	65c
6. Coastal Sands	1100	Low	R50-20	R34-40	64c
7. Ibati	1070	High	R53-50	R39-00	63c
8. Mlalazi	1000	High	R50.00	R36-40	57c
Mtunzini Average	1059		R51-72	R36-58	62c
9. Granite Hills	900	Low	R41-00	R25-90	57c
10. Eshowe South	850	High	R42-50	R27-60	44c
11. Eshowe North	890	High	R44-50	R27-40	51c
12. Ntumeni East	980	High	R48-00	R27-90	59c
13. Ntumeni West	870	High	R43-70	R24-40	59c
Eshowe Average	898		R44-10	R26-64	54c
Total	933		R46-60	R30-20	58c

9.3 The amount of fertilizer used in 1967 (last known figures) was 122 000 tons which was equivalent to 84 kg/ha N, 17 kg/ha P and 93 kg/ha K. This cost about R28 per ha per crop, or R16.70 per total hectare or 33c per ton.

9.4 In a trace element and major nutrient survey conducted by the Experiment Station during 1970, 98 soil and leaf samples were taken from 30 different farms in Zululand South representing all the major soil types. No severe trace element deficiencies were detected but 39 soil and leaf samples showed deficiency levels of potassium after normal fertilization, 23 leaf samples showed deficiency levels while the corresponding soil samples were adequate, and 17 soil samples showed deficiency levels while the corresponding leaf samples were adequate. Only 19 samples showed adequate potassium in both the soil and the leaf. In only 12 samples was there a big discrepancy between the soil and the leaf analysis indicating a fairly good correlation between the analyses.

9.5 During the last two years 1 777 soil samples for F.A.S. recommendations have been analysed from Zululand South. This is estimated to represent only 15 to 20% of all the fields harvested. The free services were used by 94 growers but 10% of the growers sent in 55% of the samples. Very few leaf samples were taken. Detailed figures of F.A.S. use are shown in Table X.

9.6 66% of all soil samples taken had potassium fertilizer recommended.

9.7 Only 9% of growers distributed their fertilizer by tractor drawn equipment, 6% distribute it by animal drawn equipment, 33% by a combination of tractor and/or animal drawn equipment, and by hand, and 52% distribute it solely by hand.

9.8 60% of growers use filtercake and/or other forms of organic manures for some or all of their planting.

9.9 CONCLUSIONS: The facts quoted are very interesting. I believe them to be reliable and they should, therefore, be of value to both the grower and the research worker.

9.9.1 In 1969-70 Zululand South used 80% more fertilizer than the average for the industry in 1967.

9.9.2 The whole of Zululand South is estimated to have spent R185 000 more on fertilizer than would have been recommended by F.A.S. - in other words 23% more than average F.A.S. recommendations. Bearing in mind that potash is the most widely used single nutrient, it is surprising that in the recent nutrient survey 56% of soil samples and 62% of leaf samples showed deficiency levels of potassium following normal fertilizing.

9.9.3 How can these anomalies be reconciled? The following comments are my own personal opinion and they may be incorrect. Nevertheless, they should I feel, be stated:-

i) I fail to understand how a commercially orientated profit seeking industry could consistently overspend on fertilizer if the individuals concerned were not themselves convinced as a result of experience that it was a fairly sound investment. With the price of fertilizer in relation to the price of cane being what it is, one cannot afford

TABLE X F.A.S. use during 1969 and 1970 for liaison groups in Zululand South

Liaison group	No. of growers using F.A.S.	No. of samples sent	Fields sampled as % of fields harvested
1	6	71	8
2	9	132	20
3	7	108	14
4	7	94	12
5	13	306	28
6	9	225	24
7	7	147	18
8	5	66	8
9	5	53	8
10	9	172	20
11	6	189	30
12	5	91	14
13	7	140	23
Total	95	1796	17

not to fertilize for maximum expected yields. I believe, therefore, that consideration should be given to increasing the level of fertilizer application recommended by the F.A.S.

ii) It is true that some individuals are grossly overspending on fertilizer and their yields per hectare in relation to their neighbours do not show any better response. Too little use is being made of the free services provided by the F.A.S. - particularly leaf sampling which should supplement soil sampling to provide a sound fertilizer programme.

iii) Individuals who are convinced that 220 kg per hectare of nitrogen and upwards is a sound economic investment for commercial ratoon crops may have to reconsider when the new quality payment system is introduced. This amount of N is only likely to increase cane tonnage at the expense of

percentage sucrose. Low sucrose is likely to be penalized on an E.R.S. payment system.

9.9.4 The high percentage of fertilizer distributed by hand is related to the availability of abundant, cheap labour.

10. WEEDING

10.1 In an appraisal of the state of weediness on their farms 14% of growers claimed that they have complete control of weeds.

47% of growers claimed that weed control is fairly good
28% of growers claimed that weed control is not good enough
9% of growers claimed that weed control is poor
2% of growers claimed that weed control is hopelessly inadequate

Allowing for the fact that some farmers are a lot more complacent about the weed situation on their farms than others, this summary is thought to provide a realistic assessment of the situation and shows that considerable improvement is necessary.

