SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

PROGRAMME FOR ANNUAL GENERAL MEETING 22 OCTOBER 1975

10.00	Chairman's report General
10.20	Nematodes in sugarcane - a S.A.S.I.A.A. review paper Dr. John Dick and Dick Harris
11.00	Tea
11.30	Soil structure and its implications Dr. J.M. Oades
12.00	The concept of minimum tillage in sugarcane Graeme Iggo
12.30	Lunch
2.15	Some notes on the advantages and disadvantages of burning and trashing. Dr. Gerald Thompson
2.45	Some thoughts on sugarcane agronomy. Dr. John Hill

SOUTH AFRICAN SUGAR INDUSTRY

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SOIL STRUCTURE AND ITS IMPLICATIONS

by

Dr. M. Oades

Summary

Soil structure is defined along with characteristics of the soil and its environment which may lead to structural problems such as surface crusting, compaction and erosion.

Conditions which may lead to structural problems are examined singly and comments made on the possibilities of improving the physical condition of the soil.

The improvement of saline and sodic soils using gypsum is described.

Soils in which cultivation reduces organic matter levels resulting in structural deterioration are defined and contrasted with acid soils where iron and aluminium oxides cement clay particles into aggregates, and calcareous soils where aggregates are stabilized by calcium bridges between clay and organic materials.

Organic materials are divided into 3 groups which glue clay particles together by different mechanisms. Based on the chemistry of the organic materials poly (vinyl alcohol) was chosen as a synthetic soil conditioner.

An experiment using poly (vinyl alcohol) to stabilize a seedbed in the field is described.

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THE CONCEPT OF MINIMUM TILLAGE IN SUGARCANE

by Graeme Iggo

The conventional method of establishing plant cane is to plough out the old ratoon crop following harvest and, in the following few months, cultivate repeatedly before replanting. The reasons for the numerous cultivations and the consequent time lag can be given as follows:

i) to destroy the old ratoon crop so as to avoid the transmission of virus diseases into the new plant crop, e.g. R.S.D.

ii) to prepare a suitable tilth for the seed setts. (A good seedbed can be described as one which provides good physical contact between seed setts and moist soil).

iii) to control weeds and in particular perennial weeds e.g. Cynodon dactylon, Kikuyu etc.

iv) to incorporate soil ameliorants.

If all these objectives could be achieved with the use of chemicals then the concept of minimum tillage bears consideration. The key factor in a successful minimum tillage or no tillage (where the seed is placed directly into the old sward without any attempt to create a seedbed) operation, is the availability of a herbicide which will destroy the old sward or crop without leaving a harmful soil residue, or alternatively one which is selective towards the new crop. The development of paraquat (Gramoxone) has led to thousands of hectares of different crops throughout the world being established under the minimum and no tillage systems. For example, in the United States during 1971, 430 000 hectares of crop were established under the no tillage system. In the U.K. during 1973, 830 000 hectares were established with minimum tillage (i.e. no ploughing) and 105 000 hectares with no tillage.

A series of experiments conducted by the Experiment Station from 1972 - 1974 illustrated that glyphosate (Roundup) could kill sugarcane without leaving any apparent soil residue detrimental to subsequent sugarcane growth. The development of glyphosate led to the concept of minimum tillage in sugarcane.

Three experiments were established on different soil series, (Waldene, Rydalvale and Phoenix) to compare the effects on growth of sugarcane established by conventional tillage with that of minimum tillage techniques. The following is a report on the experiment established on the Waldene soil series, (11% clay, 11% silt, 79% sand, 1,55% organic matter) at Shakas Kraal.

Methods and materials

The trial was established on the site of a former fertilizer trial (FT7N/65) which was terminated in the 6th ratoon crop and was burnt and harvested on the 26 October 1973. The subsequent operations for both the minimum tillage and conventional treatments are listed below in chronological order.

		MINIMUM TILLAGE	CONVENTIONAL TILLAGE
1973	Oct 26	ratoon harvested	ratoon harvested
	Nov 7	-	ploughed to a depth of 40 cm
	15	-	disc harrowed (1)
	Dec 6	-	disc harrowed (2)
	12	plots sprayed with 12L of 'Roundup'; on average 6 leaves unfurled	-
1974	Jan 7	-	disc harrowed (3)
	Feb 15	sprayed with 3L 'Gramoxone' to control weed growth.	disc harrowed (4)
	19	interrow rotovated, ridged and planted	proposed cane row rotovated, ridged and planted
	20	full cover pre-emergence application of Lasso ec + Gesaprim	full cover pre-emergence application of Lasso ec + Gesaprim
	Mar 26	top-dressing 300 kg/ha 1-0-1(47)	top dressing 300 kg/ha 1-0-1(47)
	Aug 6	top-dressing 300 kg/ha 1-0-1(47)	top-dressing 300 kg/ha 1-0-1(47)
1975	May 28	harvested	harvested

