

TRACTOR COSTS – LOOKING BACK AND INTO THE FUTURE

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Abstract

In the past-one-and a half decades machinery prices and operating costs, in particular those of agricultural tractors, have increased progressively. This has prompted the agricultural sector to reassess their tractor replacement programmes as well as mechanised farming practices in general. In this paper new tractor sales and buying trends over the past fifteen years are examined and discussed. Some of the main causes for the exponential rise in prices and tractor operating costs, which are beyond the control of either the tractor manufacturers or their dealers, are highlighted. An attempt is also made to predict future costs, as well as to indicate adaptations that both distributors and growers will have to make in an effort to keep tractor operating costs at acceptable levels.

Introduction

In the production of sugarcane, machinery costs are responsible for about 40% of the farmer's total costs. Traditionally the grower has made use of the standard agricultural tractor, both for land preparation and the transportation of his cane from the field to the transloading zone or directly to the mill. Over the past 15 years the purchase price and operating cost of tractors has risen by 800%, while price increases for his produce have lagged.

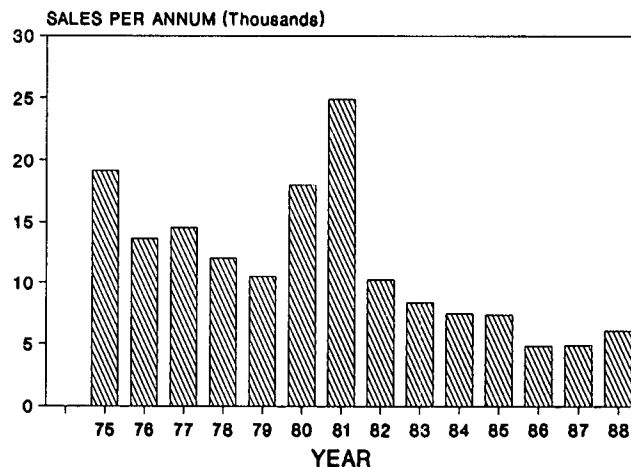
This problem is not confined to the sugar industry, nor to South Africa only, but has manifested itself world-wide, including many of the highly developed countries, which employ sophisticated production and marketing methods.

For the South African agricultural sector to remain competitive on world markets it will have to adjust to this phenomenon quickly. If the individual farming enterprise is to remain viable, new farming techniques will have to be developed, mechanisation planning, machine use and equipment maintenance improved, and the training and upgrading of tractor drivers addressed.

History

In the past 15 years the South African agricultural machinery industry has experienced dramatic changes. New tractor sales reached their highest levels in the early 1980s and plunged to alarmingly low levels during the mid-1980s, as shown in the annual sales statistics in Fig 1. Farmers have remained consistent in their choices of tractor size and configuration. The sales percentages in Table 1 show that 45-60 kW tractors are by far the most popular choice. However, during the lean years there was a minor shift towards the tractors of less than 30 kW which were fully imported models, escaping heavy import duties. Recent market trends in tractor size and configuration can be seen in Table 2. It is estimated that four-wheel-drive units now make up 40% of all sales in the sugar industry.

New tractor sales have shown a steady decline since 1975 with the exception of the boom years of 1980 and 1981, during which record sales in excess of 24 000 units were sold. This sharp increase could be ascribed to aggressive selling prior to the introduction of the Atlantis diesel engine



Source: Directorate Agricultural Mechanisation

FIGURE 1 Total tractor sales.

