

DEVELOPMENTS IN SUGARCANE GROWING IN NATAL AND ZULULAND 1953-1959

By J. M. ROBERTSON

A paper entitled "Sugarcane Growing in Natal—Field Methods and Practices in Operation in 1953" was read by C. H. O. Pearson at the Technologists' Congress of that year. This paper dealt with all aspects of cane growing from planting to harvesting and included green manuring, time of planting, spacing, selection and treatment of seed material, fertilising, weed control, irrigation and choice of varieties.

During the last six years changes have taken place, particularly as regards fertiliser usage and the replacement of certain varieties being grown at that time. It is not the purpose of this paper to detail once again that read in 1953, but rather to discuss the main modifications that have occurred in farming practice.

Field Preparation

Viewed from a purely mechanical aspect there are very few changes which have taken place as regards ploughing and land preparation in general. The disc plough remains the most commonly used equipment but some of the larger farms and estates are discarding the plough entirely in favour of the Rome Harrow and chisels. This very heavy type of disc harrow is, at present, probably the only implement which will deal really adequately with a layer of trash and has the action of shredding and incorporating this trash with the soil. The Rome Harrow may be taken over a field as many as six times in order to obtain a tilth, while the chisels effect a deep cultivation. When the field is finally furrowed out for planting any undecomposed trash is in such a fine condition that it does not interfere with the furrowing operation. Using this equipment the fallow period has been reduced to six weeks, and on one occasion to three weeks.

The disadvantage of the disc plough is that it cannot deal efficiently with a layer of trash and it is normally necessary to employ a certain amount of hand labour pulling the trash into the furrow ahead of the plough. The move away from green cropping in favour of the short fallow has an important bearing on this, as, unless repeated discings are given to aid incorporation and unless sufficient time is given for at least a partial decomposition, the furrowing operation is inclined to bring the trash to the surface once more. Where the practice of green manuring is retained this is not so important as during the growth of the Sunnhemp or Velvet Beans there will be sufficient time for some decomposition to take place. In some of the coastal areas,

particularly in Zululand, planting is being carried on practically throughout the year and the aim of the grower is to re-establish at the earliest possible moment. In consequence of this difficulty of dealing with the trash many growers are considering, or have already started, burning the final crop before ploughing out. This obviates the necessity of attempting to turn in a large bulk of coarse organic material and the semi-decomposed mat of trash from previous cuts offers no hindrance in this respect. It is difficult to say whether this practice is in any way harmful, but when it is remembered that the proportion of cane to trash is 4:1 it can be seen that a fair bulk of organic material is being lost to the soil and this cannot be advised on the weaker coastal sands.

The use of the mould-board plough is not widespread but this implement is capable of doing an excellent job and deals fairly well with trash or with a green crop. It has been seen operated mainly in conjunction with a small tractor and a big point in its favour is the complete turning of the old stool thus exposing it to the drying action of air and sunlight.

The Rotary Hoe is seldom seen but with further development of this implement and possibly used in conjunction with chisels a tilth similar, or superior to that obtained with the Rome Harrow, may be possible, and would have the big advantage that a heavy traction unit would not be required as in the case of the latter.

Green Manuring

The trend in the industry is towards the elimination of a green manure crop and many growers have now gone over entirely to the short fallow and direct replanting. Research has shown no benefit to be derived from the practice of green manuring, and, in fact, taken over a period of years the amount of sugar produced per acre has been greater from cane planted after a short fallow.

The growing of a green manure may be of some benefit on the weak coastal sands low in organic matter, but to obtain this the planting of cane must take place as soon as possible after the ploughing in of the green crop. Apart from the above it would still appear to be a useful practice to sow Sunnhemp or Velvet Beans in the case of fields ploughed out in the October or November period which are not intended for planting until Autumn, as a cover is provided for the soil during the hot months of the year.

Planting

Ideally fields for replanting should be cut and ploughed in the May-June period for spring planting or towards the end of the season for autumn planting. Where the short fallow is practiced this system allows for the cutting of fields at times when ratooning may be poor due to weather conditions and still enables cane to be re-established after only a short period of fallow.

