

## MECHANISATION SYMPOSIUM

# LABOUR VERSUS MECHANISATION: COMPETITION OR CO-OPERATION

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### Introduction

Agricultural mechanisation, as we know it today, is a relative newcomer to the art and science of profitable farming. It is only since the end of World War II that agricultural mechanisation has moved forward to take its place as one of the major factors concerned with profitable agricultural production. This rapid expansion has, together with all the many desirable attributes of mechanisation, resulted in the widespread acceptance of a number of misconceived ideas. As in the early days of artificial fertilizers we had the "muck and magic" principle of economic farming, today we also have the attitude of 'machines not men', with the central pivot of the internal combustion engine. Not surprisingly there are too many known examples where mechanisation has been undertaken in such a manner that it has failed to achieve its loudly stated advantages.

In many cases, the so-called labour saving effects of mechanisation have not been realised. Thus, the national statistics of such countries as the United Kingdom show that for a considerable period of time after the introduction of machines to the farm, labour has shown an amazing ability to remain in employment. Furthermore, the cost-cutting advantages of machines have not, in many cases, been achieved and costs have actually risen along with increased output. The reasons for these failures may fairly be attributed to faulty decision making, incorrect problem definition and faulty planning, rather than an inability to achieve the desired results when operations are correctly mechanised. Even today, we have in South Africa voices calling for such mechanical devices as the two-row cane cutter, when no detailed feasibility studies have been carried out. The proven need for modern business management techniques to be applied to sugarcane farming in South Africa suggests that labour and machines must be viewed as two valuable complementary resources. These should be used either singly or jointly, in varying proportions, to obtain the highest level of continuous profit that is considered feasible.

It would seem to be an unjustifiable waste of money and available resources to introduce power-driven machines to the average sugarcane farm before the existing power resources, chiefly labour, are fully and efficiently utilised. Additionally, the replacement of labour by machine when the former is in abundant supply, merely creates a less flexible production-cost structure. It also substitutes, very frequently in an African context, a high cost production factor for a low one. In many instances it

has been the "drift from the land" that has been the main factor forcing farmers to adopt improved methods of production, including mechanisation. The residual workers have demanded higher wages, and so overall labour costs have continued to rise. In the context of economic productivity, labour and machines can be substituted one for the other and mixed freely within their inherent capabilities. In the more sophisticated agricultural industries of the world, combined labour and machinery costs frequently account for more than half the value of total agricultural production. In South Africa the same position prevails, and in labour-intensive enterprises such as sugarcane farming, labour costs alone can amount to as much as 60% of total direct costs.

### Labour availability and utilisation

Despite opinions to the contrary, abundant labour is available within the South African agricultural framework. As recently as 1964, 30% of the economically active white population was still on the land despite a continuous decline since 1949 (Anon.)<sup>1</sup>. Unpublished data supplied by the Department of Bantu Affairs, indicates that a considerable reservoir of untapped unskilled labour exists, for which no reasonable means of employment is presently available. Limited farm management data shows a variation amounting to almost 400% between the lowest and the highest labour cost figures for sugarcane farming. At the bottom end of the scale, labour cost figures amount to 22% of total direct costs, while at the other end these amounted to 61%, with an average of 44%. Thus, one of the prime factors responsible for the replacement of labour by machinery elsewhere in the world would appear, at the present stage of development, to be absent from the South African cane farming scene.

The sugarcane growing industry is still very largely managed along traditional lines and this is particularly so in the case of labour management. Such important techniques as labour motivation and training and work incentives are often frequently derided when propounded as a valid means of improving labour productivity. Evidence from management studies carried out with Bantu labour in other parts of Africa, together with that available from South African industry, indicates the lowness of the level of productivity which is still considered acceptable from labour employed on the average farm.