Table 1
Tractor categories – kW

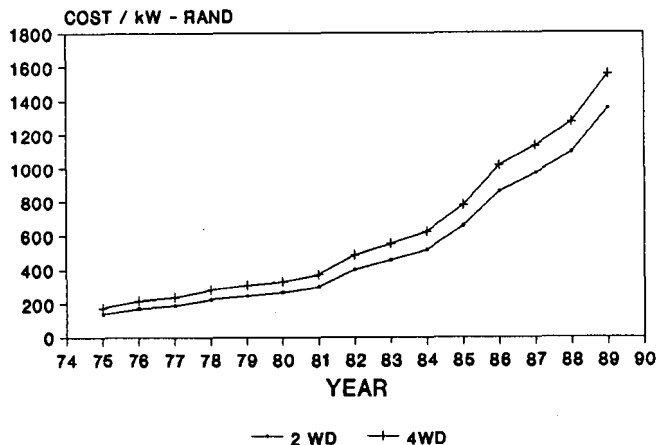
Year	Percentage sales by tractor category (kW)						Market %
	20-30	30-37,5	37,5-45	45-52,5	52,5-60	60-90	
1975	—	16,7	12,1	20,4	31,7	9,8	90,7
1976	—	15,3	13,5	14,9	34,2	11,8	89,7
1977	0,7	12,4	14,6	14,9	32,8	17,8	93,2
1978	1,0	10,8	12,8	15,3	36,1	17,5	93,5
1979	0,9	11,9	12,4	17,2	34,8	17,0	94,2
1980	0,4	9,4	11,2	18,9	35,0	19,1	94,0
1981	1,9	7,8	12,8	17,6	36,2	17,4	93,7
1982	7,5	7,5	11,7	13,9	31,6	20,4	92,6
1983	9,8	6,9	9,8	16,6	29,7	16,9	89,7
1984	10,3	8,1	9,7	20,0	24,4	16,3	88,8
1985	7,3	7,4	8,5	23,0	23,1	17,5	86,8
1986	4,7	7,6	7,9	22,3	27,7	17,8	88,0
1987	3,2	9,7	11,4	15,7	32,2	18,7	90,9
1988	2,5	8,3	10,7	17,3	32,8	18,3	89,9
Mean	4,2	10,0	11,4	17,7	31,6	16,9	91,8

Source: Directorate Agricultural Mechanisation

Table 2
Tractor market trends – 1987/88

Tractor class-kW	Total sales	% Share	% 4 WD
< 20	225	2,0	27,6
20-30	307	2,8	45,3
30-38	984	8,9	14,8
37-45	1 210	11,0	23,2
45-52	1 827	16,6	36,2
52-60	3 582	32,5	34,8
60-90	2 031	18,5	71,1
> 90	842	7,7	81,4
Total	11 008	100,0	—

Source: Directorate Agricultural Mechanisation

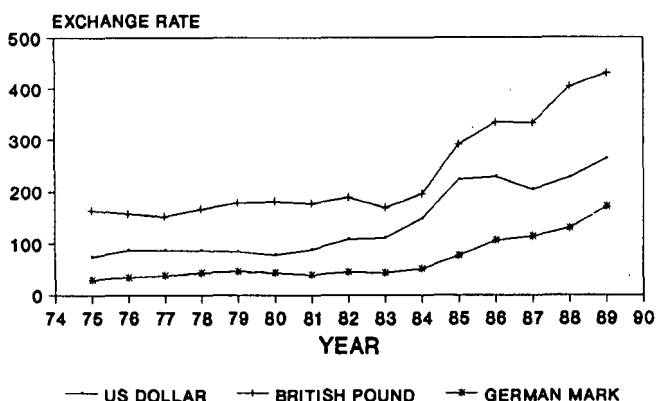


Source: Directorate Agricultural Economics, Trends/Agfacts.
FIGURE 2 Tractor prices.

(ADE) programme. There are however signs that total sales are returning to normality as a steady increase in sales has been recorded over the past two years.

There are many other factors which influenced the declining sale of tractors which include the effect of the "buying spree" at the beginning of the decade, the severe and prolonged droughts, and the floods experienced country-wide during the eighties. However, there are other factors that are beyond the control of either tractor manufacturers and dealers or the prospective consumer.

The purchase price of new tractors rose by more than 800% during the period 1975 to 1989. The average costs per kilowatt of two and four-wheel-drive tractors during this period are shown in Fig 2. This increase has had a marked influence on market trends. A major reason for this steady rise has been the decline in the value of the Rand compared with the currencies of the Republic's more important trading partners, as illustrated in Fig 3. Although the country's currency recovered marginally in 1987, its performance during the past three years is not promising.

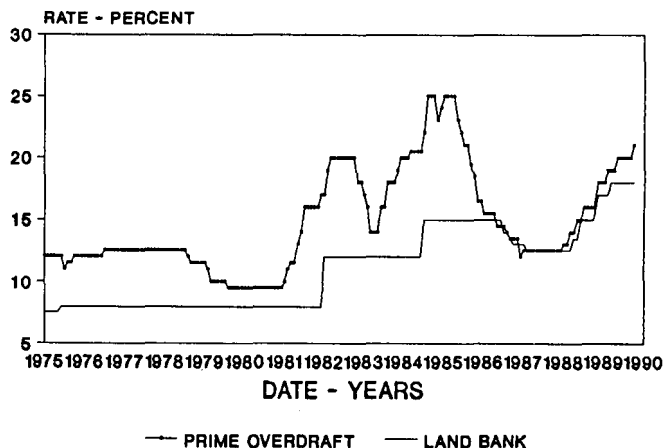


Source: Bureau Economic Research.
FIGURE 3 Foreign exchange rates (RSA cents per foreign currency).