The high rainfall in recent years and consequent wet soil conditions have led to an extension of the planting period, and, particularly in the coastal areas of Zululand, this operation may be seen at most times of the year, the period of disfavour being the hot and usually very wet month of February. Planting in August and even July has been frequently seen in these areas and provided the sett has been properly prepared and treated with a fungicidal dip the resulting stand appears to be equally as good as that resulting from a September or October plant. Germination is admittedly slow but the sett laid in the cooler ground at that time of the year does not deteriorate rapidly and will germinate with the first adequate rain, the young plant being in a position to take full advantage of the warmer spring conditions.

On the North Coast, except under irrigation, planting is not favoured after March and on the South Coast it is preferred to complete the planting programme before the end of January. The higher altitude areas with their special conditions continue to plant mainly during the September, October and November, period.

More attention is being paid to field layout than in the past and many growers are now planning their farms on a contour basis with a view to soil and moisture conservation. In this respect some thought should be given to strip cropping as this would surely be of benefit not only on the hill lands but also on the coastal sands where wind erosion is a problem in fallow or recently planted fields.

Preparation of seed material depends largely on the time of year, but during the optimum germination period the popular method is still to place the complete stick in the furrow and to cut into setts *in situ*. At other times setts are prepared and dipped in a fungicidal solution prior to planting. In this connection it has been noted that germination of prepared setts may suffer due to too frequent handling causing mechanical damage to the bud, and when setts are being transported to the fields they should preferably be carried loose on the trailer rather than be packed into sacks. Setts are placed in the furrow either to obtain a single continuous line or to leave a gap of 6-9 inches between ends. The practice of double stick planting is now rarely seen.

Spacing of the cane rows is commonly between four and six feet depending mainly on the preference of the individual but it has been observed that the tendency is to use a wide spacing of say 5-6 feet on the alluvial flats and to reduce this to 4 feet in the higher altitude areas. Recent experimental evidence suggests that spacing of the cane rows is bound up with the available moisture supply and that rows should be narrowly spaced where there is a plentiful supply of water and widely spaced where this is the limiting factor. Thus the maximum return from alluvial flats and irrigated land is to be expected from a narrow spacing, and conversely under dry land conditions a wide spacing will give superior results through the reduction in the number of stools in a given area demanding a limited supply of water. Further large-scale trials are being conducted but mechanical considerations such as post-planting treatment, must, of course, be taken into account.

The use of machinery for planting is on the increase and, whereas very few complete planters have been seen in operation, the use of a covering-in machine is commonplace, which, due to reduction in labour requirements speeds up the process. The main fault which has been noted with these implements, particularly where the soil is cloddy, is the tendency to drag the setts in the furrow with the consequence that large gaps are liable to appear.

It is normal practice to plant directly the furrow has been opened and to cover in immediately. Especially in hot weather and dry conditions the value of this becomes apparent in a better germination through retention of moisture in the furrow. The actual depth of furrowing will depend on soil and moisture conditions, but it is curious how often a field is cultivated to a depth of some nine inches to be followed by a ridger used to the full depth and the sett placed immediately on the hard compacted layer below. It is preferable to use a ridger with a sharp point which will leave a narrow groove for the sett rather than a type which gives a broad dish effect at the bottom of the furrow.

Little attention has been paid by growers in general to the selection of seed material and the possibility of improving the quality of the seed by special treatment. It is felt worth reiterating that cane cut for seed should be in a condition where the buds are plump, vigorous and likely to germinate quickly and, where possible, well grown cane of approximately twelve months old should be used. A few planters have adopted a practice which originated overseas and which consists of the application of high quantities of nitrogen and potash some four to six weeks before cutting for seed, the object being the production of a high nutritive value in the sett for the feeding of the germinating plant. Whether such a practice is of real advantage is

difficult to say as no comparative tests have been carried out, but excellent germination has been observed following this treatment in conditions which were not by any means ideal.