Farm management data for the 1967-68 crop, which has already been quoted, indicates that of the total

bill for production, labour constituted between 22% and 61%, with an average of 44%. Of this, cutting and loading amounted to an average of 28% (from 16% to 34%), while weeding amounted to 22% (between 10% and 34%). Machinery costs, including that used for supervision amounted, on average, to 15% of total direct costs (ranging from 10% to 25%).

The current objectives of the extension services of the South African Sugar Association's Experiment Station include a planned 40% reduction in labour requirements for cane growing. This, it is contended, can be achieved through the use of such selected tools as the long handled cane knife and herbicides, the proper organisation of labour gangs, the training of labour, and the use of appropriate and adequate incentives.

The number of man days presently required to produce one ton of cane varies from 1.0 to 2.3, with an average of 1.5. This is an average figure which includes all the labour and supervision used for the entire range of operations for the season's output. These figures may be incomprehensible to some but can be equated to an output of between 1.6 and 3.3 tons of cane per cutter per day, with an average of 2.4. This agrees well with other data sources which suggest an industrial average daily output of 2.43 tons cut and stacked per cutter man day. Against these figures are known output levels on individual farms of up to 19 tons of burnt cane cut per 6 to 7 hour working day using the lang handled cane knife, or up to 8 tons of cane which has to be trashed.

Farmers who do not use herbicides for weed control have a seasonal labour demand of between 10 and 15 man days per acre (average 11.5). In contrast, those who concede that they use at least some, have labour needs of between 4 and 12 man days per acre (average 7.5). Applying this data to the industrial crop, let us observe the potential effects of using such improved practices.

Data for the 1965/66 crop have indicated that approximately 50% of the cane harvested during the season was burnt (Du Toit and Murdoch)<sup>2</sup>. If one accepts that with the addition of the Malelane area, this figure increased slightly for the 1967-68 crop, to say 55%, then of a total production by European growers of 17.1 million tons of cane, approximately 9.4 million came from burnt crops and 7.7 million from trashed. At the average industrial figure of 2.43 tons cane per cutter man day this required a total of 7.04 million cutter man days or, on the basis of a 220 day crushing season (Perk)<sup>3</sup> at least 32,000 labourers for the season. If we accept only half the projected levels of productivity that have been suggested, namely 10 tons cut per day in burnt crops as opposed to 19, and 4 tons per day in trashed cane instead of 8, the total labour requirements for the cutting operation would have been 940,000 and 1.925 million respectively, with an additional estimated 1.71 million man days for stacking (based on 10 tons per man day stacked). This total of 4.575 million man days employed over a crushing season of 220 days, indicates that 20,800 labourers would have been required instead of the postulated 32,000, a reduction of 35%.

However, an even greater reduction in labour demand would be achieved if mechanical loading were introduced. This would conceivably displace a further 7,800 labourers (24%). Acceptable designs for mechanical loaders are available today. Providing these are effectively utilised, the cost per ton of cane loaded into trailers will be less than that for hand loading.

Assuming that only 55% of the total acreage (including land ploughed out), had to be weeded in the 1967-68 season, the labour demand, assuming no herbicides were used, to keep approximately 238,000 acres at the standard of cleanliness achieved by herbicides, would have been 2.74 million man days, or 9,950 labourers for a 275 day season. Had all these growers used herbicides to the mean of the scale encountered in a farm management sample survey, the labour requirements would have been 1.79 million man days or 6,500 labourers for the season, a reduction of 35%. However, our present knowledge suggests that the use of herbicide for weed control in the industry could be greatly improved, suggesting that a 35% reduction in labour required for weed control, is a low target.

#### Mechanisation

Data for the 1967-68 crop show that 78% of cane farms in South Africa produced less than 10,000 tons occupied 56% of the land and gave 40% of the total output.

1967-68: Production of South African Sugarcane Farms.<sup>1</sup>

Production (tons cane)	% of farms	% of area	% output	Av. farm size (acres)
<5,000	47	24	17	161
5,000-10,000	31	32	31	320
10,000-15,000	14	21	23	462
>15,000	8	23	29	840

<sup>1</sup>Excluding miller-cum-planter estates.