10.2 The main reasons given for achievement of a high standard of weed control, pointed to efficient management and the effective use of herbicides or trash. Main excuses for poor weed control relate to weather conditions, unreliability and ineffectiveness or shortage of labour, the long milling season, economic stress and poor response to herbicide application.

10.3 No attempt has been made to determine average weeding costs but the distribution of these costs between hand labour, animal drawn cultivators, tractor drawn cultivators and chemical control for the different liaison groups are given in the Table XI.

The high overall percentage of hand labour used points to the still abundant supply of relatively cheap labour. Animal-drawn cultivators are commonly used, specially on steep terrain. Tractor-drawn weeding equipment is less widely used than expected, assuming that the relative cost of tractor cultivations has been correctly assessed.

Chemical control is just beginning to contribute substantially to the overall cost of weeding, especially in those areas where cane is burnt.

10.4 Fifty-seven percent of growers are using herbicides and of these 68% were satisfied with the results they obtained. Twenty-two percent were not satisfied and 10 percent were undecided or non-committal.

10.5 The main herbicide used is 2,4-D amine with M.C.P.A. favoured by many growers for ratoons. Paraquat, usually mixed with 2,4-D amine, was used to control watergrass in plantcane and as a spot spray in trashed ratoon cane. A little diuron, Hyvar X, Tordon and T.C.A. were also used.

TABLE XI Percentage distribution of weeding costs for liaison groups

Liaison groups	% Hand labour	% Animal draft	% Tractor cultivators	% Chemical control
1. Mandini	77	3	19	1
2. Nyoni	72	6	10	12
3. Amatikulu	64	11	20	5
4. Weybridge	66	8	16	10
Gingindhlovu South Average	70	7	16	7
5. Nyezane	56	6	20	18
6. Coastal Sands	68	2	10	20
7. Ibati	68	5	12	15
8. Mlalazi	59	15	14	12
Mtunzini Average	63	7	14	16
9. Granite Hills	79	12	2	7
10. Eshowe South	62	9	15	14
11. Eshowe North	55	19	22	6
12. Ntumeni East	93	6	0	1
13. Ntumeni West	81	15	3	1
Eshowe Average	74	12	8	6
Average	69	9	13	9

10.6 A total area of 2 130 ha of land was sprayed by those answering the questionnaire, which suggests a total estimated area of 3 730 ha for Zululand South. This represents 18% of the total area harvested or 46% of the total untrashed area of cane.

10.7 CONCLUSIONS: Weeds feature high up in any list of topics for conversation among farmers. The weather and shortage of labour are frequently blamed for weed infestations. Wet seasons prevent timely access to fields and dry seasons retard crop canopy, which shades out weeds, so growers reckon they cannot win. However, they can and must win. Regardless of weather, labour availability, milling seasons or anything else, the grower must maintain effective economic control of weeds if he is to achieve maximum yields and high returns.

11. IRRIGATION

11.1 There are about 1 750 ha of land irrigated by sprinkler irrigation systems in Zululand South. This amounts to between 5 and 6% of the total cane area.

11.2 There are 36 quota holders who irrigate. Of these, 14 obtain their water direct from streams and rivers, while the rest have storage dams.

11.3 Six of the growers who irrigate are acutely short of water even after relatively short summer droughts and throughout most of the winter. Most growers have only limited irrigation water after prolonged droughts.

11.4 The amount of irrigation water applied per annum varies a great deal and ranges from 50 to 750 mm. However, the majority of growers apply between 200 and 400 mm of irrigation water. Most irrigation is practised where rainfall is on average less than 1 100 mm and the largest concentration of irrigation farmers is between the Nyezane river and the Tugela river on the coastal plain.

11.5 The average response to irrigation water applied has been very difficult to assess from the replies to the questionnaire. Using a sample of only seven growers with the best yield data and records of water applied, it seems that the average yield increase due to irrigation is 17.3 t/ha, from a total average application of 274 mm. This represents 6.3 t/ha per 100 millimetres of irrigation water applied.

11.6 This figure compares favourably with the rainfall efficiency figures in Table III and fairly well with the average irrigation response in Experiment Station irrigation experiments, where an increase of 27 tons per ha was obtained from an application of 355 mm or 7.6 t/ha per 100 mm.

11.7 CONCLUSIONS: It is quite clear from the replies received that records of both irrigation water applied and yields from irrigated fields are inadequate. As a result, most of the growers have very little knowledge of the profitability of their schemes. It is not surprising, therefore, that there are so many farmers with relatively easily-developed water supplies who do not know whether it is worthwhile to invest in irrigation equipment.

11.7.1 Some growers with large areas under irrigation appear to be performing no better than their neighbours under dryland conditions. Others, through lack of records, are obviously exaggerating the responses obtained by irrigation.

