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Mechanization Trends in South Africa and its Effects on
Farm Labour

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MECHANISATION TRENDS IN SOUTH AFRICA AND ITS EFFECTS ON

FARM LABOUR

(with particular reference to the Highveld Maize and
Wheat areas).

INTRODUCTION:

The explosive expansion of the world's population has been well publicized and it is common knowledge that the world's growing need for food and fibre is such that very substantial increases in agricultural production will be required to feed and clothe the world's future population.

Increased production has been achieved and will be achieved with known and available resources and new production techniques but very much larger investments in agriculture including investments in machinery, will be needed to maintain this trend.

While increased mechanization will not have as an important and far-reaching effect on total production as increased fertilization and the selection of more productive hybrid strains, which are also disease and pest resistant, will have, machines do have an important role to play in the many applications for which they are eminently suitable in agricultural production such as in soil preparation, planting and harvesting.

While high levels of mechanization are unlikely in the

foreseeable future throughout all regions of the world, certain pockets of mechanized agriculture do exist in the so-called green belt areas of the world situated between the 30th and 55th parallels of the Northern and Southern hemispheres and it is in these areas where increased mechanisation will be most productive.

Together with the lower portion of South America, the Southern parts of Australia and all of New Zealand, Southern Africa is one of the significant areas in the green belt lying South of the equator and as can be expected, in contrast with the rest of the African continent, this region is agriculturally most productive and has the most highly mechanized agricultural activity on the continent.

INCREASED PRODUCTIVITY:

Virtually all the best agricultural land in South Africa is cultivated to-day and not very much more can be made available through irrigation or other existing techniques. To raise yields will require intensified use of the land at presently used and continued development of improved strains of seed and greater use of improved fertilizer. It will also require the development and use of more productive farm machinery.

The farmer in South Africa shares the worldwide farmers risk position, in that he is unable to control some vital aspects of his production, such as unpredictable weather

and market prices. He has, perhaps, a higher risk than most in regards to adequate moisture.

He is learning, however, that high horsepower equipment with high technological capability increases his ability to plant, control weeds, insects, and diseases and to harvest rapidly on the larger acreages now used by him. The ability to finish tasks when weather conditions are as close to ideal as possible often means the difference between a good and an average or poor crop.

The abnormally wet summer of the last few years have brought this lesson home to many farmers when they were unable to enter their lands for planting and cultivating with their smaller tractors equipped with standard wheels and tyres.

Without the bigger machines with adequate horsepower and equipped with dual wheels many a farmer could not plant his crop in time to ripen before the onset of the autumn frosts.

During dry years the ability to get his seed into the soil after a favourable rain has fallen, as speedily and efficiently as can be done by larger sophisticated machinery spells the difference between a poor crop and a reasonable or successful one.

His ability to use an opportune but possibly brief period of time, such as can happen between two rainy spells for instance, has been greatly extended by the availability of properly equipped machines with adequate horsepower to accomplish what has to be done quickly and effectively.

This is a kind of situation which arises more often during every season than is generally realized and to be able to take timely action during such opportune periods can be of considerable advantage to the farmer.

The large sophisticated tractors, combines and planters and other implements with builtin hydraulic functions lower farm labour requirements and labour costs, speed up operations, reduce risks, and increase productivity, Most important, this greatly increased productivity of large modern equipment results in lower capital investment per hectare - as much as a 50% reduction over current mechanization patterns used in South Africa.

PATTERNS IN THE UNITED STATES:

In some respects the mechanization of South African agriculture follows a similar pattern to that which has been developing in North America as we do have certain features in common although we may not enjoy the fortunate combination of climate and soils and topography which pertains in some parts of the United States.

In the United States, the market for large horsepower farm tractors and associated equipment is growing rapidly and has during recent years expanded at a rate of 40% per year. The average horsepower of tractors jumped from 35 kilowatt in 1960 to 60 kilowatt in 1972 and in 1975 it exceeded 65 kilowatt.

The leading agricultural machinery company in the States

found that in recent years more than a third of their tractor sales were in the 75 kilowatt and higher group. Almost half of their sales came from the 38 to 75 kilowatt group and only 14% from those less than 38 kilowatt. Competitor companies were recognising a similar trend in their sales figures.

Combines and the attachments known as "cornheads" which turns a combine into a more effective and efficient Maize harvester, have grown in capacity and size and over the last decade and a market growth of 21% has been recorded in this particular field.

Studies by the Company mentioned indicated that the market growth invariably centred in the larger sizes of the various product classes and in the more sophisticated equipment such as self-propelled machines.

Further trends in the United States which are being mirrored by developments in our country are the number of tractors in use in American agriculture. The number of tractors in use had been stable for many years and is now beginning to decrease but with the increase in the horsepower of machines it means that the total horsepower used in farming operations have increased and not declined.