If we consider the use of mechanisation on these farms, there is even less data available than there is for labour. What is available, suggests that on average a tractor is used for 810 hours per annum for all operations, and that the utilisation per 1,000 tons of cane harvested each season varies from 155 to 585 hours with an average of 298.

It would seem, therefore, that a first priority in any mechanisation exercise should be to increase the utilisation of existing machines. Clearly any substantial increase in the amount of mechanical equipment employed on the majority of South African cane farms would increase significantly the risk of over-capitalisation with consequent lower rates of financial return. For the 47% of farms which produce less than 5,000 tons of cane, it may be virtually impossible to achieve any substantial increase in the utilisation rates of machines, while in the next larger group this improvement may be limited due to the indivisibility of mechanical units. So there seem to be possible openings for increased mechanisation, in the generally accepted sense of the term, only on the remaining 22% of farms. Bearing in mind the

prospects for improvement in labour productivity which have been outlined, it appears that at this stage of development, increased mechanisation should be essentially an individually tailored exercise.

It does not follow that the generally accepted concept of mechanisation, which involves the internal combustion engine producing in excess of 40 hp, is the correct one to follow. In the truly catholic sense, mechanisation surely includes hand tools, and in this context an ideal place for improvement of implements is in hand tools used for weeding. The universally used native hoe is essentially a soil moving tool and is not designed specially for weeding. Yet there is a vast range of hand tools which has been designed and used for many decades in other parts of the world including, to name only two, the swan-necked and the dutch hoes. These light, well-designed tools have proved their value not only in Western Europe and America but in the Rhodesian tobacco industry, where the standard of management is adequate.

Again, if management is suitably analytical in its approach why should it assume that mechanisation should be restricted to the four-wheeled tractor of great weight and power. The outstanding usefulness of light, 2 to 10 hp pedestrian controlled power units, has been established throughout South-East Asia by Japanese machinery manufacturers, and in Southern Europe by the Italians. Three possible fields of application come instantly to mind. First there is the use of a rotary slasher to keep weeds and grass under control in such areas as breaks, field, road and irrigation canal edges, where bare earth is undesirable if erosion is to be avoided. Indeed, individual farmers have already taken up this point of their own accord. Second, instead of using either mules or a tractor of 40 to 50 hp, there is the possibility that inter-row cultivation can be carried out

using a 5 or 10 hp pedestrian controlled machine. These are capable of travelling at approximately 0.9 mph and can cultivate 3 acres in an 8 hour day, at a much lower overall cost than a 40 hp tractor. Third, the application of herbicide using hand-operated knapsack sprayers or tractor-powered equipment moving along cane rows has distinct limitations. Hand operated knapsacks fail to provide a uniform rate of application while tractor mounted or tractor drawn sprayers can only be used on flat or gently sloping terrain. Small, two-wheeled power units would improve uniformity of application while the low ratios of bulk and weight which make them very manoeuvrable, would extend the range of conditions under which they can be used.

#### Conclusion

The sugarcane industry in South Africa can make substantial savings by:

- (i) training, organising and motivating its labour, and providing it with better tools;
- (ii) increasing the use made of existing machinery; and
- (iii) introducing light, mobile power units for specific field operations.

A machine is a means to an end, not an end in itself. It replaces man in the performance of an operation but lacks man's flexibility and it is also costly. Let us make optimum use of our human resources before we commit ourselves to mechanisation in its present industrial concept.

#### References

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2. Du Toit, J. L. and M. G. Murdoch, 1966. Summary of agricultural data: sugarcane crop 1965. *Proc. S. Afr. Sug. (Tech.) Ass.* 40: 294.
3. Perk, C. G. M., 1968. 43rd annual summary of chemical laboratory reports. *S. Afr. Sug. Yearbook 1967/68*, p. 127 (Table 7) Pub. S. Afr. Sug. J.