11.7.2 Lack of irrigation control, which is, in effect, inadequate management, appears to be the main cause for irrigation response being below expectation. Furthermore, it seems that improvement in such aspects of cane management as provision of adequate drainage, effective weed control and timeliness of harvesting - all of which go hand-in-glove with sound irrigation - are not being effectively exploited.

12. HARVESTING

12.1 62% of the crop harvested in Zululand South is trashed and 38% burnt, but variations are so great, even from farm to farm, that a more complete breakdown is given in Table XII.

12.2 The average output per labour unit for cutters and stackers (excluding those growers who are loading mechanically) together with other harvesting information is given in Table XIII.

12.3 CONCLUSIONS: Whether cane is trashed or burnt is the personal choice of the individual grower but one that is strongly influenced by the expected rainfall, the irrigation system employed and altitude. From Gingindhlovu to the Tugela, most farmers trash their cane, north to Mtunzini most growers burn. At high altitude both trashing and burning are practised, though the former is exployed mainly for weed control rather than conservation of moisture.

12.3.1 More and more growers in the drier areas are trashing when they cut the last crop. That this number should have reached 19% of all growers despite the advice of the Experiment Station, is worth noting. I find it difficult to believe that this innovation has spread, as it has done, if it did not have some merit. The Experiment Station does not recommend the practice on a basis of cost and the fact that there is no measurable response in the subsequent plant cane crop. However, growers using this technigue, have learnt to incorporate their trash into the soil at little extra cost over and above conventional land preparation and they claim that they are doing it for weed control as well as moisture conservation. Some growers who do not burn the last crop use the trash to mulch coffee fields or make compost.

12.3.2 The practice of pre-trashing is more widely used than was expected. No actual questions were asked regarding this practice but from answers received dealing with labour output, it was observed that at least 12 growers pre-trash it as a routine practice. It enables cutters to nearly equal their task for burnt cane.

12.3.3 At Ntumeni, a recent formal experiment showed that the practice of trashing resulted in a depression in yield. This was probably due to the lower ground temperatures (caused by the trash blanket at high altitude) which retarded growth and more than outweighed the advantages of moisture conservation. That this should have occurred during a dry year when moisture conservation is particularly important, is also significant. It seems that growers in this area may need to reappraise the situation - investigating the real value of trash for weed control and then be prepared, at least, to modify their trash management, even if they still decide not to burn.

TABLE XII TRASH MANAGEMENT BY LIAISON GROUPS

Liaison groups	% Area trashed	% Area burnt	% Growers trashing last crop	% Growers burning last last crop	% Growers burning more than last crop	% Growers burning all crops
1. Mandini	91%	9	57	43	-	-
2. Nyoni	87	13	42	58	-	-
3. Amatikulu	80	20	10	90	-	-
4. Waybridge	80	20	25	50	25	-
Gingindhlovu South Average	84	16	33	61	6	-
5. Nyezane	47	53	5	25	54	16
6. Coastal Sands	44	56	18	38	6	38
7. Ibati	27	73	-	17	66	17
8. Mlalazi	16	84	-	-	80	20
Mtunzini Average	34	66	6	20	51	23
9. Granite Hills	79	21	6	69	25	-
10. Eshowe South	49	58	20	14	52	14
11. Eshowe North	61	39	-	50	50	-
12. Ntumeni East	80	20	40	20	40	-
13. Ntumeni West	78	22	28	50	22	-
Eshowe Average	69	31	19	40	38	3
Zululand South Average	62	38	19	40	32	9

12.3.4 With the average output of harvesting labour standing at 2.8 t cane per man per day, the total production of 1 723 600 tons cane in the 1969-70 season required an estimated 3 080 labourers cutting for nine months of the year. This is a very sizeable number and represents a relatively low work output.

TABLE XIII HARVESTING DATA BY LIAISON GROUPS

Liaison groups	Output per unit Burnt cane cut and loaded	Output per unit trashed cane cut and loaded	% Growers cutting and loading separately	No. of growers using long handled cane knife	No. of growers loading mechanically
1. Mandini	2.8 t	2.8	88	Nil	Nil
2. Nyoni	2.7	2.5	50	Nil	1
3. Amatikulu	3.4	2.4	69	Nil	1
4. Waybridge	3.6	2.6	38	Nil	1
Gingindhlovu South Average	3.1 t	2.66	61	-	-
5. Nyezane	4.3	3.0	29	1	1
6. Coastal Sands	4.9	3.4	25	Nil	2
7. Ibati	4.4	3.0	Nil	1	1
8. Mlalazi	4.6	2.4	60	2	3
Mtunzini Average	4.6 t	3.0 t	28	-	-
9. Granite Hills	2.4	2.2	6	Nil	Nil
10. Eshowe South	2.8	2.3	37	3	5
11. Eshowe North	2.5	2.1	100	1	3
12. Ntumeni East	2.3	2.0	40	Nil	Nil
13. Ntumeni West	2.4	2.1	22	Nil	Nil
Eshowe Average	2.5 t	2.1 t	45	-	-
Zululand South Average	3.4 t	2.6 t	44	8	18

12.3.5 The system of separate cutting and loading has developed to a remarkable degree and it was most surprising to find that 44% of growers adopt this system while, two years ago, the figure was less than 5%. Though only small increases in efficiency have been measured as a result of this system, it is paving the way for mechanical loading, which seems to be on the increase.