The number of combines, pickers, balers and other harvesting equipment started declining some 10 years ago, as the productive farms had by this time acquired all the machines they required and were buying fewer larger machines

to replace more of the older machines which were being retired. Marginal farms, were disappearing making a further contribution to the drop in numbers.

Productivity per man hour however continues to accelerate with the increased use of larger machines.

In the 30 to 40 years since the prewar years productivity in United States Maize production has improved fifteenfold.

The most improvement took place during the 1950's and 60's when tractor unit sales peaked in the United States around 185,000 units per year, more than ten times the unit sales in South Africa.

The number of farms are decreasing, and the average acreage per farm is increasing; the average horsepower and average value per tractor is increasing and no tapering of these trends are foreseen for some while yet. In addition most farmers are farming more farms - dramatically increasing the utilization of the larger equipment.

TRENDS IN SOUTH AFRICA:

Similar trends in the horsepower of tractors sold are discernible in South Africa as reflected by the following industry figures:-

Power class	Unit sales					
	1966	%	1972	%	1975	%
- Kilowatt						
0 - 37,5	5373	41	3237	19	3455	18
38-60,0	7392	57	13031	77	12311	64
61 and Over	300*	2	738	4	3400	18
	13065	100	17006	100	19166	100

* Estimate.

We find that the number of farms and the utilization of land for cultivation purposes reflect a similar trend to that in evidence in the United States.

<u>Year:-</u>	<u>No. of farms:- (White areas only)</u>	<u>Area under cultivation (ha)</u>
1950	116 848	7 662 000
1965	95 438	10 028 000
1973	81 935	11 621 000*

* 1971 figures.

The increased acreage of the average farm favours the introduction of the bigger machines to maximise their productivity potential.

The areas planted to the major field crops produced in South Africa, Maize, and Wheat were as follows:-

	<u>Maize (ha).</u>	<u>Wheat (ha).</u>
1950	3 014 000	1 135 000
1965	4 241 000	1 360 000
1974	4 488 000	1 761 000 *

* The development of certain wheat varieties opened up areas with new potential in the Highveld region.

The improvement in the production of Maize can be seen in the following productivity figures:-

MAIZE:

	<u>Tons produced:</u>	<u>Tons per h.a.</u>
1950	2754000	0,91
1965	4393000	1,04
1974	10610000	2,36

INCREASED PRODUCTIVITY REQUIRES INCREASED MACHINE CAPACITY:

Improved seed varieties and improved field practices were the main reasons for this improvement but it also required more horsepower and bigger ploughs and more sophisticated planters and combines working at higher speeds to prepare and fertilize the soil for the seed and to gather the harvest. To increase yields and to counteract the vagaries of the South African seasons, deeper tillage has become common practice in the Highveld areas to trap and conserve the moisture in the soil. This calls for tough deep-penetrating implements handled by more powerful tractors.

Powerful combines with increased capacities to handle the increased yield per plant and the denser growth generated by increased fertilizer usage had to be developed. To ensure that these larger machines are not cumbersome to handle they are commonly equipped with hydraulic power-assisted functions which enables a trained operator to control such a large machine over uneven terrain and even hillsides with considerable precision and minimal physical

effort, while the machine must still perform its primary function of harvesting the crop, speedily with little or no wastage.

ENERGY CONSIDERATIONS:

The energy crisis has brought a new impetus to research. While since about 1960 more emphasis had been given to engine performance and convenience, manufacturers are now renewing their efforts to produce engines which will use fuel economically and more efficiently.

To ensure that the larger engines deliver the full power of which they are capable in the rarefield air of the Highveld area, they are increasingly being equipped with turbochargers and intercoolers to achieve this end.

WORKING ENVIRONMENT:

In order that the potential of these big tractors and other self propelled machines can be fully utilized by the operator, hour after hour, much thought has gone into improving the conditions under which operators have to work.

While there may be more arduous jobs than that of driving a tractor on a seat exposed to all kinds of weather as well as noise and dust, it is nevertheless too much to expect a highly skilled operator who has to remain alert and concentrate on what he is doing, to perform satisfactorily under such conditions for more than a few hours.

Attention has been given and is being given by more and more manufacturers to the construction of enclosed cabins which will protect the operator from the unpleasant factors mentioned above. By providing him with a comfortable posture seat, total protection against the weather and clean filtered air, he can maintain a faster working pace for longer hours during the day or night and in this manner fully utilize the productivity of his tireless machine.

These amenities which were at one time considered unnecessary luxuries have come to be looked upon by progressive farmers as essential elements in fostering higher productivity in their more skilled operators who have been trained to understand and to effectively use all the functions of the sophisticated agricultural machinery of to-day.