Notes on the planting procedure

i) A split element rotary hoe was used prior to ridging out for both the minimum tillage and conventional plots. A working depth of 15 cms was used.

ii) A double ridging unit was used to draw the furrows to a depth of 12,5 cm from the original soil surface.

iii) Sugarcane variety NCo 376 (1st removed from hot water treated material) was planted using a double line of setts each averaging 60 cm in length. The setts were dipped in both insecticide and fungicide prior to planting.

iv) Saaifos (single) was applied in the furrow at planting at a rate of 690 kg/ha.

v) The setts were covered with 4 - 5 cm of soil by using a tractor mounted covering device.

Irrigation

Irrigation was applied by an overhead sprinkler system which was controlled by means of a profit and loss account using an estimated total available moisture (TAM) figure of 76 mm.

Results

1. Effectiveness of glyphosate in killing the ratoon crop

Four months after spraying the old ratoon crop with glyphosate, counts were made of volunteer plants in both the minimum tillage and conventional tillage plots. A quantity of 450 volunteers per hectare were found in the minimum tillage and 5 per hectare in conventional tillage plots. It should be noted that a rate of 12 litres of glyphosate per hectare was applied instead of the currently recommended 10 litres.

2. Soil moisture at time of planting

Soil samples taken immediately after ridging and from the lower side of the planting furrow, indicated soil moisture to be 14,02% in minimum tillage and 9,42% in conventional tillage plots.

3. Nutrient status of soil at time of planting

Soil samples were taken from the interrow of the old ratoon crop and the analysis indicated the following levels.

Treatment	P ppm	K ppm	pH	Mg ppm	Ca ppm	N% *
Minimum	64	72	5,35	100	416	0,96
Conventional	50	46	5,35	81	430	0,76

* 1% = 10 000 ppm

4. Third leaf analysis at 4, 6 and 12 months

The sugarcane grown using minimum tillage indicated a higher 3rd leaf nutrient status, but with time the differences diminished.

	N%	P%	K%	Mg%	Ca%
4 months					
Minimum	2,01	0,29	1,36	0,24	0,39
Conventional	1,82	0,23	1,21	0,20	0,37
6 months					
Minimum	1,74	0,23	1,04	0,28	0,51
Conventional	1,52	0,19	0,94	0,22	0,47
12 months					
Minimum	1,77	0,25	1,33	0,18	0,21
Conventional	1,70	0,24	1,30	0,16	0,21

5. Analysis of undisturbed soil core samples

Soil cores were taken in the interrow at both the 0-10 cm and 20 - 30 cm depths. Sampling was done 9 months after planting. The analysis is presented in the table below with the figures representing the mean of sixteen determinations.

	Minimum tillage		Conventional tillage	
	0 - 10 cm	20 - 30 cm	0 - 10 cm	20 - 30 cm
Bulk density (g/cm^3)	1,46	1,65	1,57	1,69
Tensions 25 cm (% by weight)	21,5	17,1	19,0	17,4
60 cm	19,1	15,4	16,5	15,7
100 cm	17,7	14,1	14,9	14,3
Total pore space (% by volume)	44,9	37,6	40,7	36,1
Air filled pore space (% by volume)	19,1	14,3	17,3	11,9
Available moisture capacity (mm/cm)	1,18	0,96	1,30	1,23

6. Growth of crop

Sugarcane grown under both tillage systems germinated extremely well but throughout the crop cycle shoot populations were slightly higher with minimum tillage. Stalk heights were always greater with minimum tillage and this advantage was maintained through until harvest.

7. Yield results

The trial was harvested on the 28 May 1975 at 15 months of age. During the cropping period 1 046 mm of rainfall were recorded and 381 mm of supplementary irrigation were applied. The yield results are presented in the table below.

Treatment	Dry matter % cane	Purity	Popn. 000s/ha	Stalk length cm	Tons cane /ha	ERS % cane	Tons ERS/ha
Minimum	24,3	85,6	146	217	152	9,8	14,9
Conventional	26,1	88,2	143	208	137	11,1	15,1
Mean	25,2	86,9	144	212	144	10,4	15,0
CV %					7,1	3,8	7,8
LSD (0,05)					12,1	0,47	1,39
LSD (0,01)					17,9	0,70	2,06

Comments on sugarcane growth in two other minimum tillage experiments

M.T. 110 103 c. t c/ha.