12.3.6 A total of 18 growers are known to have mechanical grabs for loading and several of these growers moved their entire crop mechanically. Most of them are well satisfied with their system.

12.3.7 The long handled Australian cane knife is not very popular and only known to be used on 8 farms. Output per labour unit is not known for these farms but the quality of the cane undoubtedly influences labour output to a marked degree. From the little information available, the average output of 8 to 10 tons cut (but not stacked) in burnt cane using the long handled knife is somewhat better than average. Seven to nine tons are cut in similar conditions with the short handled knife. In trashed cane there are at least 6 growers who use a short handled curved cane knife.

13. TRANSPORT

13.1 Infield loading and transport systems are summarized for the three main regions in Table XIV.

13.2 The main transport systems are summarized (according to liaison groups) in Table XV.

13.3 53% of all growers would like to change their present system of transport and a further 3% are undecided. Bigger payloads are being contemplated by many direct-delivery growers and nearly all S.A.R. growers would like to change to road transport.

Side-loading trailers and pallets seem to be preferred to rear loaders or hand loading. A few of the growers who still load by hand have indicated that they are consideraing mechanical loading.

13.4 It is estimated from returns that 250 out of the total of about 580 tractors in Zululand South are engaged in cane transport. This represents 43% of all farm tractors and it means that on average each transport tractor moves an average pf 6 900 tons of cane. Naturally tractors with short hauls move a great deal more than this, while those with long hauls move less.

13.5 One hundred and sixteen new tractors were sold in the Mtunzini and Eshowe Magisterial districts from May 1969 to April 1970. If we assume that this is an average figure and that the tractor population is fiarly stable, then the average life of a tractor would appear to be about 5 years.

13.6 CONCLUSIONS: Sugarcane is a bulky crop and transporting it requires a great deal of manpower and/or specialized equipment. Organization of transport and ensuring its reliability are extremely important issues. Handling of the crop is already highly mechanized, but is liable to become more so, especially in areas where the topography is gentle.

With 10% of the crop already being stacked or loaded with mechanical grabs and with so many people dissatisfied with their present transport systems, the trends are already very easily read and big changes are expected in the near future.

TABLE XIV PERCENTAGE OF GROWERS USING VARIOUS LOADING AND INFIELD TRANSPORT SYSTEMS IN THE THREE MAIN REGIONS

	Hand loaded trailers	Rear loading trailers	Side loading trailers	Pallets	Mechanical Grab loaders
Gingindhlovu to Mandini	18	36	29	11	6
Mtunzini to Gingindhlovu	3	63	24	Nil	10
Eshowe to Ntumeni	46	21	15	3	15
Average	19	40	23	5	10

TABLE XV MAIN TRANSPORT SYSTEMS IN USE BY LIAISON GROUPS

Liaison group	% S.A.R.	% HILO	% Direct delivery
1. Mandini	25	75	Nil
2. Nyoni	-	-	100
3. Amtikulu	-	-	100
4. Weybridge	-	75	25
5. Nyezane	17	50	33
6. Coastal Sands	30	70	-
7. Ibati	15	77	8
8. Mtunzini	100	-	-
9. Granite Hills	100	-	-
10. Eshowe South	100	-	-
11. Eshowe North	100	-	-
12. Entumeni East	-	-	100
13. Entumeni West	-	-	100
Average	37	27	36

14. LABOUR

14.1 The estimated peak labour force required on all the farms in Zululand South is 13 500. The average labour requirement is estimated at 10 600. Because the peak demand for labour occurs at the same time of the year on all cane farms, some 2 900 people are only seasonally employed for a period ranging from three to six months each year. The peak demand for labour averages 7.8 units per 1 000 tons cane, while the average demand is 6.2 units per 1 000 tons cane.

14.2 Thirty percent of growers said that "Indunas" and tractor drivers on their farms did not carry enough responsibility. It is assumed that the growers concerned imply that these personnel should be trained to accept more. Unfortunately, this question was poorly phrased as many growers who answered in the affirmative also voiced the opinion that these employees did not have the ability or the training at the present time to accept more responsibility.

14.3 Fifty-two percent of all growers were not satisfied with the work output of their labour force and a further 9% were only reasonably satisfied or sometimes satisfied. Satisfaction with labour performance was often associated with a great deal of personal supervision, sound tasking, clear instructions and a fair deal. Improved feeding and housing were also mentioned. Reasons for dissatisfaction were few but included lack of communication and the lack of ability of the Bantu labour. Growers own suggestions for improvements were also few, but included better feeding, better housing, increased wages and better motivation. Surprisingly, however, no reference was made to training.