Harvesting

The increasing use of fertiliser and the excellent rainfall of the last few years have combined to produce a much larger crop than ever before and mills have been opening in April and continuing until the end of February in order to deal with the greater tonnage of cane. Due to this earlier start in cutting it is not now necessarily the practice to cut plough out cane at the beginning of the season, but rather to leave it until the colder months. During this period ratooning is liable to be poor and it is safer to cut fields for ratooning when temperatures are higher.

In some of the coastal areas it is the aim of many planters to reduce the growing time to eighteen months. This has arisen from the excellent growing conditions of recent years when it has been possible to obtain an extremely good tonnage in that period of growth. The reasons for such a policy are varied, but it has been certainly found to give greater efficiency in cutting and heavier loads when cane is still standing and reasonably straight. There is also an indication that sucrose may be higher in cane that has not lodged and it is intended to lay down trials to obtain information on this aspect. Consideration must also be given to the fact that where cane is allowed to grow for a shorter period the area cut each year is much greater and a drought would cause an unnecessarily large reduction in the crop to be cut the following season.

Again as a result of high rainfall and wet conditions there has, in some areas, been a reversion to the burning of all cane before cutting, the stated view of those concerned being that ratooning is very poor unless burning is practised. This may or may not be the case, but it would seem that these difficulties could be overcome by the alternate lining of trash. This system plus adequate drainage should take care of excess water, improve ratooning, reduce the amount of weeding necessary in ratoons, and at the same time retain the value of trash should drought conditions appear.

The biggest change in cane harvesting has been in transport and where practicable the self-loading trailer is rapidly superseding other methods. Where conditions are specialised the older methods persist, such as the continuation of direct loading on tram line on the alluvial flats. Self-loading trailers are of two basic types, side and rear loading, but the main advantages can be summed up as follows:

1. There is a saving in the number of trailers required to move the crop.

2. The cutter has an individual task which can be weighed and bonus paid accordingly.
3. The output of cutters is increased through avoiding the tedious labour of loading direct on to trailers, trucks or lorries.

From the field the cane is disposed of by a number of methods after off-loading from the self-loading trailer:

1. By gantry (with or without scale) to tram truck.
2. By mobile crane to S.A.R.
3. Cane dumped and hand loaded on to S.A.R.
4. Cane left at depot for eventual transfer to heavy road transport for haulage to mill.
5. Direct delivery to mill.

Where the self-loading trailer is not used the methods of transport are varied and the following have been observed:

1. Use of sledge carrying a load of approximately one ton, which is towed to a central point in the field and bundles then transferred by crane to trailer or lorry.
2. The stacking of small bundles of about one ton in the field which are then picked up by crane and transferred to trailer or lorry.
3. Direct hand loading on trailer or lorry either for haulage to the mill or transfer to S.A.R. by hand or by mobile crane.
4. Tram trucks conveyed to field by specially built trailer, hand loaded and returned to line.
5. Direct hand loading on tram line.

There is little to comment upon as regards the cutting of cane but it has been observed on a few occasions that cutters are inclined to leave rather a long stubble and it should be impressed on labour that the stick must be cut right into the ground.

After-Harvest Treatment

The treatment of cane land after harvesting has been the object of some interest, and, especially on the heavier soils, it is now the practice of many planters to subsoil with a view to breaking up the compacted soil and improving ratooning. The actual method used in subsoiling varies but is either a single line drawn in the inter-row or down either side of the cane row. The presence of a layer of trash causes some difficulty in this operation and necessitates the employment of hand labour in moving the trash. Where heavy equipment is being used there is now available a subsoiler with a large rolling disc which efficiently cuts through the trash layer and allows the unimpeded entry and operation of the subsoiler tine.