The trial established on the Rydalvale soil series is due to be harvested late in October 1975 at 19 months of age. Both shoot populations and height measurements indicate very little difference between minimum and conventional tillage in terms of crop growth.

However, at 11 months in the trial established on the Phoenix soil series, sugarcane grown with conventional tillage has a greater stalk height and higher shoot population than that of minimum tillage.

Discussion

Assuming that at least equal yields can be achieved with minimum tillage and conventional tillage, several advantages of the minimum tillage technique are:

i) A shorter fallow period between crops. The only delay from harvesting to planting being the time required for the old ratoon crop to develop sufficient leaf area for glyphosate to be effective (approximately 5 unfurled leaves, 40 cm in height)

ii) Reduced risks of soil erosion as at no stage would the land be void of vegetation. This would apply particularly to the steeper areas.

iii) Reduced cultivation costs.

iv) Control of problem perennial weeds e.g. Cyperus rotundus, kikuyu, Cynodon dactylon.

Disadvantages of the minimum tillage system include:

i) Cost of glyphosate for killing old ratoon - 10 litres per hectare would cost R112.

ii) Should it rain soon after the application of glyphosate, a poor kill is likely to result which could not be easily rectified.

iii) The technique of minimum tillage is not feasible when an alteration to field layout is planned.

GAI/PMO/3.4.7/149
14 October, 1975

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

SOME NOTES ON THE ADVANTAGES AND DISADVANTAGES OF TRASHING AND BURNING

G.D. Thompson

Of the many statements that can be made regarding trashing and burning perhaps the following could be pertenent in the South African context today:

1. Trash conserves moisture and may therefore increase yields when moisture is a limiting factor.

2. The effect takes place predominantly during the period of incomplete canopy when evaporation from the soil surface is a significant component of E_t.

3. Trash causes soil temperatures to be lower than they would be in the absence of trash.

4. In some areas and during some seasons trash may cause soil temperatures to be so low that ratoon growth is significantly impaired, and may even be completely suppressed.

5. Varieties vary in their response to treatment with a trash blanket.

6. Trash reduces runoff and erosion.

7. Trash conservation improves the mineral status of the surface soil, but even after prolonged treatment, the effect is not quantitatively important.

8. A good trash blanket can successfully suppress the growth of weeds which occur in cane fields. (A 'good trash blanket' is roughly described as that remaining after a crop of 80-90 tons cane per hectare has been well cleaned at the time of harvesting).

9. Increasing amounts of trash tend to suppress crop yields, but under conditions where moisture conservation is sufficiently important, even a very heavy trash layer may be preferable to no mulch at all.

10. A trash blanket may be harmful in wet valley bottoms.

11. Harvested yields from trashed fields may be reduced to an unknown extent due to the loss of cut and uncut stalks hidden within and beneath the trash blanket. The extent of this loss will depend on the assiduousness with which labourers collect the crop when harvesting.

12. The effectiveness of a trash layer in controlling weeds depends on an even distribution of the mulch. (The trash should be re-spread immediately after harvesting, as it soon compacts and makes good re-distribution almost impossible. It is essential to cover the

areas cleared by the harvesting labour for laying whips and stacks on bare ground. Windy conditions soon after harvesting can nevertheless play havoc with trash distribution).

13. Trash causes fewer shoots to develop than would grow in the absence of trash, and the number of harvestable stalks is also lower in trashed than in burnt fields.

14. Trash reduces the output of manual harvesting labour by an amount dependent largely on the thoroughness of trashing.

15. A relatively small amount of trash, e.g. singed and unburned tops, if concentrated in every fourth or fifth interrow, may contribute much of the benefit to be gained from a full trash blanket.

16. It is much more difficult to harvest green cane mechanically than to harvest burnt cane mechanically.

The above statements are those which need to be considered when deciding whether to trash or to burn, both for short term and long term planning. Nevertheless, an overriding factor may make the consideration of these pros and cons irrelevant, e.g.

(i) in Hawaii, anti-pollution laws will prohibit burning of cane or trash. The Hawaiians will therefore have to harvest green cane mechanically, and any benefits which accrue will be quite incidental.

(ii) the Australians have not been able to design a satisfactory green cane harvester, and burning is therefore mandatory in their industry today. Anti-pollution laws could change this situation radically, but the change would have little or nothing to do with the effects of trash on the crop.

