The Costs of Using Draft Animals for Sustainable Agricultural Production in Tanzania

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Abstract

This study was carried out to determine the annual costs of owning and using a pair of draft animals (oxen) for agricultural production in areas with and with little tradition in cattle keeping. Shinyanga region represented an area with tradition in cattle keeping, whereas Morogoro region represented an area with little tradition in cattle keeping as it borders with tsetse fly infested area. In each region a total of 40 households were selected for the study, then the annual average method was used to calculate the annual costs.

The findings show that the annual costs of ownership vary from place to place. The area with tradition in cattle keeping has advantage of low cost by 39% less as compared to area with little tradition. It was concluded that animal traction technology is more suitable both socially and economically viable for farmers with tradition in animal keeping. Other technologies such as the use of single axle tractors should be thought for agricultural production in areas without tradition in animal keeping.

Keywords: Draft animal, Oxen, Costs, Mechanization, Tanzania

Introduction

Agricultural mechanization is recognized around the world as decisive factor influencing farm productivity directly and/or indirectly. Mechanization facilitates structural changes in agriculture. For example, it may augment the land available by permitting land that is difficult to prepare, to be brought into production, or by permitting multiple cropping. In addition, it may permit idle land to be brought into production in situations where land is plentiful but its use is constrained by limited means to cultivate it. In

Tanzania effort to promote mechanization with animal draft power from the dominating human power started more than 70 years ago (Kwiligwa *et al.*, 1992).

Animal power is used virtually in every environment and on every continent in the world. However there are few countries within the developing countries with long tradition of using animal draft power. These include Ethiopia, India, Indonesia, Nepal, North Africa and most of Latin America (Starkey, 1992). In this areas large numbers of draft animals including oxen, cows, bulls, donkeys, mules, horses, buffaloes and camel have been used for soil land cultivation. Tanzania also has a large livestock population. However the use of draft animal power is still confined to few areas in the country. Recent estimates put the draft animal

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power usage at less than 20% of annually cultivated land (URT, 2002).

The draft animals in most places are shackled in pairs using withers yokes and mostly two or thee people are used to control a team of two oxen. Mgaya *et al.* (1992) revealed that oxen in Tanzania usually start working when they are about three years of age depending on the adequacy of feeds. Animal reared under poor conditions start working when they are more than 5 years of age.

Pearson and Smith (1992) reported that the management of draft animals in most places is greatly influenced by the importance of the animals placed in a farming system. This is influenced by the fact that animals are used along side with other sources of power, namely manual and mechanical. There are many factors that might influence the relative proportion use of these power sources in any particular area. Taking an example of an area with high population pressure, in expanding area under-cultivation the use of animal power becomes less available because of lack of area for grazing. Farmers in these areas use to greater extent manual labour than animal power. Tembo (1989) stated that shortage of animal power in the communal lands in Zimbabwe is a major constraint to increase sustainable productivity of these areas. A shortage of animal power is often made worse by drought and diseases out breaks. that reduce the population of animals, including those used for draft.

Other important factor connected to the use of animal draft is the costs incurred in the processes of owning and using them. This dictates the profitability of the enterprise and the ability to switch between power sources. Literature search has revealed no study has been conducted to determine the cost of owning and using draft animals in Tanzania. However blanket statements have been frequently issued regarding the cheapness of the technology especially when compared to the use of tractor technology. There is need to develop hard data on the cost of using draft animals. The aim of the study was therefore to determine the cost of using draft animal power in traditional and non-tradition cattle keeping areas.

Materials and Methods

Data on draft animals were collected in Shinyanga and Morogoro regions. Shinyanga region represented the areas with farmers having the tradition in cattle keeping. Morogoro region represented an area with no or little tradition in cattle keeping as it borders with tsetse-fly infested area. However nowadays the government and non-government organizations in Morogoro region promote the technology to assist farmers in alleviating the shortage of farm power. In Shinyanga data were collected in Kahama and Bukombe districts, whereas in Morogoro, data were obtained in Kilosa district.

The Participatory Rural Appraisal (PRA) and structured questionnaires were the tools used

in collecting the information. The questionnaires were mainly based on a wide range of farm, off farm and family activities carried out by the interviewed farmers in the selected households. The key informants in all villages visited were the family members owning oxen as draft animals. This is because oxen were the common animals used for agricultural production activities. In each region a total of 40 households were selected.

The costs were calculated using the average annual cost equation. The major cost components in the equation were the purchase price of oxen, interest and insurance costs. Other cost components were the labour, tax, shelter, health and compensation costs.

The cost of feeds was not considered in the equation because during data collection majority of the households indicated that they were not supplementing their oxen with other feeds apart from practicing free range grazing. The few households that carried-out supplementation reported to use crop residues and other by-products from their farms, which they obtain at no cost. In that case the feed cost was taken care by the labour cost.

