Donkey power for appropriate mechanisation and transport for women in Zambezi Valley, Zimbabwe

by

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Abstract

The marginal communal areas of Zimbabwe are suffering from a shortage of draft power for agriculture and transport. It has been argued that tractors are the only solution to this problem. However, buying and maintaining sufficient tractors to cultivate the marginal areas would cost enormous sums, mostly in foreign exchange, and the increased yields due to improved land preparation would be marginal in comparison. Also, hiring tractors makes no economic sense for the farmer.

Animal traction is the main source of draft power in the communal areas. Cattle ownership per household has been declining, for several reasons—human population growth not matched by increased livestock numbers, environmental degradation leading to shortage of grazing land, drought, disease and the need for households to sell cattle to provide cash income. Donkeys could provide an alternative source of draft power. They are cheap, easily trained, hard working, thrive in arid conditions, can survive in tsetse areas, are not affected by bovine diseases and would not be used for food. As well as being suitable for cultivation work, they could be used by women to reduce their heavy workload. A donkey traction project is being established in the Zambezi Valley, one of the poorest areas of Zimbabwe in terms of rainfall, soil type and general infrastructural development; it plans to set up donkey traction groups, with a bias towards assisting women, and to produce donkey equipment using existing knowledge and local resources.

Introduction

Since time immemorial, animals have supplemented the power of human limbs by providing power to till the soil and to transport farm produce, even to distant towns. The type of animal used has been, and still is, varied, ranging from small donkeys to large Indian elephants. Draft animal power is used today on a large scale in many parts of the world (Starkey, 1988).

The choice between draft animal power and the tractor or truck will depend on many factors, including the land being tilled and the terrain over which goods have to be carried. The availability of fuel, spare parts and maintenance will also effect whether motorised power is appropriate. Unlike oil, which in many cases has to be imported, draft animal power is a renewable resource. Draft animals can be bred where they are needed for work and can provide fertiliser and fuel for the farmer (Bodet, 1987). Draft animals can assure the timely movement of agricultural inputs, seeds, fertiliser and manure, and such timeliness is important in areas of low rainfall. Work animals can also undertake efficient transport of harvested crops.

The Zimbabwean economy is heavily dependent on agriculture which accounts for over 11% of the Gross Domestic Product. Agriculture in Zimbabwe can be broadly divided into four farming sectors:

- communal farming
- resettlement
- small-scale commercial
- large-scale commercial

The large- and small-scale commercial farms are owned by individuals while in the communal areas the land is owned by the community: arable land is allocated to families to cultivate, and grazing land is communally used. The resettlement schemes are part of the government's land redistribution efforts, and settlers have use rights to the land.

Over 60% of the population of Zimbabwe lives in the communal areas, where 70% of the inhabitants are children and women. Zimbabwe is classified into five agro-ecological regions, based on soil type, rainfall and other climatic factors. Classification is in the order of decreasing agricultural potential. Over 75% of the communal farms are located in marginal regions 4 and 5. It is against this background that the issue of availability of animal or mechanical power to till and transport produce becomes crucial to most of the country's population.

This paper shares the ideas of an agricultural development initiative which is soon to be implemented in the one of the marginal areas of the

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country, the Zambezi Valley. This has a special focus on the needs of women and includes a donkey traction project.

Mechanisation in communal areas

Prospects for tractor power

Rusike (1986) estimated that there were 2900 tractors in the communal areas. Estimates of other authorities put the figure as low as 600. Most of these tractors have depreciated beyond their efficient working life and are only used on the owner's farm and for transport.

The government also runs a tractor tillage unit through the District Development Fund (DDF). This unit was initially set up to plow the land of farmers who had been resettled. The unit consists of 260 tractors and from the limited information available it is understood that these tractors each plow roughly 60 ha/year. DDF also runs 1000 additional tractors used for road grading. It is understood that these are also used for three months of the year for plowing, using plows borrowed from the commercial sector. Even if the tractors also work at a rate of 60 ha/year, the total tractor-plowed area is insignificant, at less than 2.4% of the total cultivated communal land (Elliot, 1989).

The government-run scheme appears to make very inefficient use of capital resources. This is in line with findings from other countries on the inability of government tillage units to operate on a financially sound basis.