14.4 Seventy-five percent of growers claimed that their labour appeared satisfied with the present conditions of service and a further 12% that their labour was reasonably satisfied. It must be appreciated that this is the master expressing his opinion of his servants working conditions but it is unlikely to be seriously biased.

14.5 Changes envisaged in the next five years are very interesting:-

20% of growers envisage a general worsening of the labour problem to the point that it will cause difficulty or even chaos.

16% of growers envisage little or no change with uneducated manual labour doing much the same as they do today.

5% of growers envisage general improvement based on better conditions, greater understanding and diplomacy on the part of employers, and in consequence a lower turnover of labour.

4% of growers expect a big reduction in total labour units for better or worse.

25% of growers expect wages to go up with or without increased output. Many of these growers also mention better feeding, better housing, education, training, working with family units and improved recreation facilities. 30% of growers did not care to comment at all.

14.6 CONCLUSIONS: Cane growers control a vast labour force and when one considers the families that these labourers support, it amounts to a considerable proportion of the local population.

14.6.1 A peak requirement of 27% in excess of average needs is very high and must be the cause of much of the migratory tendencies of a proportion of the labour. It is considered that greater stability of the labour force is a goal well worth working toward.

14.6.2 The inroads that mechanization is making are considerable. Mechanical loading or stacking of 10% of the total crop has replaced 90 to 100 labour units, each loading 9 to 10 tons per day. Increased use of herbicides is doing exactly the same with regard to weeders. The repercussions of these trends in the sociological sphere are substantial. It could enable the cane farmer to become more selective because of greater competition for work and so improve the quality of his labour force. However, it could equally cause a great deal more unemployment unless alternative work is created for surplus labour.

14.6.3 Commerce and Industry are definitely drawing off the more able and more intelligent labour. To compete with this trend, farmers must provide better conditions of service which include increased wages, better feeding, housing, recreation facilities and means of living with their families.

Training to improve work output per unit and greater acceptance of responsibility is the means by which the farmer can best offset the drain on his profits.

15. GENERAL MANAGEMENT AND FARMER'S ATTITUDES

15.1 The average cane grower in Zululand South spends 1 hour 35 minutes in the office per day! A more meaningful breakdown is that:-

26% of growers spend less than ½ hour in their offices per day.

28% of growers spend from ½ to 1 hour per day.

35% of growers spend from 1 to 2 hours per day.

6% of growers spend 2 to 4 hours per day and

5% spend more than 4 hours per day.

15.2 When questioned on the value of all farm records:-

45% of growers stated they were "essential"

32% of growers that they were "worthwhile"

8% of growers that they were "interesting but cannot be effectively used".

2% of growers that they were "unnecessary" and

5% of growers stated emphatically that they were not "bookworms"!

Where growers ticked more than one of the above categories all have been included in the summary.

15.3 When questioned on their attitude towards farmer's meetings and gatherings:-

43% of growers said they were "invaluable as they are"

24% of growers said they "need improvement on content and task"

15% of growers said they "need improvement in method and maintaining harmony"

10% of growers expressed "personal shyness in groups"

6% of growers said they were a "pleasant waste of time"

2% of growers expressed "personal apathy to groups" and

only 1% said all meetings "serve very little useful purpose".

Many growers ticked more than one of these categories and all have been included.

15.4 The reading habits of growers vary greatly, as is only to be expected, but it would be fair to say that most growers read the articles that interest them in the "Farmers Weekly", "Sugar Journal", Experiment Station publications and the daily press. Experiment Station publications as a group are claimed to be the most useful and "Sugartech" and "The Link" are the two that figure most frequently. "The Sugar Journal", "The farmers Weekly", "Experiment Station Annual Report" and Experiment Station "Bulletins" are listed in that order closely behind the two already mentioned. Less frequently read but interesting publications mentioned under the heading of "Agricultural, Sugar Technology, Engineering, Management or Business literature" are "Farming in South Africa", "World Farming", "Landbou Weekblad", "The Financial Mail", "The Economist", ("Fortune"?). "Civil Engineering digest", Financial and Trade reports "Understanding and motivating the Bantu People", text books on agriculture and sugarcane, church publications, "The Readers Digest" and workshop vehicle manuals. The growers who gave truthful yet evasive answers such as "I don't read enough" or "I read all I can get" also contributed toward a better understanding of reading habits, though their replies are more difficult to assess.

15.5 The question of whether or not there should be greater government control of what individual farmers are allowed to do with their land, evoked some of the strongest feelings in the entire questionnaire. On a straight vote 30% of growers said they were for greater control and 66%

were against, but the comments passed show very much stronger feelings than this.

12% of growers are very strongly in favour of greater control

13% of growers answered straight "yes"

5% of growers answered a "yes" with provisos or "yes" in some directions and "no" in others

4% of growers offered no comment

57% of growers answered with a straight "no" and

9% of growers were emphatically against any greater control. In fact, they said there was already far too much!

15.6 Only 8% of growers said they felt burdened by having to make too many and too difficult decisions and a further 3% said they sometimes feel this way. The majority appear to have no difficulties in this regard, in fact many growers stated that they enjoy their freedom to decide, or the power and authority that they hold on their farms.