In the current South African situation, there appear to be two distinctly different sets of conditions:

(i) in the north, where Australian-type mechanical harvesters can be used to harvest burnt cane satisfactorily, and where the advantages of trash are generally much less than elsewhere in the industry.

(ii) in the south, where the trash/burn option is still wide open.

Considering then the situation in the south, where very little mechanical harvesting is yet being practised:

(i) burning has generally been carried out in the midlands where low temperatures and frost are important factors. Much of the terrain in the midlands may also be sufficiently flat to warrant the use of Australian-type harvesters. I remain convinced, however, that the trash layer could be exploited effectively in the midlands from October onwards, particularly with NCo 376.

(ii) on the coast today, the advantages of trash are being frittered away, and except from a conservation point of view, most growers might as well burn. I say this because the quality of trashing by manual harvesting labour has become abysmal, and the value of

the yield response to trashing is probably being lost due to cane left in the trash blanket, and poor weed control from an inadequate blanket. From an industrial sugar production point of view, trash must be reducing extraction at the mills appreciably, and sugar produced in the crop is not being recovered because of the dirtiness of the cane. (Some of the quantitative estimates of extraneous matter, currently being made in the industry, show values in excess of 20%).

(iii) I used the term 'frittered away' in (ii) above advisedly, and it is a matter of some regret to me that, as an industry, we are failing to exploit trashing as we could and should do. As labour has become more expensive and less plentiful, we have passively accepted progressively lower standards of work from our cane cutters. These lower standards are then, apparently quite logically, used as an argument against trashing, because they have reduced the value of trashing. But if, on an industrial basis, we had been awake over the past 20 years to the advantages to be gained from training and motivating labourers, I believe that our standards could have been maintained economically. Most particularly, we have not exploited the potential that exists for financial motivation of cane cutters to trash properly. Even if we were only to break even on the total material benefits of trash by paying cutters much more to cut green cane, the industry would have benefitted from the value of more sugar extracted to gain a high export price.

(iv) looking into the future, it seems to me that we are entering the mechanical/semi-mechanical harvesting phase so rapidly, even in the south, that the importance of training and motivating manual labourers is going to be of rapidly decreasing importance. In these circumstances it will probably be particularly difficult to motivate cane producers to pay much attention to motivation and training of manual labourers. The call is far more likely to be for semi-skilled personnel.

(v) trying to collate the effects of all the forces at work within the industry, then, it seems that the virtues and advantages of trashing are unlikely to receive the consideration I think they deserve, and that the industry is likely to gravitate into an almost universal burning policy, until anti-pollutionists one day make an impact, perhaps.

GDT/SN
9th October, 1975.

La Mesy : cons. lay-out.
Planting machine

SOUTH AFRICAN SUGAR INDUSTRY AGRONOMISTS' ASSOCIATION

SOME THOUGHTS ON SUGARCANE AGRONOMY

BY

JOHN HILL

INTRODUCTION

My guidelines for this talk included my own view on the facits of agronomy which require the greatest attention from the standpoint of either management or research. The importance in methods of motivating staff, both senior and junior, and perhaps the role of the South African Sugar Industry Agronomists' Association, could also be considered. In addition, my Collins dictionary defines Agronomy as 'the study of the management of the land and the scientific cultivation of crops'.

Thinking about facits of sugarcane agronomy which might require attention made my mind turn immediately to defining perhaps one or two major problems which, in my opinion, face the Sugar Industry at the present time. With these problems defined, it makes their evaluation not only possible, but exciting. Exciting, because with the reward so high, the number of possible strategies for the achievement of successful solutions can be opened right up.

In the September edition of the South African Sugar Journal, there is an interesting article entitled 'Startling Revelations Concerning Future Developments', an article written by the editor of the Sugar Journal in 1926, on how he thought the South African Sugar Industry would look when he revisited it in 1976. Some of the author's predictions have been amazingly accurate and in a similar context I would like to approach my paper from a viewpoint of what I would like to see if I return to the Sugar Industry in 20 years' time.

TWO PROBLEMS FACING THE SUGAR INDUSTRY

Analysis of the 1974/75 production data for the Sugar Industry reveals that the average yield was less than 5,6 tons of cane per hectare per 100mm of crop moisture supply. Since this represents only about 60% of the current potential yield of 9,0 tons of cane per hectare per 100mm of crop moisture supply, I would define one of the most significant problems facing the Sugar Industry as the gap between actual and potential cane yield.