Arguments have been made that because of the rising population, the increasing area under cultivation and hence the reduction of grazing lands, tractors are the only solution to the draft power shortage. However, a brief look at the costs involved dispels this notion. The total area under cultivation in the communal areas is now roughly three million hectares. Assuming a high operational efficiency of seven hours/ha including travelling, an eight-hour working day and an eight-month plowing period, each tractor should have a potential to plow 200 ha/year. To plow three million ha each year would thus require 15 000 tractors. At a price of 65 000 Zimbabwe dollars (Z$) for a 75 kW tractor this amounts to Z$ 975 million (US$ 1 ≈ Z$ 6 in 1992). Assuming a 10% replacement rate, this would amount to Z$ 97 million per year with both amounts being in foreign currency. Fuel costs, also primarily in foreign exchange, would amount to roughly Z$ 54 million per year excluding travel between fields (200 ha x 30 litres/ha x Z$ 0.6/litre x 15 000 tractors). The costs of maintenance and repair can be estimated at 10% of initial cost, or Z$ 97 million per year. Thus, based on these figures, which provide extremely low estimates of the actual costs, using tractors to overcome the draft power shortage would require an initial outlay of Z$ 975 million and annual costs of around Z$ 250 million, most of which would be in foreign exchange.

This annual figure amounts to almost exactly the total crop sales of Z$ 220 million to the marketing boards by the communal farming sector in 1986. The increased yields due to improved land preparation would be marginal compared to the costs (Elliot, 1989). The exact figures are complicated by the rate of inflation which was above 150% in early 1992, and by fuel prices which have almost doubled over the past two years. Nevertheless, it should be clear that it is unrealistic to view mechanical traction as an immediate or viable solution to the draft power and transport problems in marginal communal areas. (The situation in the high potential agro-ecological areas is different and tractors may prove appropriate there.)

Animal traction in Zimbabwe

In the communal areas of Zimbabwe, animal traction is the predominant source of draft power. Oxen and cows are the main draft animals. There are over three million cattle in the communal areas and over 20% of these are used for work. Over the past five years there has been a dramatic decrease in the number of cattle owned per family. The factors that have contributed to the decline include:

- the rapid increase of population (3.5% annually, dropping to 2.8% recently) which has not been matched by a similar increase in livestock numbers
- rapid environmental degradation which has reduced the carrying capacity of the land and has resulted in an acute shortage of grazing. This shortage will get worse unless alternatives are found, and so many households may have to live without cattle. For example, the recommended stocking rate in agro-ecological region 5 is one livestock unit per 20 ha. If this carrying capacity were to be strictly applied in the communal areas, families having the average land holding of 2.5 ha would not even be able to keep one beast at home
- drought and diseases which have resulted in the loss of thousands of cattle
- the increasing importance of the cash economy, with the result that more households have faced cash shortages and so have been forced to sell their cattle for slaughter, so reducing the number of cattle owned by families.

Table 1: Some advantages and disadvantages of donkeys

Advantages	*Disadvantages*
Friendly towards humans	Suffer from being alone
Willing to work	Friends not easily separated
Can turn in a small space	Need shelter from cold and damp
Easy to train	Meat not eaten (in Zimbabwe)
Need little supervision in work	Mature slowly
Can utilise poor feed well	Comparatively small in size
Not affected much by external parasites	Breed slowly
Need little water	Manure is fibrous
Can survive in tsetse areas	
Comparatively cheap to buy	
Strong relative to size	
Live/work more years in good care than other animals	
Milk good for humans	

Source: after Jones (1991)

These factors are not a temporary feature but will continue unless solutions are found. One option might be a different draft animal species, one which might not require the same amounts of grazing, water and management, and which would not be slaughtered for meat or kept for purposes other than traction. One such animal, that has been used for centuries in parts of Africa and is widely available in Zimbabwe, is the donkey.

Donkey power for semi-arid areas

The donkey is the most numerous domesticated African equine (67% of equines kept in Africa are donkeys) and more than 30% of the world donkey population is found in Africa. Donkeys are mainly found in drier ecological regions, where drought has been widespread in recent years, and it has been speculated that donkeys could be used to prevent the recurrence of famine and starvation.