Other factors which led to the high capital costs were the advent of the government financed ADE project (which increased tractor prices by approximately 20%), the introduction of general sales tax (which now stands at 13%) and the recent import surcharges imposed on tractors.

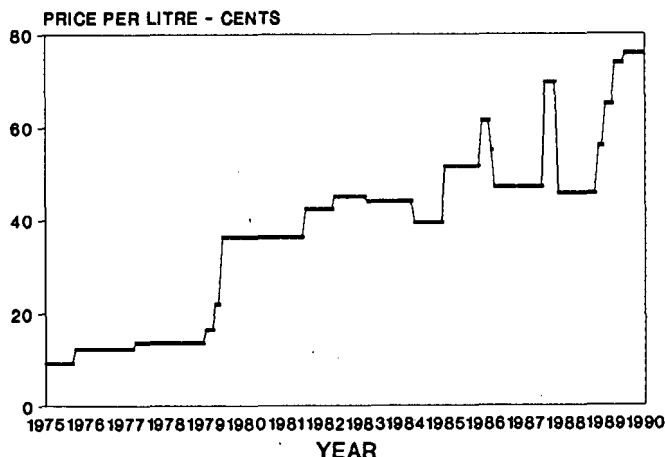
The high capital cost of imported agricultural machinery has meant that buying and operating costs have also risen dramatically over the review period. Bank prime overdraft

interest rates and Land Bank interest rates on capital investments, as shown in Fig 4, have fluctuated considerably during this period, and are marked by rapid changes as great as nine percentage points in a single year. It is interesting to note that Land Bank rates since 1987 are more realistically linked to commercial borrowing rates. The sharp increase in tractor prices and subsequent low sales volumes during the mid-1980s, are clearly linked to the decline in the value of our currency and the high interest rates experienced during this period.



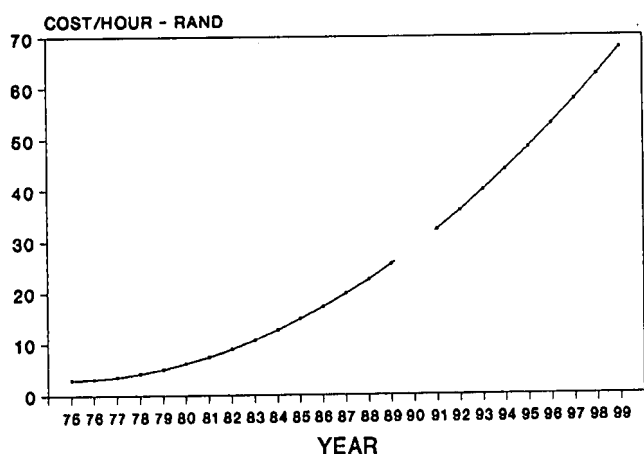
Source: Land Bank, First National Bank.
FIGURE 4 Capital borrowing rates.

Boycott action and the Republic's dependence on imported crude oil, coupled with the variable monetary exchange rate, has meant that diesel fuel prices have also fluctuated considerably. The price of fuel on its own, as illustrated in Fig 5, has played an important role in the sharp increase in tractor operating costs. The agricultural industry has not and may never recover from the 120% increase in 1979. The further increase in the cost of fuel during the past two years is also a cause for concern.



Source: BP Southern Africa (Pty) Ltd.
FIGURE 5 Diesel fuel price.

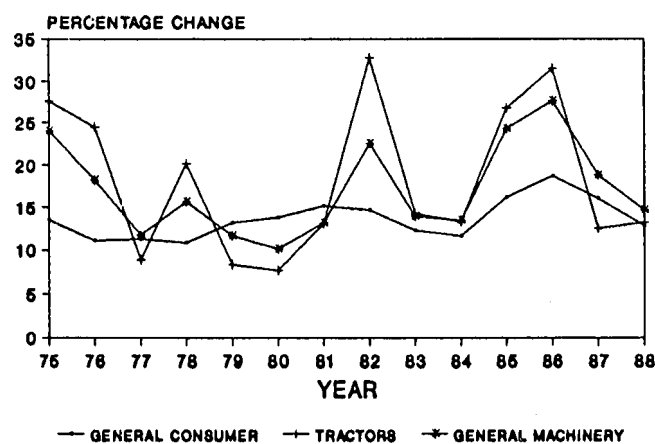
Other items that have had an effect on operating costs are increased insurance cover, tyre prices (up 300% since 1980), spares and labour costs for tractor maintenance. The effects of these increased costs can best be illustrated by comparing yearly fixed and variable hourly costs for a 57 kW two-wheel-drive tractor over the review period, as illustrated in Fig 6. The estimated hourly cost, assuming similar cost rises in the future, is also shown for the year 2 000.