Fertiliser Practice

Since 1953 many changes have occurred in fertilising practice and today more fertiliser is being applied than ever before, particularly as regards nitrogen and potash. Experimental evidence and the Fertiliser Advisory Service have combined to bring to the planter the advantages to be gained by the application of fertilisers in increased and balanced quantities. Although the majority of growers are conscious of this need, there are still many who do not apply nearly sufficient fertiliser, and it frequently occurs that a fair application is given to the plant crop whereas ratoons are neglected. Such a policy is extremely short sighted as ratoons should, financially, give a far better return than plant cane.

Fertiliser Advisory Service recommendations are given as straight fertilisers, with, where possible, an alternative in the form of a mixture. The average grower, however, prefers to use a mixture, since, though slightly more expensive, the question of mixing varying quantities on the farm is not necessary and all applications are worked out in terms of pounds per acre of the particular mixture in use. Many planters now work on the principle of buying a standard planting mixture, a standard ratoon mixture, and nitrogen in one form or another to be used as a supplementary top-dressing. The amount applied may also be standardised or varied according to knowledge of the capabilities of a particular field. This practice is, nevertheless, somewhat arbitrary as the quantities of each nutrient applied bear little relationship to the needs of the soil. In all cases the use of the Fertiliser Advisory Service is to be recommended as the quantities for each field, or section of a field, are given according to its needs, and the actual mixing can be easily undertaken on any farm. A further point is that cases have been observed of the apparent over-use of potash in soils high in that nutrient and the addition of potash in a standard mixture will have the opposite effect to that desired.

It may be of value to give some of the dressings recently seen, both where the Fertiliser Advisory Service recommendations are being used and where standard mixtures are applied. In virgin soil previous practice has been to apply phosphate and possibly a small quantity of nitrogen, whereas recommendations today for this class of land may include up to 600 lbs. sulphate of ammonia, 600 lbs. superphosphate and dependent on the potash status of the soil, muriate of potash at levels as high as 400 lbs. per acre.

Of the planting mixtures the most commonly used is 5-13-5 at levels of between 600-1,000 lbs. per acre and frequently a nitrogen top-dressing is given at the age of 3-6 months consisting of 200-300 lbs. sulphate of ammonia or its equivalent.

Ratoon dressings have been vastly increased and of the available mixtures 10-6-10 is the most greatly favoured and 1,000 lbs. per acre is a common application. Recommendations may run in the nature of 800 lbs. sulphate of ammonia, 300 lbs. superphosphate and 300-400 lbs. of muriate of potash.

The tendency is towards the splitting of the total dressings, particularly as regards nitrogen, into two or even three applications. When it is realised that in 1953, 200 lbs. per acre of sulphate of ammonia was considered a good application the advances made in this direction can be easily seen. Recent experimental evidence suggests that in the case of nitrogen the applications are still not high enough, and in a few years' time we may be talking in terms of 1,200-1,500 lbs. of sulphate of ammonia per acre, apart from phosphate and potash.

The value of liming in cane, a crop which can tolerate a wide range of pH, has never been proved and this practice has rarely been seen carried out. With the increasing use of nitrogen, particularly in the form of sulphate of ammonia, there may be an increase in acidity and further liming trials are required. Apart from the problem of pH correction, the use of dolomitic lime is being advised in cases where magnesium is in short supply.

The methods used in the application of fertilisers are changing where possible to the mechanical, as this usually gives a more even and more certain distribution than when hand labour is employed, apart from any saving in labour. The adoption for cane of the spinner type of spreader has led to an increasing use of this implement which is of particular value in the fertilising of ratoons where it can be used in cane up to four feet in height without causing much damage.

The application by aircraft of nitrogen, and more recently potash, is increasing in popularity as this is the only really reliable and practicable method of applying fertiliser to tall cane. So far the only aircraft seen employed have been of the conventional type, but depending on the relative costs, the helicopter may provide a steadier platform and effect a more even distribution.

Recently there has been interest, as far as the fertilising of ratoons is concerned, in the application of the fertiliser at a considerable depth through a subsoiler tine. Although this has been claimed to give better results its value as opposed to normal top-dressing has not been proved.