Recently, Hudson presented data which showed that the agricultural sector of the Sugar Industry improved productivity in terms of labour utilisation from 14,9 men per 1000 tons in 1951/52, to 10,2 in 1961/62, to 6,5 at the present time. Whilst this productivity improvement may appear to some to be quite impressive, nevertheless one should remember that this season, a number of growers are producing cane with less than 4 men per 1000 tons, while the Australian sugar farmer is managing with less than 1 man per 1000 tons of cane. There is thus concealed unemployment of labour in the agricultural sector of the Sugar Industry.

Now it is not being suggested that the South African Sugar Industry should in fact be going all out to reduce its labour requirements to 1 man per 1000 tons of cane. The rate of manpower reduction must, in fact, be governed by economic factors, including labour availability and cost. However, there is no doubt that excess labour is used in the Industry at present, and this is incompatible with the view that there are serious labour shortages on some farms and on some miller-cum-planter estates this season. This is the second significant problem facing the Sugar Industry at the present time.

The two problems outlined above are, in fact, the product of one single problem and that is THE MANAGEMENT PROBLEM in the agricultural sector of the South African Sugar Industry.

MANAGEMENT FOR AGRICULTURE

Before discussing any solutions to the management problem in the Agricultural sector, it would be as well here to commence with a definition of management for agriculture. It has been said that management is as old as civilisation, but that the study of management

is only a 20th century endeavour. In this 20th century, the textbooks on management have become very numerous, and with all these texts have also come numerous definitions of management. Some take the viewpoint that a manager is someone in control of resources, others believe that a man is not a manager until he is in charge of at least one other subordinate in a managerial hierarchy. Others have analysed management and presented an operational viewpoint, focusing attention on the processes of planning, organising, motivating and controlling. To add to the melting pot, my definition is as follows: 'Management is the art and science practised by one man to achieve his objectives *through the use of resources by other men*'.

The above definition gives scope for discussion of management from both institutional and operational viewpoints. However, in the long run, it is not this discussion that counts, but rather the action that follows. As Peter Drucker once said, 'without management, the resources of production remain resources and never become production', but I would like to add one further comment: it is not simply the action of management that is required, but the emphasis on effective management.

Managerial Effectiveness

Effectiveness, as defined by Reddin, is the extent to which the output requirements of any action are achieved. And surely it is managerial effectiveness with which we are concerned in the real world? If this is true, if managerial effectiveness should be our major objective in any line of business, including farming, then we must evaluate the consequences of improved management and, if worthwhile, then consider the action required to improve managerial effectiveness.

If managerial effectiveness is the key to the future of the South African Sugar Industry, then perhaps more heed should be paid to the rapidly advancing knowledge of industrial psychology. If the Industry is to use its most important resource, namely the human resource, to its maximum potential, then a basic understanding of the needs of all levels of employees is required by those influencing production. Recently, in the rapidly progressing field of managerial psychology, attention has been focused on managerial styles, in an effort to

improve managerial effectiveness. But perhaps even managerial styles can be over-emphasized, since the protagonists have implied that managers need to respond to subordinates in order to obtain the best output from them, whilst many managers today cling to the mistaken belief that there is one ideal style.

Reddin has struck a balance in this field, which is well worth taking note of by accepting the basic concept that the two main elements accounting for managerial behaviour are: concern for the task to be done (Task Orientation = TO) and concern for people (Relationships Orientation = RO). Reddin, then conceptualised a solution to the dilemma that any combination of RO and TO could be effective in some situations and ineffective in other situations. He did this by distinguishing and separating behaviour from the effectiveness of behaviour - by adding the third dimension of effectiveness and thereby producing eight styles - four effective and four ineffective. This conceptualisation is reproduced in figure 1.

Reddin thus subscribes to the situational view of management and believes that the effective manager will have to develop three skills to a high degree; firstly, a skill in situational sensitivity, that is, a skill in diagnosing managerial situations; secondly, a skill in style flexibility, so that he can adapt his managerial style to suit the situation; but thirdly, and perhaps most important of all, a skill in applied process management, which enables an effective manager to change an undesirable situation into a desirable one, before responding to the style-situation demands. Reddin thus sees any managerial situation as presented in figure 2.