15.7 A list of characteristics of a good farmer, placed in order of importance is as follows:

1. Good business acumen
2. Sound technological knowledge
3. Maintaining control
4. Linguistic ability
5. Good understanding of human nature
6. Handy with tools and machines
7. Love of nature
8. Good sense of humour and
9. Popularity

The attributes most often listed as those in which farmers would like to improve were business acumen, technological knowledge, linguistic ability and handy with tools and machines.

15.8 CONCLUSIONS: Little comment can be passed on this section though the findings in each case are, I think, meaningful.

15.8.1 With regard to farmers meetings and gatherings whether they be Mill group meetings, Farmers Association meetings, liaison group meetings or symposia; the attendance invariably fluctuates between about 30% and 60% of those who could attend. The figures quoted under section 15.3 seem to indicate that if we could improve the content and task of our meetings we could improve our attendance by up to 24%. If we could improve the method and our ability to maintain harmony within the group, attendance could be improved by a further possible 15% and lastly if we could make everyone feel welcome and wanted, and provide them with a desire for mutual

support, then those who are shy within groups would also be more likely to attend. The responsibility for this improvement lies not only with the designated leaders and chairmen, but with the community as a whole.

15.8.2 On the question of greater government control, where individuals voiced their own personal opinions, it is my contention that these opinions may be considerably changed after a good debate and airing of views on this subject. This I believe, because of the influential nature and the convictions of the men who agreed with a need for greater control.

16. PERSONALITY AND LEADERSHIP PATTERNS

16.1 The questions on whether growers liked trying out new ideas and talking about new ideas did not help much in pinpointing the "innovators" or the "communicators" (two important minority groups in the leadership pattern of every community). This was so simply because 67% of growers claimed to be innovators and a further 18% claimed to like innovating only good ideas! Without a single omission, 100% of growers claimed to like talking about new ideas and innovations. So, though I have my own ideas on who the key "innovators" and "communicators" are, no new light was shed on this subject.

16.2 The questions asked on farmers who influence individuals and who are considered to be the "best" farmers in the district were rather too personal for many growers. I am grateful to those growers who did express their opinions for some very meaningful patterns emerge. Whether this section was filled in or not it helped me to understand the individuals concerned.

16.3 Many self-reliant, individualistic growers claim to be influenced by none of their fellow farmers. This type of person is also seldom influenced by any direct extension techniques but has to think out all decisions by himself. It would hurt his own pride even to catch himself accepting anyone else's ideas. Of course with some of these people this attitude is a bold front and they may be less independant than they care to recognise.

16.4 Many growers claim that they are not influenced by one single farmer but seek guidance from a number of individuals whose ideas they respect in different fields. They may be influenced by one man when talking on things mechanical but will discredit all that same man may say about labour relations.

16.5 Still other growers claimed that they were influenced by all their fellow farmers but by some in a positive direction and others in a negative direction.

16.6 There were no less than 28 names mentioned by only 53 growers who attempted to answer the question "Who is the best cane farmer in your district?". No one name recorded more than five votes. A few facetious answers were given

and many people declined to answer or said it was "too difficult". Many growers, though not prepared to commit themselves to a name, nevertheless indicated the merits which they would use to assess a "best farmer". Most of these chose the size of a man' bank balance, a few the productivity of a man's land, and still fewer, a farm's productivity in relation to its environmental potential and his limited resources.

16.7 CONCLUSIONS: Personality and leadership are very difficult to define. Many growers question the right of anyone to attempt to categorize people into different types. These views are understood but let it suffice to say that an extension officer must know much more than sugarcane agriculture. He also needs to know a lot about people, particularly the people with whom he works - not only as individuals but how they behave in small and large groups and how they affect one another within the community. In a nutshell he should know "what makes people tick?" The late Mr. Robert Lawrie who filled in a very comprehensive and detailed questionnaire for me, asked the same question at the end of his form. He wrote: "What makes our extension officer tick?"

16.7.1 Working in an area for a number of years and attempting to analyse a questionnaire such as this should teach one a great deal about the people with whom one works. I believe this has taught me to have a better understanding of the intricate patterns of association and conflict between people - people of different age groups, educational background, language groups, political, religious and sociological convictions - and all individuals in character.

16.7.2 If we can all understand each other's weaknesses and advantages in working together, sharing the leadership, retaining our individual personality, then we must progress toward a fuller more comprehensive future.

17. INFORMATION SOURCES AND EDUCATION

17.1 Growers were aked to name, from a list of 12 sources of information which relate to cane farming, the five they consider most important in their order of merit. All 12 were listed by a few growers. Other specified sources were also listed so, by processing this information an order of merit and a "percentage importance" for each source of information, has been arrived at.