Irrigation

Figures from the last census show that irrigated cane accounts for some 10 per cent of the industry but there is a considerable interest in the potentialities, particularly as regards the installation of overhead spray systems which are eminently suitable

for South African conditions. Perhaps the main interest has come from the northern part of Zululand where the growing of cane has been increasing in recent years in an area with a low natural rainfall.

Overhead spray equipment is an expensive item of capital expenditure but this is more than offset by its general portability and its more efficient use of water when compared to a furrow system, an important factor when water is in limited supply. The use of such a system has enabled the irrigation of areas in which it would not otherwise have been possible and there is no reason why its use should not be expanded.

There is still a vast amount to be learnt regarding irrigation techniques, not only in connection with water supply but also because fertiliser policy must be adapted to the different conditions. Investigations are now in progress and results will be forthcoming within the next few years.

Drainage

The high rainfall of the past few seasons has shown the necessity for field drainage and more attention is being paid to this subject than before. The installation of a permanent system of drainage with tiles is an expensive undertaking and very little has been done, the initially less costly open drain being used. The advantage, of course, of the tiled drain is its long life and the fact that being completely buried it does not interfere with cultivation. Moulds can be obtained in which a sand and cement mixture half pipe can be produced and these should prove fairly durable and less expensive than tiles.

The system of mole draining has been little used although this should prove easy, economical, and effective on the heavier soil types and will also have the effect of giving a thorough deep cultivation. Although mole draining is not a permanent system it should last through one cycle of cane and again has the advantage that there is no interference with cultivation.

Pests and Diseases

The subjects of eelworm and ratoon stunting disease have attracted considerable attention on the part of the planters directed mainly towards methods of treating the land in the former and the seed in the case of the latter.

The discovery that cane is affected by eelworm and that this may be the cause of poor growth and partial crop failure in some of the coastal sands has led to a great deal of interest. Experimental work is now in progress which will yield useful information within a year or two. So far soil fumigation has been shown to give highly significant responses in plant cane and the results of these chemicals on ratoons

are awaited with interest. One estate is already carrying out treatment on a field scale using a tractor mounted applicator, the basis of which is a tank from which a series of pipes are led to tines in the soil and the injection made at a depth of some nine inches. For the average grower the use of such chemicals is almost entirely dependent on the cost factor and this must obviously be largely dependent on the results obtained from ratoons.

As regards ratoon stunting disease a number of planters have installed their own tanks for the heat treatment of setts. The impracticability of treating quantities of seed for large-scale planting has become immediately apparent, not only from a consideration of the time and labour involved but also from the poor germination that has resulted in many cases after treatment. The answer to heat treating on the farm would appear to be the development of a small tank in which temperatures could be accurately controlled and which would be used for the treatment of sufficient seed to plant nursery blocks from which, in turn, seed material would be obtained for field scale planting.

Varieties

The variety position has changed somewhat since 1953 and such varieties as Co.290 are no longer to be seen. Co.301 is very rarely still being planted but the majority of growers have ploughed out, or are ploughing out, this variety.

Co.331—is widely grown throughout the sugar belt.

It is not being planted as frequently as in the past but there is still a certain popularity on the sandier soils. Properly treated, Co.331 is capable of giving a high tonnage of cane per acre but with a low sucrose if cut too early or too late in the season, and even at the optimum period sucrose is still low in comparison with other varieties. This variety should not be left over as it becomes hard and pithy when past its best. Care should be taken in the selection of seed material as germination is inclined to be poor.

N:Co.310—A large proportion of the land under cane is now planted to this variety which does very well in the better class soils giving high yields with excellent sucrose. Because of its reputation it is often to be seen on the coastal sands where it is not suitable. Many growers are now saying that N:Co.310 is not as good as it was; this may or may not be the case, but to date there is no variety to replace it on the really good soils.

N:Co.339—There has been a good deal of controversy regarding this variety and, although its disadvantages include poor germination, heavy flowering and its potentialities as a source of infection of mosaic, it is giving good yields with a good sucrose. It appears to do particularly well on the sandier

types of soil although it can be seen on most farms. The sticks are inclined to be thin but this cane has the advantage that even after heavy flowering there appear to be few dead sticks and that ratooning is excellent. It is somewhat susceptible to red rot in high altitude areas. This is usually due to borer damage initially.