Before discussing in detail how donkeys can be supported it is necessary to look at the advantages and disadvantages of domesticating donkeys (see Table 1). The following material comes mainly from a training manual on the use of donkeys in agriculture in Zimbabwe (Jones, 1991). This was recently produced by the Institute of Agricultural Engineering under the Department of Agriculture, Technical and Extension Services in collaboration with the German Agency for Technical Cooperation (GTZ).

The donkey is said to be one of the most rewarding animals to train and once trained it can be trusted to do many tasks without human supervision. A donkey will learn quickly both from other donkeys and from humans, and it has a remarkable memory, especially for paths and routes.

A donkey can work for up to four hours, pulling forces of about 250 N. Donkeys are smaller than cattle, at 120–300 kg, but can often undertake much of the work that cattle can do: this has given rise to the suggestion that donkeys produce more work than cattle per kilogram liveweight. Well-trained donkeys need only one person to work with them. Donkeys like to walk in straight lines and can recognise and follow furrows easily, and quickly learn where to turn.

Donkeys can be used for plowing where soils are light and sandy. They may also be used for ridging, weeding and threshing. For cultivation and carting, they may be worked singly, in pairs or in larger teams. On level terrain, a donkey can pull a cart with a 450 kg load. In many parts of the world where there are no roads, the main work of donkeys is as pack animals. Pack donkeys enable people in remote areas to sell and buy goods in urban markets and keep in touch with development. There is practically nowhere a donkey cannot go; with four feet it can often manage steep rocky paths better than a human can.

Although donkeys have many attributes, their adoption depends on the judgement and attitudes of farmers. In general donkeys are regarded as low status animals. If this continues to be the case, donkeys might have limited future significance in African development. However, if Africa is to develop through its own devices there is a need to mobilise all available resources for sustainable development. Development strategies based mainly on external resources will not solve the current

problems on the continent. It would therefore be unjustified and wasteful to neglect donkeys as an available, sustainable and valuable resource.

In light of this, the Ministry of Community and Cooperative Development in Zimbabwe intends to introduce donkey traction in the Zambezi Valley area, as a pilot on-farm research trial. This will be done in the context of a project entitled "Entrepreneurship development amongst farmers with a special focus on the needs of women".

Farming in the Zambezi Valley

The Zambezi Valley is one of the poorest areas of Zimbabwe in terms of rainfall, soil type and general infrastructural development. The area is still characterised by a presence of tsetse flies and wildlife which have been responsible for a number of deaths of domestic animals. Communication from one area to another is very difficult because of the poor infrastructure. The rains are so erratic that even obtaining water for home consumption can be difficult. Women often walk tens of kilometres through thick bush infested with dangerous, wild animals to fetch water, which is transported by head. Even though the area is marginal for crop production, people try to cultivate drought-tolerant crops like sorghum and millet for survival. Table 2 shows the low crop yields obtained.

At present most households cultivate their farms by hand hoeing. Some farmers hire the District Development Fund tractors to plow their land at a cost of Z$ 70 per hectare, often using the meagre cash which they have received as remittances from their working relatives in town.

Given the low yields recorded in Table 2, basic arithmetic suggests that it makes no economic sense to promote tractors in such marginal areas. For example, in 1984 the producer price of maize was Z$ 140 per tonne and average yields of maize in and around the Zambezi Valley were 146 kg/ha (Agritex, 1985). Thus in monetary terms the average farmer obtained about Z$ 20 per hectare, whilst to hire a tractor for plowing cost Z$ 55 per hectare.

In 1988/89 the producer price of maize increased to Z$ 210 per tonne and the plowing fee was Z$ 70 per hectare. The average maize yield in the area in 1988/89 was 360 kg/ha. With this yield, the gross income per hectare was Z$ 75, which allowed those hiring tractors just Z$ 5 "profit", less all other production costs (labour, seeds and other inputs).

It seems clear that there is no logic in employing mechanical traction in such a low-yielding environment. Furthermore, many farmers' fields are not suitable for tractor tilling because of steep slopes, the small size of the farms and the large distances between farms which necessitates much road travel. As the Zambezi Valley is remote, tractors are often idle due to lack of fuel and spare parts. It is therefore surprising that government agencies continue to encourage tractor plowing at the expense of animal traction.

