

Agricultural Tractor Ownership and Off-season Utilisation in the Kgatleng District of Botswana

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Abstract

In recent years tractor power usage has increased among smallholder farmers in Botswana. This is mainly due to the influence of available government loans, subsidies and grants on draft power financing. A study on tractor owners and tractors was conducted in the Kgatleng Agricultural District. Questionnaires asked owners about the tractor's usage, serviceability, operation and maintenance costs. It was found that 37% of the tractor owners were illiterate, 42% had primary education and 21% had secondary education. Forty-two percent were over 60 years old and 41% were between 41 and 60 years. Mainly their owners and sons operated the tractors. The tractors, largely Massey-Ferguson make, were used mainly for ploughing. The average ploughing done by each tractor was 106.7 ha/year, and they were parked most of the time during off-season. More than half of the tractors were over 15 years old, and they were poorly serviced and maintained. Service records for tractors were non-existent and their current owners overhauled 68% of the tractors. Tractors experienced frequent problems with hydraulics, power loss, engine oil

leakage, front wheel bearings and the electric system. Tractor owners were reluctant to use their tractors for non-ploughing activities. They used them sparingly during off-season in order not to risk damage. Regarding farming as a business, farmers could engage their tractors in all year activities, such as threshing, forage baling, operating mills, water pumping and transportation. These show potential for making ownership cost effective, but it is advisable to do a cost analysis of farm operations for farmers to realise the profit.

Introduction

Botswana's agriculture has been dominated by animal draft power for many years. The introduction of animal draft power into smallholder farming systems dates back to a century ago (Baker, 1988). Animal draft power is well established and is the common form of power used by traditional farmers (Panin *et al.*, 1995). The animals used include oxen, donkeys, horses and mules. They are used during most of the primary and secondary tillage operations. The animals are also a source of meat, milk, transporta-

tion, and a trade resource. They are also prominent in a lot of social ceremonies.

However, in recent years, tractor power has emerged to rival the use of animals for draft. In the early 1970s only four percent of the total smallholder farming households used a tractor for ploughing and this figure rose dramatically to 17% and 39%, respectively, by 1980 and 1987 (Poulsen and Purcell, 1989). It is possible that in some parts of Botswana the figure could even be more than 80%.

The use of tractor draft power has increased among smallholder farmers, in spite of the on-going debate on the sustainability and profitability of mechanising smallholder crop production systems (Litschaner and Kelly, 1981). Several factors though could be responsible for the increase; the primary reason could be the influence of government loans, subsidies and grants on draft power financing. Farmers were able to get financial assistance through schemes such as Arable Land Development Program (ALDEP) and low-interest loans through National Development Bank (NDB). Periodic occurrence of droughts often led to such

loans being either written-off or interest waived. High purchase prices for cattle offered by Botswana Meat Commission (BMC), structural transformation in the Botswana economy, increased earnings through non-formal income such as remittances, and various other favourable agricultural mechanisation policies also made it easier for farmers to acquire tractors (Panin *et al.*, 1995).

The Kgatleng agricultural district is one of the districts where the use of tractor draft power is predominant. During the 1998/99 cropping season, 183 tractors were registered with the Ministry of Agriculture for ploughing. Registration was done so that tractor owners could benefit through the Ministry's Accelerated Rain-fed Arable Program (ARAP) which paid out cash incentives to farmers (or hired services) for ploughing and tendering their own fields. The profitability of tractor use therefore was linked to the amount of utilisation during ploughing operations. But ploughing operations take place during the months of October to February, which is only a small fraction of the whole year. Off-season use of tractors in the district has not been studied before and so the associated costs and profit can not be determined. In some parts of Botswana tractor usage has been found to be as low as 200 hours per year (Tape-la and Nlisi, 1997), instead of the optimal 1000 hours per year (Lonnemark, 1967). Given the absence of previous studies on tractor use in the district and the low levels of tractor usage in other parts of the country, it was found necessary to carry out a study with the following objectives:

- 1) To determine the average hours of tractor usage per year in the Kgatleng agricultural district;
- 2) To identify activities other than ploughing and the proportions of tractor usage in the Kgatleng agricultural district; and

- 3) To determine the cost of owning and operating a tractor in the Kgatleng agricultural district.