Source: Directorate Agricultural Economics.

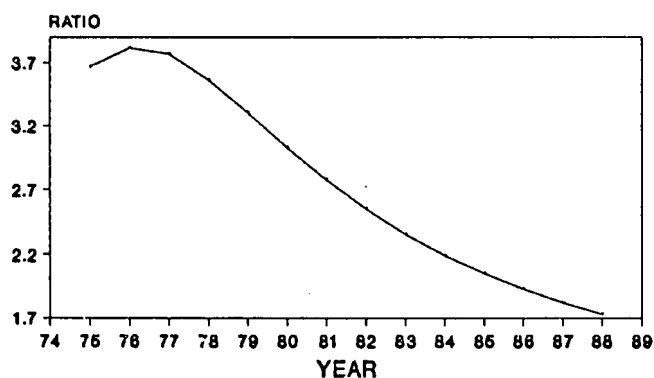
FIGURE 6 Tractor operating cost (57 kW tractor @ 1 000 hour/annum).

The annual inflation rates, comparing percentage changes in the general consumer rate with those of the agricultural sector, are given in Fig 7. From them it is clear that the farmer was at a distinct disadvantage between 1982 through 1987. This trend is also evident in the sugar industry. From the ratio of cane price to tractor operating costs (Fig 8) it can be seen that tractor operating costs increased at a faster rate than the cane price. However, trends over the past two seasons indicate that this ratio has improved.



Source: Central statistical service.

FIGURE 7 Annual inflation rates.



Source: Directorate Agricultural Economics, S.A.C.G.A. Annual Report.

FIGURE 8 Ratio-cane price/tractor operating cost.

The Future

Although the farmer may have little control over many of the inflationary factors already discussed, he can reduce

tractor and machinery costs in numerous ways, thereby maintaining acceptable profit margins.

Agricultural practices

Although accurate statistics are not readily available, numerous changes in the grower's purchasing trends have been observed with regard to the volume and class of agricultural tractors purchased in the sugar industry. Farming practices and methods of cultivation have altered considerably since the mid-1970s, in an effort to reduce mechanical operating costs. In the future many growers will have to adopt advanced scientific farming methods.

The gradual acceptance of reduced tillage and the introduction of the minimum tillage concept have significantly altered the size and class of agricultural tractors that have been purchased. The effectiveness of shallow ploughing (Dicks *et al*⁵) for eradicating poor yielding ratoons in heavy soils, and the successful eradication of sugarcane by chemical means (Iggo⁶) as well as the planting of the new crop in the old interrows (Iggo and Moberly⁷), have contributed to the reduced demand for the large four-wheel-drive tractors that were a common sight on many estates with steeper slopes in the industry's coastal belt.

A relatively new approach in the fight against rising tractor costs is the concept of chemical mowing. The average farming unit or estate spends a considerable number of tractor hours per annum on maintaining grassed verges and water bearing structures. Chemical mowing could undoubtedly reduce annual tractor operating hours and have a significant effect on tractor replacement intervals in the industry.

Mechanisation planning

Either manual or computerised programmes, that select the machinery complement capable of completing the given schedule of operations at the correct time, and the least cost (Murray,¹¹ Murray and de Beer¹²) are used for this exercise. Regular, timely and preventive tractor and equipment servicing plays an extremely important role, not only in keeping operating costs at acceptable levels, but also enabling the farmer to operate with the least number of units (Statham¹⁶ and Braithwaite³).

The widespread use of computers in normal farming is not far away. Computers allow the farmer either to develop his own programme or to use proven programmes. These programmes include factors such as cash flows and replacement cycles (Smithers,¹⁵ Ottermann¹³). Information is then readily available when required.

Another important feature of sugarcane cultivation is the production of a Land Use Plan (LUP) for a particular farm. The plan covers crop management and protection practices as well as machine operating efficiencies. In order to obtain optimum efficiency for all mechanised operations, field machine indexes together with extraction routes and transloading zones are assessed and recommendations for improvements made. These would be done to suit local conditions (Platford and Nel¹⁴).

The under-use of tractors in terms of both potential engine power and annual operating hours has become an increasingly costly practice. The importance of the correct selection and matching of farm machinery (Braithwaite¹), setting of implements, proper usage of the modern tractor's internal hydraulic system and the optimum use of available tractor engine power are too often underrated by farmers.