Let us turn now to the process view of management, which after all, is the heart of managerial action. Newman and his associates at Columbia University, after considering all viewpoints of management in the literature, have concluded that the managerial processes of planning, organising, motivating and controlling represent the clearly distinguishable stages or functions on which one can separate and analyse management. Since many of the textbooks on management in agriculture deal with the family-farm and owner-operator situation, they are not directly applicable to an agriculture that is labour

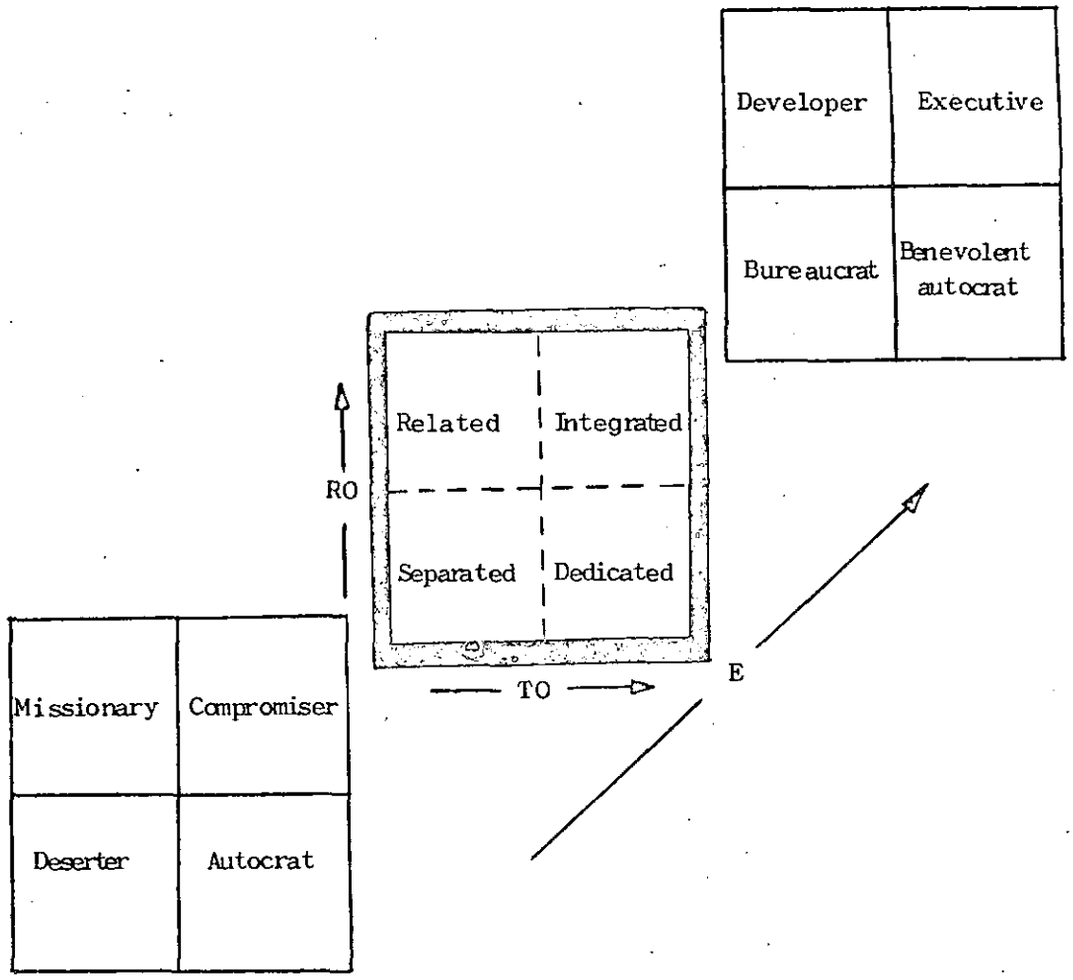

FIGURE 1 3-D Eight Managerial Styles, after Reddin (1970a)