Survey Method

A questionnaire was prepared to ask farmers who owned and operated tractors about the tractor's use, serviceability, and operation and maintenance costs. Other information asked was personal information that could help the researchers understand the ability of the farmer to effectively operate the tractor and keep records. A random (pathfinder) survey was carried out to administer the questionnaire to tractor farmers during the 1997-1998 ploughing season. In total, 19 farmers were interviewed, translating to about 10 % of the total registered fleet of tractors for the agricultural district. The farmers interviewed were the owners who knew or had information on the performance of their tractors. During the interview, the researchers also made physical assessment of the tractors and noted their condition. In cases where a farmer owned more than one tractor, each tractor was treated as a separate unit and information about its use was collected independently.

Results and Discussion

A total of 19 farmers were interviewed in the study, making 10% of

the registered tractors in the district. The respondents in the study were the owners except in one case where the respondent was the owner's son. Therefore, each respondent had first-hand information about the use, operation and record keeping of the tractor. In all cases, the owners were married and were full-time farmers. In cases where wives were respondents, they demonstrated comparable knowledge about the tractor as their male counterparts.

The information was important to know since it reflected the ability of the farmer to comprehend the operator's manuals and other written instructions as well as record keeping abilities. It was not surprising that majority of them had no education at all, or have been educated only up to primary school level. This observation was made because 42% were an older generation with over 60 years old, 41% were between 41 and 60 years old and the rest were younger. Lack of education may have been the reason why only 58% of the operators were licensed and the rest not. Despite the education level, the farmers showed reasonable knowledge about tractor operation systems and adjustments; knowledge possibly acquired through experience and interaction with peers.

The age distribution of farmers indicated a similar range observed by Baryeh (1982) among West African countries. Investiga-

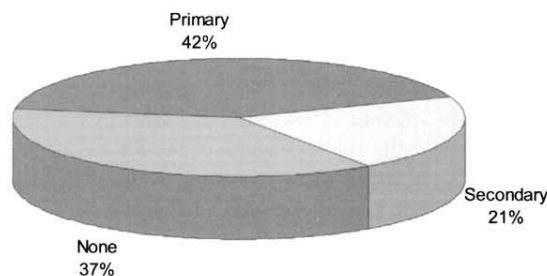


Fig. 1 Education levels of the farmers in the Kgatleng District.

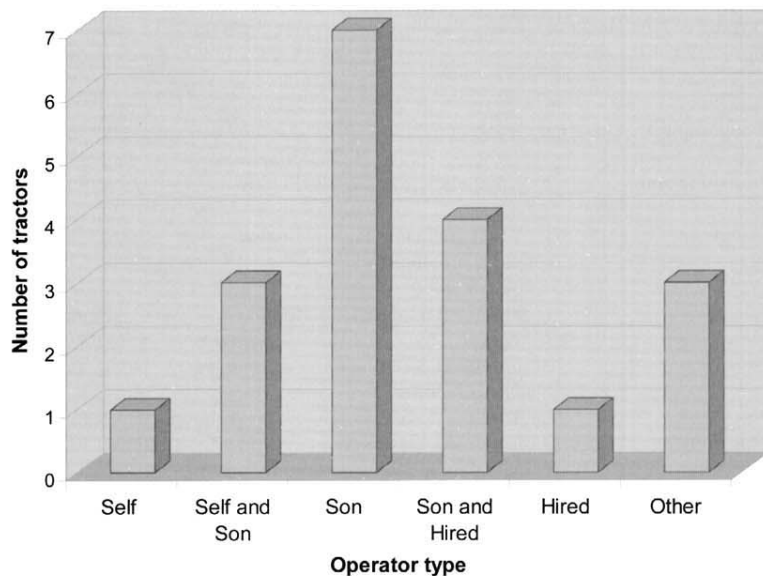


Fig. 2 Operator description for tractors in the Kgatleng District.

tions on why young people tended to stay away from farming may be necessary to undertake. Their apparent disinterest in farming may lead to abandoned fields in the future or even result in the more expensive mechanised farming.

It was evident that in most cases the owner's sons were the primary operators of the tractors. They were the sole operators or at least worked alternately with their fathers or hired labour. The reasons for this arrangement may be that the sons are younger and so tended to be fit to withstand the demands of ploughing. They may also be more conversant and comfortable with modern technology than their fathers. Hired labour tended to be expensive and so to cut down on costs, it was better to use unpaid family labour. In fact, most of the families visited had over seven children and thus had a lot of labour reserve. Customarily, children especially sons, are expected to help with farming activities. The other operators used were a nephew, brother to the owner as well as a brother-in-law. This practice has a downside when the operators are not knowledgeable of the proper

settings and adjustments.