Need for animal traction

Given this background the only realistic option for alleviating transport and draft problems is the use of animal traction. In most parts of the country cattle are normally used for this type of work, but cattle cannot be kept in the Zambezi Valley because of the presence of tsetse flies and wildlife. The presence of buffalo, which can carry foot and mouth disease, strongly mitigates against the introduction of cattle. (Zimbabwe exports meat and on a number of occasions much foreign currency has been lost due to outbreaks of foot and mouth disease.)

As an equine, the donkey is not affected by bovine diseases such as rinderpest and foot and mouth disease, and is relatively tolerant to trypanosomiasis. It is cheap to buy (about Z$ 150) and thus if attacked by wildlife its loss is not as drastic as would be that of an ox or cow (costing Z$ 500). Thus the donkey has been selected as the most suitable draft animal for the Zambezi Valley.

Table 2: Crop yields in Manjolo communal area, Zambezi Valley, 1984–89

Crop		*1984/85*	*1985/86*	*1986/87*	*1987/88*	*1988/89*
Maize	Yield (kg/ha)	146	165	68	273	360
	Area (ha)	770	385	392	411	345
White sorghum	Yield (kg/ha)	180	209	90	300	270
	Area (ha)	10	1670	1700	1790	300
Millet	Yield (kg/ha)	270	315	136	364	270
	Area (ha)	1760	2 034	2074	2180	405

Source: Agritex Crop Production Branch Databank 1984–1989

Donkeys for women

For a long time the heavy workload of women has been highlighted, but no practical solutions have been found. Their work involves transporting fuelwood, water and food grains over large distances. Experience has shown that donkeys can be employed to do these tasks, as in other parts of Africa and to a lesser extent elsewhere in Zimbabwe. Also, as a way of supplementing household food needs, women normally work on vegetable gardens, which need regular watering. Simple, donkey-pulled carts with water drums could go a long way toward in reducing women's workloads in transporting the water. Distances to grinding mills can be so great that women travel a whole morning to reach the mill, carrying the grain on their heads. More grain could be carried using donkeys, thus reducing the number of trips women make to the mill.

Donkey traction project

The Ministry of Community and Cooperative Development has expressed interest in establishing a donkey traction project in conjunction with the Intermediate Technology Development Group, the Institute of Agricultural Engineering and the Kulima Mboluni Training Centre. It plans to set up donkey traction groups, with a bias towards assisting women. The women will identify the type of equipment to be used with the donkeys to lessen their daily workload.

As this is a pilot project it will aim at producing the necessary donkey equipment at grassroots level, using already existing knowledge and local resources. This pilot scheme will therefore require close cooperation with the Animal Traction Network for Eastern and Southern Africa (ATNESA) for the purposes of information exchange.

Conclusions

It is well-known that changes in farmers' practices are gradual. This implies that short-term projects are unlikely to have any impact and that any attempt to promote a technological change will require a long-term commitment.

The perceived social status of any initiative is a crucial factor. In this context, draft animals and donkeys are sometimes viewed with suspicion in certain quarters where they may be considered a feature of the past. Such attitudes are understandable and logical arguments alone may not be sufficient to overcome them. If, in countries where there is a significant number of donkeys, leaders could give encouragement and promote scientific examination of donkey use, this would prepare the way for an objective technical discussion of an area of crucial importance to overall national development. Scientists could be encouraged to look at the possibilities of crossbreeding stronger equines, by crossing good horse breeds with donkey breeds to produce hardy and powerful mules. The potential for breeding a productive and adapted equine animal seems higher, now that horses and zebra have been successfully crossed.

In 1992 there were reports in the press informing the public that the rural areas of Zimbabwe had once more experienced disaster in the form of a drought. In one province, 7000 cattle died in one month, and many others were likely to die of starvation, despite all the efforts of farmers to save them. Donkeys were said to be coping with the drought better then cattle, and seemed able to survive on the small amounts of plant material that remained. This suggests that donkeys are particularly appropriate to the drought-prone environment of Zimbabwe.

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