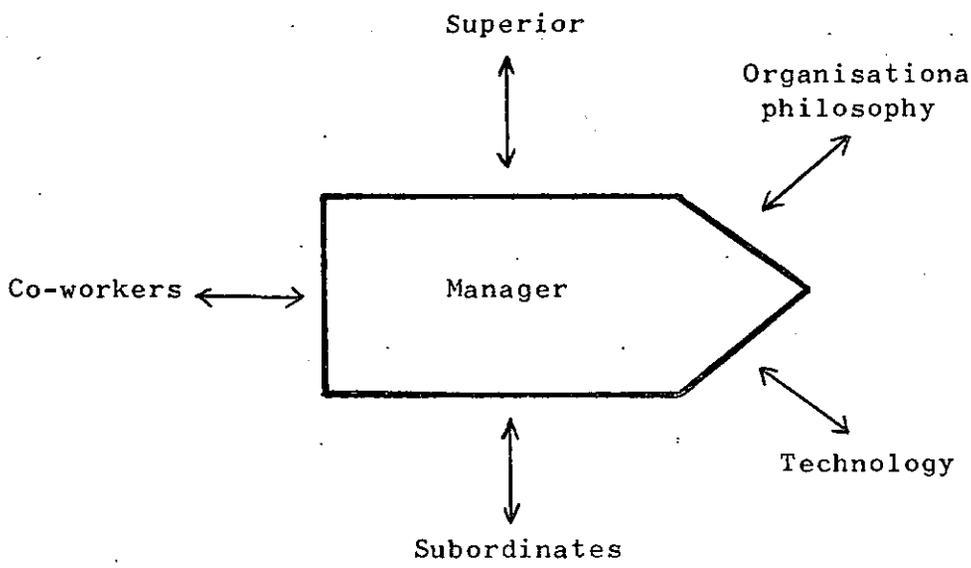

FIGURE 2 The situational representation of management, after Reddin (1970a)

intensive, such as the Sugar Industry. However, the processes of planning, organising, motivating and controlling have been defined in simple agricultural terms for the sugar farm by the writer, and managers in the Agricultural Division at Tongaat have received training in these processes. In addition, these processes have been integrated into the normal work situation so that they are now accepted as useful, fundamental tools in achieving managerial effectiveness. Combined with the participative management style of MBO, this managerial development has led to significantly improved utilisation of all farm resources resulting in improved yields and improved profits.

Now, managerial psychology is particularly relevant to agriculture, because farmers are notorious for their strong traits of individualism and needs for independence. More than any other group in the economy, the agriculturalist is, above all, a rugged individualist and his needs for self-expression are well known. I have given emphasis to this aspect here, because large agricultural operations, such as the miller-cum-planter and even some of the large grower organisations would do well to appreciate this concept and turn it to their advantage by the application of a participative management style which many researchers have shown to be tailor made for this type of situation. Furthermore, managerial situational diagnosis is a vital concept to be understood if agriculture is to succeed in the future, because particularly in South Africa, there are sectors of the labour force which will not respond to certain managerial styles. For example, those peoples who expect authoritarian leadership can only really be effective when a more directive managerial style is imposed.

AN EVALUATION OF THE MANAGEMENT PROBLEM

Let us return to the Sugar Industry at this point. Let us evaluate loss of production from the actual to the potential yields as they stand at the moment. In 1974/75, the Industry produced almost 17 million tons of cane. If managerial effectiveness had allowed the potential yield of 9 TCH/100mm to have been achieved, then with the addition of only marginal amounts of resources, a crop of 27

million tons could have been produced. This additional crop would have produced more than one million tons of additional sugar and I do not need to elaborate on the increased revenue which would have accrued to this Industry and this country at the export prices which prevailed.

Looking at it in another way, and introducing certain assumptions and perhaps more realism, one can arrive at an industrial crop of 24 million tons of cane at the current rate of vertical expansion of 1,8% applied over 20 years. Superimposed on this calculation could be the addition to the industrial crop by the effects of horizontal expansion - something already under way. With land losses to industrialisation and urban development on the one hand, and the expansion possibilities mentioned above on the other, one might assume a tipping of the balance towards an industrial crop of approximately 24 million tons of cane within 10 years, and this at a moisture efficiency factor of about 6,7 TCH/100mm. This, I would venture to say, looks more probable than just possible. Combined with continuing improvement in managerial effectiveness, the industrial crop should exceed 30 million tons of cane 20 years from now.

Now, what about the labour situation? What about the concealed unemployment of labour, since at present the agricultural sector utilises 6,5 men per 1000 tons of cane, whereas we could assume that it would be most economical to utilise in the region of 3,5 men per 1000 tons? Dealing with absolute numbers of labour, again in 1974/75, 110 500 people were employed daily on cane farming activities. At a labour productivity figure of 3,5 men per 1000 tons however, only 59 500 people would have been employed per day, a difference of 51 000 people per day, or nearly 16 million mandays, with an associated value of at least R25 million per annum!