1.	Experiment Station personnel	14.5%
2.	Experiment Station publications	14.3%
3.	Growers own farming experience	13.8%
4.	Fellow farmers	13.6%
5.	Experiment Station Liaison Group meetings	11.5%
6.	Symposia and lectures	10.3%
7.	Mill Group or Farmers Association meetings	9.2%
8.	The Farmers Weekly	3.7%
		90.9%

	Percentage brought forward	90.9%
9.	Childhood and early environment	2.8%
10.	Growers own formal education	2.8%
11.	Other specified sources:- (e.g. films, wives, demonstrations, books)	1.6%
12.	Commercial representatives	1.4%
13.	The Daily Press or Radio	0.5%
		100%

17.2 If the present generation of cane growers rate their own formal education as fairly low on the list of information sources for modern farming, then they certainly plan to change this situation for their sons or successors, who will take over their farms one day. When asked what training they would like their successors to have in order to farm their land effectively, the replies were varied but comprehensive. The following list is an attempted breakdown of the answers received:

25% list a university education in agriculture, engineering, accountancy, commerce or business management. One even thought a Ph D Agriculture desirable for his successor.

18% list a diploma in agriculture with or without the Short Sugar Course

11% list technical training in mechanics, engineering, diesel mechanics or building.

11% list business training in commerce or industry. several of these stipulated working at the Experiment Station.

(Eleven percent of the above 4 groups list combinations of 2 or 3 of these types of training and a further 28% list practical farming experience in addition to one or more of the formal types of training).

5% list between 5 and 6 years farming experience

5% list between 3 and 4 years farming experience

6% list between 1 and 2 years farming experience

(Many growers listing practical farming experience stipulate the desirability of letting potential young farmers work with several leading farmers, not as junior labour supervisors or "Indunas" but in positions where they can get a more complete insight into all that constitutes farming).

4% of growers said that training should be thorough

5% listed less training than any of the above categories

10% did not reply to this question

Not categorized in the above analysis, but nevertheless interesting, is the fact that several growers listed training in such fields as leadership, linguistic ability (especially Zulu), farm management, labour management, psychology and civics as desirable for their successors.

17.3 Fifty-eight percent of growers replying found that the whole questionnaire was "interesting" and many passed additional comments.

16% found it both "interesting" and "time consuming"

6% found it just "time consuming"

5% found it "amusing"

3% found it "frustrating"

12% did not comment

17.4 CONCLUSIONS: It is not thought that too much should be read into the list of sources of information in 17.1 though the general picture presented should be meaningful. The importance of personal contact, be it in groups or person to person is very clearly evident.

17.4.1 If one groups information sources, the individual approach is rated rather lower than would have been expected, because commercial representatives did not score high. Group media on the other hand are rated higher than expected, especially the apparent effectiveness of the liaison group meetings which have had a rather chequered career.

17.4.2 The analysis fully justifies the Experiment Station's four-pronged drive to improve sugarcane agriculture:-

a) by a direct person-to-person approach
b) by small informal liaison group and economic study group meetings
c) by larger industry-wide lectures and symposia
d) by mass media - especially the written word

17.4.3 If the growers preferences with regard to furthering their successor's education come near to realization, then future farmers are likely to hold comparable or better educational qualifications than almost any other sector of the community.

18. PREVIOUS EXTENSION

18.1 It has been extension policy to attempt to maintain personal contact with each individual grower and each individual farm in Zululand South. This has developed into a rather passive contact where growers call in the extension officer only on request. It has been at this level that individual problems have been investigated. All aspects of extension recommendations have, from time to time, been covered, but the aspect which has met with the greatest success is

definitely land planning and effective utilization of natural resources. This is probably due to the writer's personal experience and training in soil and water conservation.

18.2 In 1963 the Liaison movement was started and this structure was used for group discussions, demonstrations and farm walks. In 1970 planned concentrated group activity during the off season failed, mainly due to work connected with this situation survey and involvement with industry-wide symposia. Only two complete rounds of meetings with each liaison group were held - one of a general nature and one on metrication in agriculture.

18.3 In 1969 two economic study groups were built around selected growers interested in farm records. The initiator of each group and the early adopters selected their own group and decided on numbers. The success of these groups, as the name suggests, demands a great deal of homework on the part of group members and a great deal of trust and mutual understanding while working within the group. The purpose of the groups is to help members to build up sound local economic standards and pinpoint weaknesses in costs of cane production on individual farms. The cane growers economist, Mr. N. Frean, provides much of the data analysis and advice for these groups. Members of the first group are drawn from growers from Weybridge to Mandini region, and the second from the Eshowe/Ntumeni region. A third group is being launched in the Gingindhlovu/Mtunzini region. Once these groups are well established they may, themselves, decide to share their findings with a wider sector of the community, but even by example alone they will indirectly benefit other growers.

18.4 Industry-wide seminars or symposia have now been held for a number of years. In more recent years the theme for the symposia has been decided at an annual extension officer's conference. In 1968 Mr. Pearson led a team on the theme of Ratoon Stunting Disease and hot water treatment. In 1969 Mr. Bartlett and Mr. Morrow dealt with management and efficiency of harvesting. In 1970 Mr. Whitehead led a team on crop hygiene and quality seed production. A second series of symposia, on land drainage and salinity problems, was also held for the more northerly regions of the canebelt.