N:Co.293—is now widely planted in the high altitude areas and to a small extent on the coastal belt. At high altitudes it gives a very satisfactory return, but care must be taken in the time of cutting as ratooning is inclined to be poor. It is very prone to flowering and is susceptible to smut.

N:Co.292—A useful variety for the sandier soil types. It is not a good germinator and in plant cane it has been noticed that there may be few sticks per stool. It does, however, ratoon well, rarely flowers, and gives a satisfactory yield.

N:Co.376—This is without doubt the best of the recently released varieties and is giving heavy yields in tons cane per acre though sucrose is not as high as N:Co.310. It appears to do extremely well in the better class sands and lighter soils and is now being widely planted. It is a first class germinator and ratoons well. The canopy is not as good as N:Co.310 but it is more upright and does not tend to lodge as readily at high tonnages.

N:Co.334—This variety was first released in 1957, having been held over from 1954. It is a variety said to be suitable for sandier conditions but in at least one instance its main value is being found in wet vlei areas. It is an upright cane with a rather poor canopy and grows somewhat slowly in the first year. As it is susceptible to ratoon stunting disease care must be taken in the selection and treatment of seed.

N:Co.382—Released at the same time as N:Co.334 this cane is also recommended for sandy conditions and growth is certainly good on the very weak windblown soils of this class. It is very thin and lodges easily but has given good yields in both tons cane and tons sucrose.

Conclusion

It is difficult to generalise in agriculture as field practices vary, not only from district to district depending on local conditions, but also from farm to farm in any one area, and there are, no doubt, many individual innovations which it has not been possible to mention. The sugar industry as a whole is very much alive to the possibilities of increasing production and improving efficiency, and methods which are today being developed by a few may, in the next few years, become standard practice.

Thanks must be recorded to Mr. C. H. O. Pearson for the use of his paper of 1953, the value of which as a reference has been made apparent by the necessity to reprint it on more than one occasion.

Mr. du Toit (Chairman) said that this paper was of great practical value and it was the type of paper for which there was a great demand. Newcomers to the industry would find the points touched upon of considerable interest. He noted that Mr. Robertson had mentioned that some planters were using seed beds which had been fertilized with nitrogen and potash in order to get better results from the planted cane and Mr. Smeaton had said that he had good results from applications of nitrogen. Several years ago work done at the Experiment Station showed that seed cane which had been treated with potash gave a much better germination; this was also observed in Hawaii. Mr. Robertson had written that some years ago 200 lb. of ammonia sulphate was considered a good dressing. In 1927 the Experiment Station had recommended at least 400 lb. of ammonia sulphate. An interesting fact was the increase of irrigation which now applied to about ten per cent of the whole industry.

Mr. Smeaton said that it was incredible to see that in 1952 and 1953 he was only using 400 lb. of a mixture and had expected good results.

Mr. du Toit said that he too had records since 1952 and these showed the amounts of fertilizer used, and it was fantastic how the use of fertilizers had increased. Some areas never used to fertilize. Within recent years, largely through the Fertilizer Advisory Service, this situation had improved.

Mr. Pearson said that the paper he wrote in 1952-53 mentioned that the general use was about 150 lb. of ammonium sulphate. He was glad to see that Mr. Robertson had stressed August planting. Planting in August and September was less liable to lead to poor germination. He said that cane could remain in the ground for a long period at this time of the year and that it did grow very rapidly when the rains came. Another point mentioned was that of furrowing and he had seen planting done beyond the limits to which any cultivation had been carried out previously. A tilth in the top had been prepared with great trouble, but the furrowing went even deeper than this. Experiments carried out showed that very shallow planting made very little difference in the germination, especially with the spring planting. In January and February hot days should be avoided for planting operations and planting should not be deeper than the prepared tilth on the top of the soil.