Tests carried out by the Department of Agricultural Engineering, University of Natal, indicate that tractors are generally poorly used and there are considerable variations in field performance between tractor operators. The development of the gear selection aid (Lyne *et al*⁸) to assist the tractor operator in selecting the appropriate engine speed and gear ratio, is helping to maximise the performance of tractor-implement combinations without overstressing the engine. In field trials results from this project have shown that significant improvements in both work rates and fuel consumption can be obtained.

Increased annual use reduces the hourly operating cost of equipment. The reasons for this are that total fixed costs per hour decrease rapidly as annual use increases, while variable or operating costs vary directly with use (Booyesen and de Beer⁴). The under-use of available engine power for a common haulage operation in the sugar industry was noted by Lyne *et al*⁹). Murray and de Beer¹² illustrated how the cost per kilowatt hour increased by 50% when operating at 30% of maximum power, compared with operating at 50% of maximum available engine power.

Although the average individual tractor's annual use in the sugar industry is estimated to be relatively high when compared with other farming enterprises such as the maize industry, which has distinct, relatively short peak demand periods, there is still room for improvement.

Tractor costing methods and replacement policies

Costing of agricultural equipment is generally difficult because predictions are based on present values and standards. The rapid fluctuations in interest rates and fuel price exacerbate the problem.

Techniques of estimating hourly operating costs, including the effect of taxation, and the determination of the optimum replacement cycle for agricultural equipment and tractors, need to be reviewed and updated continually. Examples of such work have been described by Venter,¹⁷ Murray¹⁰ and Braithwaite.²

How can manufacturers and dealers assist the farmer?

In the past decade the agricultural machinery industry in South Africa has experienced many changes. Numerous companies have rationalised their products, amalgamated, been taken over or withdrawn their interests from South Africa: while some new products have entered the market. Since the 1970s locally designed and produced tractors have proved popular for certain farming and commercial applications.

Although tractor prices have risen in real terms many improvements to the standard agricultural tractor have appeared over the years. Many of these have resulted in improved machine reliability and lower operating costs. These include improved driver comfort, extended hydraulic functions and greater oil flows and pressures, wet braking systems, synchronised, multi-gear and high speed transmissions, as well as front axle suspension. Some of these features have applications in cane haulage in the sugar industry. In the long term, the introduction of the ADE engine for the popular range of tractors should result in the reduction of tractor costs for the farmer.

It is felt, however, that manufacturers should investigate the possibility of introducing a relatively unsophisticated rugged tractor in the small to medium class range. These units, while complying with the road ordinance as presently interpreted, should be equipped with only simple yet reliable instrumentation and limited hydraulic functions. All farm-

ing enterprises, especially those in developing areas, require at least one such unit to perform basic tasks such as slashing and general haulage.

Dealers and their sales staff have an important role to play in the fight against rising costs. They will be increasingly asked to advise and guide the farming community. Their credibility will depend on their ability to understand the farmer's problems and to assess his particular requirements correctly. All dealers and their staffs should be encouraged to join study groups or institutions such as "The South African Society for Agricultural Mechanisation", where a wide range of trade and farming topics are dealt with by experts.

However, together with research institutions and relevant agricultural bodies, manufacturers should be congratulated, and encouraged to continue their support for research and development into new farming practices, improvement in tractor and equipment design and alternative fuel projects, some of which may culminate in reduced production costs.

Conclusions

It is often asked: will the tractor market again reach the levels of the early eighties? The agricultural sector is normally slow to recover; and in view of the recent severe droughts and floods, and the present poor economic climate with its high inflation rate and stringent credit facilities, it is predicted that recovery will be even slower. It appears therefore that the short term outlook is unfavourable. However, it is generally predicted that the demand for new tractors will gradually increase, and that in the mid-1990s total sales in the country will again reach 10 000 units per annum.

The South African farmer will have to improve his overall mechanised farming efficiency if a fair margin of profitability is to be maintained. The only way that this can be achieved is by detailed planning and recording of the entire farming enterprise so that capital invested in mechanised equipment may be used effectively and efficiently to reduce cost proportionately.

The farmer, and tractor and equipment manufacturer, may both be facing an extended period of economic stress, and will therefore need mutual support to survive. The following decade may therefore bring a significantly different approach to mechanised farming practices, with new technological advances being stimulated and implemented, resulting in the business of farming becoming even more challenging and interesting, and one hopes sweeter.

Acknowledgements

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