The Kgatleng district is within 50 km from the capital city, Gaborone, where there is a Massey-Ferguson dealer. This fact accounted for the high number of the Massey Ferguson tractors encountered during the survey (Table 1). Another Massey Ferguson dealer was in Pilane, within the district. Farmers normally buy models which they are certain to easily find spare parts. Other tractor makes were available from neighbouring South Africa, requiring a long process with the Customs Department to import them.

The tractors were generally over 15 years old and were bought second hand. The conditions of the tractors varied widely. The authors could not establish how much of the damage on the tractors was acquired from the previous owner(s). The service records were not available. But it could be deduced that the tractors were bought in poor condition as 68% had to be overhauled by the current owner. Even with overhauling, some tractors experienced frequent problems with hydraulics, power loss, engine oil leakage, front wheel bearings and

the electrical system. The farmers could only mention these problems from memory and had no record of how frequent they occurred and the cost to fix them. That being the case, it was impossible to accurately perform any cost analysis for the tractors. Only theoretical values and experience from other districts and countries may offer a simple and easy way of gaining information on costs and how they are influenced by different factors (Lonnemark, 1967). The farmers relied on local mechanics, dealers and auto garages in Gaborone for repairs and servicing.

As previously stated, the tractors were pre-owned and 10.5% were bought between 1970-1975; 10.5% between 1976-1980; 42%, between 1981-1985; and 21% between 1991-1995. One farmer was not sure of the year of purchase. The period when most tractors were bought, that is between 1980 and 1995, coincided with when the ARAP program was operational. Since ARAP paid cash incentives for ploughing, it was not surprising that most farmers said their primary use of the tractors was for ploughing. The Government paid farmers up to P120.00 (US\$24.00)/ha for ploughing. They ploughed their own fields and thereafter hired out the tractors to other farmers. Despite their own ploughing and hiring-out, the total area done remained very low (Table 1). On average, the tractors ploughed only 106.7 ha per year. Taking an average operation speed of 4km/hr and a plough width of 1.8m, this comes to 148 hrs per year. A number of factors could have resulted in the low hectares, the main factor being the down-time of the tractors. It took some time for the tractors to get fixed once they were unserviceable. Correct parts were also expensive and not easily available. Sometimes the mechanics used were not qualified and not reliable. Also the fields were relatively

Table 1. Information about Tractor Type, Uses and Service

Tractor Model	Year of manufacture	Year of purchase	Engine Overhauling?	Purpose of buying	Hectares per year	Other activities	Frequent problems	Location of service provider
MF 135	1970s	1993	No	Ploughing	25	None	Bearings	Local / Gaborone
MF 178	NA	1989	Yes	Ploughing	165	None	Air lock and punctures	Dealer in Gaborone
Ford 5000	1986	1994	Yes	Ploughing and hire	162	Kraal manure and water	Engine	Dealer in Pilane
MF 178	NA	1994	Yes	Ploughing	63	Water, animal feed, threshing, livestock transport	Engine	Self
MF 135	1976	1981	Yes	Ploughing	14	Firewood transport	Engine	Gaborone
Landini 6000	1971	1985	Yes	Ploughing	84	Water	Wrong parts	South Africa
MF/ Landini engine	1971	1985	Yes	Ploughing	70	Firewood, water, funeral transport	Air lock, oil leaks	Dealer in Gaborone
MF 165	1977	1983	No	Ploughing	75	Transport produce	Poor operation	Gaborone
MF 240	1978	1979	NA	Ploughing	120	Firewood, diesel for water engine	Hydraulics	South Africa
Landini / MF engine	1980	1991	Yes	Ploughing	30	Transport people	None	South Africa
Deere 1120	1972	1972	Yes	Ploughing	140	Firewood	Bearings	Local
MF 135	1974	1984	Yes	Ploughing and hire	160	None	Engine	Gaborone
MF 135	NA	NA	NA	Ploughing	160	Firewood	Starting and loss of power	Gaborone
MF 135	NA	1978	Yes	Ploughing, livestock transport	45	Sand, livestock transport	Bearings	Gaborone
MF 135	1974	1974	Yes	Ploughing	40	Water and sand	Engine and oil leaks	Dealers in Gaborone and Pilane
MF 285	1978	1982	Yes	ploughing	175	Firewood, water, funeral transport	None	South Africa
MF 185	1972	1985	Yes	ploughing, planting and hire	320	None	Tyres	Gaborone
MF 265	1980	1983	No	ploughing	100	Farm duties	Lights	Dealer in Gaborone
MF 265	1983	1983	No	ploughing	80	None	None	Local

small, about 5 ha each. So, it took some moving about from field to field in order to plough a sizeable total area. Low rainfall and a short rainy season would also contribute to the low hectares. It should be noted that the figures given were from the past season (1996-1997). Long-term averages could not be determined as farmers did not keep any written records.