Also in the equation oxen were assumed to start working with an average live weight of about 200 kg as found out by Mgaya et al. (1992). The useful working period of oxen was considered to be 6 years (Bell and Kemp, 1986; Hatibu and Simalenga, 1991; Panin, 1986). By the end of this time the draft animal is expected to attain about 340 kg (Corbel, 1986). The purchase price of the draft animals was considered to be 10% more than the purchase price of a non-working ox listed by farmers during the survey period. The price increase takes care of the cost incurred by the farmers during the training period, which is about one month.

The labour charge was assumed to be paid only during the working season, equivalent to three working months. During this time three labourers are hired to control one pair of oxen (Panin and Jones, 1992). During off-season the labour cost was assumed to be zero because the draft animals are taken care by the family labour, which was regarded to be free in this study.

Similarly it was assumed that farmers intended to own and use oxen for agricultural activities have equal access to financial institutions operating in the country. That means the purchase of draft animals was considered to be financed by bank loan. An interest rate of 22% is charged on the loan given to the farmers (BOT, 2000). The loan repayment is spread over the economical life of the draft animals.

Results and Discussion

The summary of results of the costs obtained from the field survey is presented in Table 1. The results show that the purchase price of a non-trained ox in Shinyanga region is significantly lower than that in Morogoro region ($P < 0.001$). This is because as mentioned before Shinyanga region has a tradition in animal keeping while Morogoro

region does not have. The tradition of keeping cattle in Shinyanga results into high population of cattle. In that case the supply of oxen to the local markets in Shinyanga is high, thereby resulting to lower price than in their counterpart Morogoro region. The local government in both areas sets the annual tax rates per cattle. The levies set per cattle per year in the two areas were Tshs. 500 in Shinyanga region and Tshs. 400 in Morogoro region.

It is common trend for farmers in Shinyanga and Morogoro regions to vaccinate their cattle against different diseases that erupt in their area. *Black quarter, Foot and Mouth, Foot rot, Rinderpest, pleuropneumonia* and *East Coast Fever* were cited as major diseases in both areas. The average annual vaccination cost per draft animal in Shinyanga region was apparently higher than in Morogoro.

Dipping is another measure taken by farmers to protect the draft animals and other animals against diseases caused by protozoa, transmitted by ticks (*anaplasmosis, babesiosis* and *theileriosis*) and other external parasites. Farmers in both areas pay Tshs. 100 to the local government for dipping each animal. Nevertheless, the mean total annual dipping cost per draft animal incurred by farmers in Shinyanga region was found to be higher than in Morogoro region. The reason for the difference could be partially explained by the fact that in Shinyanga, most of the farmers keep large number of cattle because they regard cattle as their wealth (banks). Therefore in order to protect the cattle from unnecessary loss caused by tick borne diseases they take their animals frequently for dipping to keep them clean and health. In Morogoro region farmers do no consider cattle as their bank thus the level of care of the animals is not so high as reflected in less dipping frequency.

The treatment costs of draft animals are the costs that farmers incur to cure sick animals. It includes diagnostic charges and the cost of buying drugs. The result shows that farmers in Morogoro region have higher cost in treatment of ox than in Shinyanga region. This is perhaps due to the problem of the *trypanosomiasis* disease caused by tsetse fly in Morogoro region.

Table 1. Costs (Tshs) of Ox in Shinyanga and Morogoro regions

Parameter	Shinyanga	Morogoro	t-value
Average purchasing price of ox	75,340 (36%)	166,470 (36%)	6.6***
Annual tax per ox	500	400	-
Mean annual vaccination cost per ox	5,019 (54%)	3,633 (24%)	1.93
Mean annual dipping cost per ox	9,519 (46%)	5,547 (26%)	3.42***
Mean annual treatment costs per ox	10,981 (40%)	11,067 (58%)	- 0.05
Average annual housing cost per ox	1,300	3,850	-
Other costs per year	< 1,400	< 1,400	-

Note: Values in brackets are coefficients of variation
*** Significant at 99% confidence interval
- Not applicable
- 1 US$ = Tshs. 700.00

Other important cost component of the draft animals is the housing costs. The housing costs in Morogoro are relative higher than in Shinyanga region. This could be explained by the fact that Shinyanga region farmers accommodate many cattle in one housing than in Morogoro. In Morogoro region most of farmers keep a small number of cattle in a house, majority of farmers in Morogoro keep a pair of draft oxen. As a result, when the housing cost is distributed to the number of cattle accommodated in a house, the result is low housing costs per animal in Shinyanga region.