Mr. King said that he would like to comment on the fertilization of seed cane prior to planting and that he would like to suggest further that they should take the seed from well grown stools. If sufficient seed was used to plant one acre, then this acre of seed could eventually be expected to plant up to even thirty or forty acres. It might be that this would pay dividends and it might be that some of the poorer seed had been stunted by ratoon stunting disease. By selecting well developed stools they might

obtain cane which was relatively free from ratoon stunting disease. This could result in an increased yield without much extra cost. As far as very deep planting was concerned, he had seen the furrow made and boys employed in picking out the clods which had been brought up by the deep furrowing. He suggested that under conditions such as this that chains should be drawn along the furrow.

Dr. Cleasby said that the subject of eelworm introduced had interested him very much and he made mention of an experiment which had already been undertaken in Zululand to test the results from soil fumigation and he wanted to know what the results of the experiment were.

Dr. Dick replied that only one experiment had as yet been harvested. In this, although the plant cane crop had shown a highly significant increase after fumigating, it was doubtful whether the increase would prove economically profitable. This estimate might have to be revised when figures for ratoons became available. A second experiment, in which different quantities of EDB had been applied, might indicate whether the disappointing results obtained in the first trial might have been due to insufficient quantities of fumigant.

The Chairman said the experiment referred to had a very poor yield and although the treatment was significant, because of the low yield it was not economical.

Dr. Dick elaborated that although the increase was twelve tons per acre, the cost was £20 per acre.

Dr. Cleasby said that he was experimenting with different levels of a fumigant but no results were yet obtained. A top level of eighty gallons per acre had been applied. The crop was good, but the estimated increase due to sterilization was no more than 5 to 8 tons per acre. The big response obtained in a non-replicated trial when the sterilized plot yielded 50 tons per acre and the unsterilized plot 8.3 tons per acre, had not been reproduced.

Mr. Larsen asked if it was possible yet to say how many ratoons could be cultivated.

Mr. Smeaton said they now had fifth ratoon fields which normally would have been ploughed out, which had given between fifty-eight and sixty-two tons per acre, which was considerably more than the yield from the plant cane.

Mr. Steward reminded the meeting that Mr. G. C. Dymond had reaped up to tenth ratoon on Uba cane with satisfactory results. From the amount of fertilizers quoted in the paper, he thought that the cost per ton of cane would be nearer 10s. than 5s., although there were a few places in the cane belt where no fertilizer was required, one had to talk about normal practice and normal conditions.

The Chairman pointed out that Mr. Dymond's results were obtained with compost.

Mr. W. Hempson said that one should use fertilizers but only when this was absolutely necessary. On fertile alluvial flats it was necessary to watch the position, take soil samples and leaf samples to ensure when it would be necessary to apply fertilizer. On the Umhlatuzi flats he had up to seventh ratoons which were giving good yields and he thought that the time to plough out and re-plant was when the field lost one third of its potential production.

The Chairman said that while this was true, on the Umhlatuzi flats and Umfolozi flats there was no need to use fertilizer to begin with, but the later ratoons certainly benefited by the application of nitrogen and potash.

Mr. Sherrard questioned if the use of green manuring could be condemned and asked if there were any experiments to prove this. He considered the established practices were brought in for a good reason. He thought that the throwing out of the idea of green manuring should be treated with reserve. With the fallow of six to nine months they had the time to get their fields really clean and get rid of old ratoon plants. Besides this, green manuring had the benefit of supplying nitrogen which went into the soil.

Mr. Robertson agreed that the old practices used which had been determined by many years of experience could not be lightly disregarded. He said that this paper described conditions as they were now in the industry and the practice, rightly or wrongly, is now being discarded. The industry this past year had produced over one million tons of sugar and he thought that if a higher target was to be aimed at, one had to make the maximum use of the land.

Mr. Hempson said that on the Umhlatuzi flats it was the practice to plant as soon as possible after cutting. It was the practice, as soon as a field was cut, to Rome harrow and apply 400 lb. of sulphate of ammonia, which helped to break down the ratoon roots. He said that this was done on both sandy soils and on the flats.