Besides ploughing, planting and other on-field activities, tractor owners were generally reluctant to use them for anything else. Thus the tractor lay idle for most part of the off-season period. The reluctance stems from the fact that the farmers did not want to risk damaging the tractor and not having an operational machine at the beginning of the next season. Only occa-

sionally did they use the tractors for transporting firewood, water, livestock and other farm produce, sand for building, and people during funerals (Table 1). In one case a farmer used his tractor for threshing sorghum. By using the tractor for stationary jobs such as threshing or water pumping the number of working hours per year can be increased and the average cost per hour reduced. Lonnemark (1967) notes that the cost are high up to 500 hours' annual use, but reduce very rapidly up to 1000 hours. It is important, therefore, to try to ensure that tractors are used for about 1000 hours annually.

Farming for most Batswana farmers is a lifestyle and not necessarily a business. As a result, the activities done were solely to sustain

their lives. But if farming were to be taken as a business, then the farmers would appreciate the need to keep proper records and engage in income generating projects. From the listed activities above, it appears there was potential for engaging the tractor all year round and make ownership cost effective. A well maintained tractor that is hired-out will be able to bring income to help pay for the loan acquired to buy it. At present, the farmers use non-arable income or sold cattle to buy the tractors.

On the other hand, the authors acknowledge that the tractor is just a power source and works attached to implements. Therefore, engaging the tractor in other activities takes more than just the decision to do so. It requires acquiring the necessary

implements such as threshers, balers, trailers and hammer mills. But if farmers were motivated to get into agro-business, they could build upon what they already have and get more implements to vary their activities.

Pre-owned machines though relatively affordable pose a problem of assessing their useful life and worth. It is a challenge to try and do a cost analysis of a tractor that has been reduced to salvage value by the previous owner. Depreciation rate is difficult to determine. Lon-nemark (1967) recommends that when the tractor is used for a short time per year, depreciation should be considered as a fixed cost and calculated from the amount to be written off, which is the price of the machine, or the investment needed for its acquirement. We suggest that a thorough study be done into cost analysis of pre-owned farm tractors. The available methods mostly deal with new machinery and where records are properly kept. As noted by Chen and Bateman (1988), there is no prevailing standard among the several alternatives. The lack of consistency lead to budget differences that may not be due to technology or productive capability. Other methods such as one by Ward (1990) are complicated and only understandable by scholars and researchers. This factor together with the absence of written records by the farmers made it impossible for the authors to determine the cost of owning and operating a tractor in the Kgatleng agriculture district.

Conclusion

The study surveyed tractor use and maintenance as well as characteristics of tractor owners. The use of tractors by farmers in the Kgatleng district has grown over the years. Research aimed at optimal use of the tractors should also be stepped

up. Presently, farmers have no means of knowing if it is cost effective to own and operate a tractor or not. Farm accounts are mixed up with other family activities such that it is impossible to know the contribution of each entity. They need to be trained to keep proper and simple records that can be used in tractor management decisions. If tractor ownership by individual farmers prove not to be cost effective, machinery circles by a group of farmers may be tried. However, since this would be a new venture, the farmers will need assistance from government agricultural extension workers.

It has also been found that tractors are old and not well maintained. They are not fully utilised especially during off-season. It could be profitable for farmers to use their tractors for off-season activities such as threshing, transportation, water pumping, and hay baling for a fee. Tractor owners were found to be mostly over 60 years old. Most of them had no formal education or had only primary education. Mainly the owners and sons operated the tractors.

It is imperative that the appropriate tractor is selected to suit particular farm size and operational requirements. But that option is not necessarily available for Kgatleng farmers. They often buy whatever tractor is available and affordable at the time. To address this problem, one way would be to establish a national farm machinery/equipment evaluation and testing centre that can help with documenting tractor condition at the time of purchase. The centre would evaluate and run tests on tractors at farmer's request and give its report for farmers to make informed decisions

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