The result of the total costs of owning and using a pair of oxen in a year is shown in Table 2. The overall minimum total annual cost of using a pair of oxen in Shinyanga region is Tshs 129,624 and in Morogoro region is found to be Tshs 180,330. The difference in costs is much influenced by the difference in the initial purchase cost of the animal and the medication cost. Considering this finding it can be concluded that the cost of using draft animals in Tanzania varies from one area to another. The area with tradition in cattle keeping have advantage of low annual cost of owning and using draft animal as compared with areas of little or no tradition in cattle keeping.

In areas without tradition in animal keeping, other technologies such as the use of single-axle (walking) tractors should be promoted but again after testing and evaluating their performance technically, economically and socially.

Table 2: Annual costs (Tshs) of using a pair of oxen in Shinyanga and Morogoro regions

Parameter	Shinyanga	Morogoro
Purchase price of trained ox	82,874	183,117
Salvage value of ox	128,078	282,999
Economic life of oxen	6 years	6 years
Annual depreciation cost for a pair of oxen	- 15,068	- 33,294
Annual interest cost for a pair of oxen	48,394	106,931
Annual housing cost for a pair of oxen	2,600	7,700
Annual insurance cost for a pair of oxen	13,260	29,299
Annual tax cost for a pair of oxen	1,000	800
Annual health cost for a pair of oxen	51,038	40,494
Annual labour cost for controlling a pair of oxen	27,000	27,000
Annual compensation cost due to a pair of oxen	1,400	1,400
TOTAL	**129,624**	**180,330**

Conclusion

Findings from this study have shown that the overall annual costs of using a pair of oxen in Shinyanga region is Tshs. 129,624 and that of Morogoro region was found to be Tshs. 180,330. That means the overall annual cost of using draft animal in Morogoro was found to be higher than that of Shinyanga by 39%. It is therefore considered advantageous to use draft animal power in the areas with tradition than those without tradition in cattle keeping.

It can therefore be concluded that, promotion of animal traction as a measure to improve sustainable agricultural production should be done consciously in areas without tradition in animal keeping in the country because this technology is economically and more suitable in areas with tradition in animal keeping than those without. In that case other sources of farm power need to be promoted in areas with no tradition in animal keeping.

Future work in this area should be geared in mapping the power requirement in different parts of the country and in determining the costs of owning and using single-axle tractors, currently introduced in Tanzania and comparing the result with the cost of owning draft animals in areas that do no have tradition in animal keeping so that different packages for agricultural mechanization in different areas of the country are established.

References

Bell, R.D. and D.C. Kemp. 1986. An assessment of some aspects of work oxen in Siera Leone. Animal power in farming system, pp 320 - 324.

BOT.2000. Commercial bank interest rates. Bank of Tanzania Report. Dar es Salaam Tanzania.

Corbel, H. 1986. The economics of animal power in Koinadugu district, Siera Leone: A case study of the work oxen introduction and credit programme. Animal power in farming system, pp 299 – 310.

Hatibu, N. and T.E. Simalenga.1991. Research and development strategy for the improvement of animal traction in Tanzania. Proceeding of the first workshop on draft animal power in Tanzania, Morogoro.

Kwiligwa, E.B; R.M Shetto; Z.J Mkoga and S. Haule. 1992. Prospects of animal traction technology in Tanzania. Proceeding of Tanzania Society of Agricultural Engineers, Vol. 4, pp 43 – 48.

Mgaya, G.J; T.E Simalenga and N.Hatibu. 1992. Care and management of work oxen in Tanzania. Improving Animal Traction Technology. Proceeding of the first workshop of the ATNESA, Lusaka Zambia, pp 139 – 143.

Mrema G.C. and M.Y. Mrema.1993. Draught animal technology and agricultural mechanisation in Africa: Its potential role and constraints. NAMA Newsletter Vol. 1 No. 2, pp 12 – 33.

Panin A.A. and J. Ellis-Jones. 1992. Increasing the profitability of draft animal power. Improving animal traction technology. Proceeding of the first ATNESA workshop, Lusaka Zambia, pp 94 – 101.

Panin A.A. 1986. Comparative socio-economic analysis of hoe and bullock farming systems in northern Ghana. Unpublished PhD. Georg August University Goettingen Germany.

Pearson, R.A. and A.J., Smith. 1992. Improving draft animal management. Proceeding ATNESA workshop, Lusaka Zambia, pp 122 – 129.

Starkey, P.A. 1992. Worldwide view of animal traction highlighting some key issues in earstern and southern Africa. Proceeding ATNESA workshop, Lusaka Zambia, pp 66 – 81.

Tembo, S. 1989. Draft animal power research in Zimbabwe: Current constraints and research opportunities. Draught animal in rural development. Proceeding of ACIAR, Canberra Australia, pp 61- 68.

URT. 2002. National Bureau of Statistics. United Republic of Tanzania, Dar es Salaam.