Mr. Steward said that recently he had visited sugar producing countries overseas and the only agricultural practice on which there was no difference in opinion was about the length of the fallow. The practice was to plant as soon as possible after cutting and in Hawaii he had seen cane planted three days after harvesting the last crop.

Mr. E. G. J. Barnes said that in recent years more importance had been placed on the cleaning of fields. Various methods of cleaning fields are now being practiced.

Mr. Robertson said that he had thought of including the various methods of weed control in the paper.

Herbicides were used to a small extent but basically the methods of weed control had not changed. It was surprising to see how much care was taken in preparing and planting lands and then leaving it for the weeds to grow.

The Chairman said that he could see why weeding was not mentioned in the paper, but the paper was of great interest to newcomers in the industry. He thought a paragraph on weed control might well be included in the paper. As far as green manuring was concerned, he said that he was glad that a warning had been sounded against the discarding of one system without adequate evidence. He said that if the land was going to lie idle, it would be economical to use a green manure. He considered the practice agriculturally sound, but that it was not necessarily of maximum value. With the introduction of new implements it was possible to get the land prepared much more quickly and more suitably so that planting could be carried out very quickly after cutting. Green manuring might have some bearing on the eelworm problem. One large estate which used green manuring topped the yields of the industry. This might be due to the green manuring practice carried out.

Mr. Halse said that the use of lupins in the vineyards of the Cape was on the increase. He said that in the sugar areas, fields should be given a rest and planted to a green crop, preferably Sunn Hemp, which takes the place of lupins which do not thrive as well here as in the Winter Rainfall Area of the Western Cape.

The Chairman said that lupins were valuable in the Cape and these were sown extensively but no land was thrown out of production. In cane, however, the application of green manure might result in a loss of time. Lupins had not been successful in the sugar belt.

Dr. Dodds said that the paper would be a valuable reference publication for the industry. In the past it was felt that a green manure crop was good agricultural practice but even in those days it was difficult to prove any economic benefit from it because of the loss of time. He thought, however, that this practice should be discarded only with great caution. When the land was replanted immediately after the cutting, particularly if the cane had been burned, there might very well be a loss of

carbon, which played a very important part in the nitrification of ammonia, as well as having a very great effect on the conservation of moisture in the soil. The application of organic matter to the soil, therefore, should be maintained in some way or other. Green manuring alone may not lead to a permanent preservation of organic matter in the soil, but together with the application of filter cake, it might well lead to a permanent increase in organic carbon in the soil. It was pleasing to see that N:Co.310 was still holding its own, but it was also disturbing to see that there was nothing to take its place as yet. It would be unwise to rely upon one variety indefinitely. N:Co.339 looked most promising, but he realised that it had certain disadvantages. The replacement of older varieties as they deteriorated by new ones was of great importance to any sugar industry.

Mr. W. Hempsen said that nobody had yet made mention of the damage done by sun and wind when land was exposed. If one was able to plant between three to six weeks after harvesting, the soil was sheltered. If it was not possible to do this, a green manure crop would be of value.

Mr. Pearson said that he had long queried the use of green manure and he referred Mr. Sherrard to an experiment carried out some years ago whereby planting cane after cane lead to an increase of twenty tons per acre in a given time. In temperate climates green manuring had been shown to be very beneficial, but this did not necessarily apply in a sub-tropical country. He also wanted to remind people of the value of permanent pastures, and cane was, after all, a grass.

Mr. Bachelor said that green crops were not only users of time, but also users of moisture. When one ploughed out Sunn Hemp one could see that the ground was very dry, which was a condition which also hindered bacterial activity. Bacteria in the more temperate climates had more time to build up their numbers in the soil. In our industry where the fallow was from five to six months, this was not possible to the same degree.

The Chairman said that the point made about moisture was a very real one. When one had a dry summer, a green manure crop would take out a lot of moisture from the soil and the cane would be at a disadvantage when planted.