18.5 By invitation to the existing formal grower organisations within Zululand South, contact is also made with the farming community, their projects and local problems. Occasionally, by request from the growers, these meetings are also used as a venue for talks or lectures on specific topics.

18.6 Extension personnel are only the link men between the grower and the research team. We in the sugar industry are in the fortunate position of being backed by a strong team of research workers who have won for themselves, as individuals and as an organisation, wide acclaim both here and overseas. This team is responsible for most of the written material in the form of publications, bulletins and annual reports. It is also extension policy to attempt to maintain close personal contact with all research workers and specialist advisors at Mt. Edgecombe.

19. GENERAL CONCLUSIONS AND A PLANNED PROGRAMME OF EXTENSION FOR 1971

19.1 It is unquestionably true, whether or not this report gives a clear picture of farming and extension work in Zululand South, that conducting a situation survey has added tremendously to the writer's knowledge of conditions in his area.

19.2 Weaknesses are pinpointed. Expected trends are sometimes confirmed, sometimes inconclusive and sometimes confounded - but at least the results stimulate the posing of further questions.

19.3 As a start-line from which to measure progress or retrogression in 5 or 10 years time, it is hoped that this report will be valuable.

19.4 It is suggested that each individual grower in Zululand South might attempt an analysis of the facts pertaining to his or her situation similar to that authored here. Where have you got to? What progress have you made? What are the likely trends on your farm in the future? How can these be improved?

19.5 EXTENSION CONFERENCE - NOVEMBER, 1970

At the S.A.S.A. Extension Conference 1970, it was decided that:-

19.5.1 Extension activities should become more aggressive in character. This does not mean that growers are going to be pressurized into doing things they do not want to do but that the extension approach will deliberately be provocative - designed to argue alternate cases as a means of stimulating thought and decision making.

19.5.2 Extension advice should be more thorough and comprehensive, aiming for quality of work rather than quantity. This policy, if anything, cuts down the number of visits that can be made so that, despite my desire to do so, it will be difficult to widen my activities and re-establish contact with growers infrequently met.

19.5.3 Extension staff should assiduously follow up the hygiene and clean seed programme and encourage the registration of seedcane nurseries.

19.5.4 Extension staff should fully acquaint themselves with the principles of drainage design and be able to put these principles into practice.

19.5.5 Extension staff should encourage stricter irrigation control by emphasizing the need to measure amount of water applied - and crop response.

19.5.6 Extension staff should demonstrate the use of recommended herbicides in each district at appropriate times.

19.5.7 Extension staff should become better acquainted with the soil series and help growers to do the same, so that they can exploit their full potential for production.

19.5.8 Extension must start operating in the field of management planning, despite the absence of specialist support, and actively promote the use of field record cards (metric version).

19.5.9 The extension service should actively create an awareness among growers of the need for management and labour training programmes.

19.5.10 The extension service should promote or revitalize and fully exploit all group activities - especially the liaison organisations and study groups.

19.5.11 The theme for the 1971 extension campaign will be "management planning" and this will be associated with conservation (land use planning), especially in view of the move to implement the new Soil Conservation Act.

19.6 LIAISON GROUP PROGRAMME

19.6.1 It is planned to launch a series of meetings at two-weekly intervals for all thirteen liaison groups, starting in February and extending only during the closed season.

19.6.2 Both morning and afternoon meetings will have to be held in order to complete the programme within the two-week period.

19.6.3 Details of meetings are still to be worked out with the groups concerned but, broadly, it is planned to review the past season's crop productivity and rainfall efficiency figures. Then, in following meetings, it is intended to cover subjects of topical interest to growers, such as choice of varieties, fertilizer programme, weekly programme, likely effects of a new quality payment scheme based on E.R.C., practical recognition of soil series in the field and, finally (about April) to review the past season's weather in an effort to forecast the coming season's crop, the area to be harvested, expected labour requirements, fertilizer requirements, herbicide requirements, etc.

19.7 STUDY GROUP MEETINGS

19.7.1 It is expected that these will continue throughout the year with their own special subjects and an effort will be made to attend these meetings and contribute where possible.

19.8 INDUSTRIAL EXTENSION CAMPAIGN

19.8.1 Work has already started on preparing material to be used in the industry-wide extension campaign.

It is hoped that this will be a symposium with a difference and will have a big impact on growers, but plans are still very fluid.

19.8.2 Whatever its final form may be, it is planned to launch this campaign shortly after the winter, probably in September/October.

19.9 DIRECT INDIVIDUAL EXTENSION

19.9.1 The greater part of the milling season will be free of any concentrated group activities to enable full time to be devoted to improving personal contact with as many growers as possible.

19.9.2 In an effort to ensure that each individual grower receives the service to which he is entitled it would be appreciated if growers making extensive use of this service would keep the needs of his neighbours in mind and not take up too much of the extension officer's time.

Q.V. MANN

7.2.6/13

17th March, 1971.