But let us see what the labour situation would be if all this additional sugarcane was produced, that is 24 million tons of cane within 10 years and 30 million tons of cane in 20 years. At the current productivity figure of 6,5 men per 1000 tons, 156 000 people would be employed daily for a crop of 24 million tons, whilst 195 000 people would be needed for a crop of 30 million tons. However, hand in hand with the crop maximisation from increased managerial effectiveness, is

implicit an increase in labour productivity. The Sugar Industry would only need to reduce labour to 4,6 men per 1000 tons to keep the present labour force employed on the increased activities producing a crop of 24 million tons of cane. Similarly, the Sugar Industry would only need to reduce labour to 3,7 men per 1000 tons to keep the present labour force employed on the increased activities producing a crop of 30 million tons of cane. It follows that if labour productivity can be increased to levels below 3,5 men per 1000 tons, as is being achieved at present on many farms and on at least one large miller-cum-planter, then despite these large increases to the industrial crop, even less people would be employed than at present. There is thus no doubt whatsoever, that the labour resource does not constitute a bottleneck or limiting factor in the development or expansion of the Sugar Industry.

Thus, from the business or economic point of view, the Industry should perhaps view this whole matter, not as a problem at all, but rather as an opportunity, on which it would be worth spending vast sums of money on both capital investment and on a recurring annual basis.

THE CHALLENGE

Evaluation of the effects of the management problem has revealed the size of the pot at the end of the rainbow. Unlike that elusive gold, however, the achievement of at least 'close to potential yields' is not impossible. On the contrary, several growers are achieving these yield levels already, whilst Tongaat miller-cum-planter is obtaining yields in excess of 8,0 TCH/100mm on a large area of its land and I am compelled to state at this point that if we (Tongaat) can get there, anybody can!

Now, referring back to the situational view of management presented in figure 2, it is immediately apparent that the human forces in the managerial situation are more numerous than technology. This should not necessarily be interpreted that technology is relatively less important. In some managerial situations, the impact of technology can overwhelm all other forces in the managerial situation. Let us look at sugarcane agriculture in this regard. The technology required to produce the optimum or potential crop is already at hand. The

problem is that this technology is not always put into practice, either as a result of a poor understanding of the managerial processes and their application to sugarcane farming by the farmers themselves, or from a lack of understanding of managerial psychology, accompanied by inefficient utilisation of the human resource.

I make no apologies for the casual treatment in this paper of sugarcane technology. I have presented only my opinion of the most important factors concerning the need to improve productivity. However, no serious argument can be evoked by the statement that the technology required to produce potential yields is already available in the Sugar Industry. In this regard I believe that many members of our Agronomists' Association have made significant contributions, and no effort should be spared to further our knowledge. Knowing how to produce 9 TCH/100mm is only one strength; to produce new varieties of sugarcane which have a greater potential, or to develop other agronomic technologies which enable the potential to be achieved with less resources, are other strengths fundamental to our long-term efficiency and stability.

The challenge is thus not the development of improved technology, but rather the development of managerial effectiveness so that currently available technology can be implemented in the agricultural sector of the Sugar Industry.

CONCLUDING COMMENT

The mind boggles, not only at the size of the Rand value attributed to the management problem, but also at the possibilities that present themselves to improve managerial effectiveness in the Sugar Industry. However, it is not for me to attempt in this paper to present any possible solutions to the management problem. It is only too easy to suggest a corrective course of action, and then withdraw and leave the field before it is implemented and put to the test. I do not wish to have my impending departure from this country interpreted in this light. It is rather the task of those that remain to consider this problem, to propose their solutions and to see them through. Thus, it is with this changed emphasis on technology that I perhaps disagree most with the author of the previous 'Revelations'. In his penultimate paragraph he states 'thanks to the work of the great

scientists, cane is grown in such a manner that, by the exercise of the minimum of judgement, the growth can be regulated to a niceity, and once the right kind of dynamic conditions have been established on each farm, a glance at the aerostat is sufficient to indicate whether or not the maximum of efficiency is being obtained'. To see the challenge this way and to leave its solution in the hands of the scientists, would not only be to our cost, but to our peril.

What role could our South African Sugar Industry Agronomists' Association play in improving managerial effectiveness? Before attempting to answer this question, let me ask a few more. What is the objective or purpose of our association? Where is our constitution? Would we not be a much more effective association if firstly, we agreed upon and set our effectiveness areas and objectives, then secondly, if the Executive Committee selected for each annual conference a theme for discussion and invited a relatively small number of skilled speakers to present papers to this conference? These papers could then be discussed in small working groups involving the rest of the audience, in order to produce some action proposals for the guidance of this industry to greater things.

In conclusion, I would like to say that the Sugar Industry has a great advantage over many. It has an inner strength, partly a consequence of its infrastructure, and partly resulting from tradition. I believe that these strengths will lead to the seeking of truth through the excellence of process, and I have no doubt that when I return in 20 years' time, I will see that the Sugar Industry has met the challenge!"

Maidstone,
21/10/75,
JNSH/SC.