DEVELOPMENT OF IMPLEMENTS:

Every agricultural machine and implement has been the subject of intense study and development; some of them have become quite sophisticated and have been provided with considerable muscle in the shape of hydraulic servomechanisms. Some of these machines have become almost unrecognizable compared with the primitive implements from which they were developed, others like the plough are still readily recognizable as such despite some considerable development work on them as well. While the basic ploughing function has not changed much over the centuries, certain design changes in the plough construction and mouldboard contours have given the modern farmer a robust implement that can

work much wider, deeper and at a much faster speed than ever before and will readily turn the sods of most of the arable soils that may be encountered and that can stand up to the tremendous forces to which it is now being subjected.

EFFECTS ON LABOUR:

The increasing sophistication of machines such as the modern tractor, the combine, the cotton picker to name a few, requires an equal degree of sophistication in the training and education of the operator and the servicemen to best utilize the increased capabilities of the machine. Many farmers are notorious for leaving expensive agricultural machinery to the tender mercies of unskilled and untrained operators to whom they would never entrust their private cars costing probably half as much. We can confidently predict that this attitude will change and is, probably already changing faster than is generally realized. Developing and observing a maintenance schedule such as a regular check of oil and air filters can now pay bigger dividends than ever in fuel savings, reduced engine wear and fewer breakdowns, especially where machines are operated by unskilled help who may lack the training or inclination to follow recommended service procedures. Laxness in this respect can damage a machine which will cost considerably more to repair than it would have a few years ago when smaller machines were being operated.

Because/...PAGE: 12/....

Because of the productive capacity of the modern big machine, breakdowns can be the cause of considerable losses in income and the maintenance and pre-season checks carried out by skilled operators assume greater importance than ever.

The development of the larger more productive machines has reduced the requirement for labour in many farming functions particularly in harvesting operations while the increased sophistication of the machines has increased the requirement for trained and highly skilled operators.

The most dramatic example to illustrate the reduced demand for labour that can be caused by the adoption of modern harvesting machinery is the mechanical picking of cotton. Since the date of introduction of cotton cultivation in South Africa lack of labour has always been considered a limiting factor to increased production. Mechanical harvesting demands a much more intensive level of farming and many modifications in accepted growing and cultivating practices such as choice of cultivators, soil preparation, row widths and in the case of cotton harvesting the use of defoliants also become necessary in order to reduce the risk of contaminating the crop with leaf debris. In spite of these added costs, however, the saving in labour costs make cotton growing and mechanical harvesting a viable proposition especially as the yield per hectare is increased with improved production methods and cultivars.

In countries like the United States of America, Israel and Australia 100% of the cotton crops are mechanically picked and much progress has been made in South Africa in this respect in recent years.

The arrival of the modern powerful tractor and other selfpropelled machines on the scene enables the South African farmer to continue with his vital farming operations on an increased scale with a reduced labour requirement in an already curtailed and shrinking labour supply situation created by the drift of farm labour towards the Homelands where the farmer must compete with industries to obtain labour under contract to him.

This situation hardly favours the farmer who is now landed with the unskilled and illiterate dropouts who are less amenable to training as skilled operators and who, because of the six months terms of the usual contract, cannot gain the level of experience and skill that are required of them. In areas close to the Homelands, this situation is causing acute labour problems for the farmer and with the passing of time this situation will extend to areas further away from the Homelands.

The time is not far distant that many a farmer will become his own machine operator along with his regular help as has already happened on some farms in the Free State.

FUTURE TRENDS:

Mouldboard ploughing is one of the biggest powerconsuming

operations on the farm and with the pressure of increasing capital and energy costs as well as labour shortages, new tillage practices will arise.

The farmer will seek ways and means to reduce the number of trips over a field to produce and harvest a crop.

The mouldboard plough will be replaced by conservation tillage, minimum tillage, till-planting or slot-planting practices wherever soil conditions will permit and new, probably more, tillage tools or tools with more options and variations of existing or new implements will be needed to meet individual needs.

The leading farm implement manufacturer in the United States foresees that tractor horsepower will continue to increase and that in another fifteen years time tractors of 375 kilowatt may be not uncommon. The only question on size limitation is whether it will increase production and cut costs. Customers will continue to seek efficient levels of production compatible with their management capabilities and as the machine size will grow and efficiency will grow, so will the production limits per man grow.

The entire spectrum of noise reduction, fuel economy control of exhaust emissions and improved reliability is under scrutiny by engine designers as they attempt to develop more precise programming of fuel injection into the combustion chamber for optimum burning and minimum noise. Such programming or scheduling of the fuel

injected will hopefully produce more power per unit of fuel due to cleaner burning.

The operation of a tractor and the other selfpropelled agricultural machines in the field will remain a human task however comfortable the conditions may be made for the better trained operator.

CONCLUSION:

This survey can because of circumstances only be superficial and had to be restricted to only that sector of South Africa farming which produces the major field crops in the country and can for this reason not be regarded as representative of the total agricultural scene in the Republic.

The situation in the cane producing areas of Natal and Eastern Transvaal and the wheat and fruit producing areas of the Western Province had, for reasons of space and time, to be omitted from review in this paper although the basic principles and trends of this subject do apply to all agricultural crops wherever known.