

# Animal traction technology in Botswana: potential and constraints

A.A. Aganga<sup>1</sup>, C. Patrick<sup>2</sup> and B.V.E. Segwagwe<sup>1</sup>

<sup>1</sup>Department of Animal Science and Production, and <sup>2</sup>Department of Agricultural Engineering and Land Use  
Botswana College of Agriculture, Private Bag 0027, Gaborone

## Abstract

*This paper discusses some of the constraints to increased adoption of animal traction technology in Botswana. Animal draught power has the potential to increase agricultural production by overcoming labour limitations. Promotion of animal draught power is, however, constrained by an alternative, profitable beef market, cattle diseases, lack of implements and spare parts. The promotion of the use of donkeys for work could improve access to animal power. The social prejudice associated with the ownership and use of donkeys is a major constraint to the promotion of donkey draught power. The increasing availability of tractor ploughing services is a challenge to the continuing use of animal traction in the 21st century. The main issue is whether the tractor service is fully sustainable and appropriate to Botswana soil types.*

## Introduction

Botswana is in the heart of Southern Africa. It is made up of a great upland plateau lying between the Chobe river and the Caprivi strip in the north and Molopo River in the south. For the most part the country is covered in Kalahari sand, red in the drier parts of the south and west. The rainfall is erratic varying from some 279 mm in the south to 711 mm in the north. The summer is the wet season. There was a decline from 1990 to 1993 in the cattle population of 28.7 percent (MOA, 1993). This decline has important socio-economic implications with respect to crop production. MOA (1993) stated that, there was a deterioration of the cattle asset base as evidenced by an increase in farming households without cattle from 37.7 percent (33 800) in 1990 to 45.1 percent (48 000) in 1993. The conclusion was that such small-scale farmers would need draught power assistance to ensure that they remain in crop production. The worst affected areas in cattle deaths were Ngwaketse North, Tati/North East, Bamalete/Tlokwen, Kweneng South, Mahalapye East and Bobirwa. The shortage of water and grazing were largely responsible for the high mortality in all these areas (MOA, 1993).

The donkey population in Botswana was about 229 000 head in 1993 (MOA, 1993). Table 1 shows the distribution of donkeys by district and region. The number of donkeys on traditional farms varied from four to 23 with an average donkey herd of 5.9 (MOA, 1993). Donkeys provide a valuable service for rural dwellers in Botswana and they are usually harnessed in pairs or in larger teams of up to eight for agricultural work (Aganga and Maphorisa, 1994).

## Agricultural production

Agriculture has a significant role in the economy of Botswana. At independence in 1966 agricultural activity comprised some 40 percent of the Gross

Domestic Product (GDP); today the figure is less than 5 percent (MOA, 1993).

This dramatic decrease is largely due to the dominance of the mineral sector contribution to the economy in the past 20 - 25 years. However of the 1.3 million people in the country around 70 percent still live in the rural areas and are dependent on agricultural activities for their livelihood. Although the agricultural sector no longer claims a significant share of GDP, it is still relied on by the great majority of Botswana (MOA, 1993). 70% of the rural families continue to rely heavily on rain-fed cultivation, though financially, livestock rearing constitutes the largest component of the agricultural sector.

Livestock alone, especially cattle, account for 3 percent of GDP and are about 28 percent of the total gross agricultural product (MOA, 1993). Arable farming is primarily subsistence and largely constrained by management and poor weather conditions both spatially and temporally. In general, the agricultural sector is dominated by mixed farming (livestock and crop production) as a multifaceted strategy to spread risk. This is particularly in the traditional sector, which produces mainly cereal crops, especially sorghum.

## Agricultural policy and development strategy

The objectives of Botswana's agricultural policy (MOA, 1991) are aimed at:

- Providing adequate and secure livelihoods for those involved in agriculture.
- Increasing agricultural output.
- Increasing food (self-sufficiency).
- Conserving agricultural land resource.
- Meeting the employment demands of a growing labour force.

**Table 1: Donkeys : Holdings, animals and average size by districts and region**

District/region	Donkey holding		Total donkeys		Average number/ holding
	Number	%	Number '000	%	
Barolong	834	2.1	6.8	8.2	8.2
Ngwaketse South	1362	3.5	10.2	7.5	7.5
Ngwaketse North	1424	3.7	7	4.9	4.9
Ngwaketse Central	914	2.4	7.5	8.2	8.2
Ngwaketse West	865	2.2	5.4	6.2	6.2
Southern Region	5399	13.9	36.9	6.8	6.8
Bamalete/Tlokweg	1153	3.0	5.1	4.4	4.4
Kweneng South	2345	6.0	12.2	5.2	5.2
Kweneng North	1833	4.7	10	5.5	5.5
Kweneng West	1061	2.7	3.8	3.6	3.6
Kgatleng	1448	3.7	14.1	9.7	9.7
Gaborone Region	7840	20.1	45.2	5.8	5.8
Mahalapye East	1776	4.6	10.7	6.0	6.0
Mahalapye West	2310	5.9	15.8	6.8	6.8
Palapye	1716	4.4	8.6	5.0	5.0
Serowe	1682	4.3	10.3	6.1	6.1
Letlhakane	3060	7.9	19.3	6.3	6.3
Bobonong	2406	6.2	12.3	5.1	5.1
Selebi-Phikwe	1772	4.5	10.9	6.2	6.2
Central Region	14722	37.8	87.9	6.0	6.0
Tati	871	2.2	4.2	1.8	4.8
Tutume	2561	6.6	14.9	6.5	5.8
Tonota	1689	4.3	9.4	4.1	5.6
Francistown Region	5121	13.1	28.5	12.4	5.6
Ngamiland West	1827	4.7	6.3	2.7	2.4
Ngamiland East	2144	5.5	13.3	5.8	6.2
Chobe	101	0.3	0.5	0.2	5.0
Maun Region	4072	10.5	20.1	8.7	4.9
Ghanzi	487	1.3	2.6	1.1	5.3
Tsabong	311	0.8	0.8	0.3	2.6
Hukuntsi	1007	2.6	6.9	3.0	6.9
Western Region	1805	4.6	10.4	4.4	5.8
Total traditional	38 959	100.0	229	100.0	5.9

Source : MOA, 1993

The above policy objectives are long term in nature and would require both short and long running strategies to attain them (MOA, 1991). MOA (1989) stated that in order to improve access to efficient use of draught power in Botswana for arable farming, both animal and tractor draught power resources will continue to be used. However, government will continue to provide financial assistance to animal draught power for both efficiency and equity considerations (MOA, 1991) towards the attainment of the stated agricultural policy.

#### **Farm power**

Botswana's arable sub-sector has been dominated over several decades by the use of animal draught power. However, over the last ten years, largely as a result of ploughing grants available to farmers during the drought period, there has been a dramatic turn towards the use of tractors. MOA (1991) stated that on economic efficiency grounds, particularly with low crop yields and erratic rainfall, animal draught power has been found to be the most efficient source

of power. The majority of small-scale crop farmers cannot afford to purchase tractors, therefore, a large number of farmers will continue to use animal draught power in arable farming. MOA (1991) identified farm power as one of the major constraints to arable farming since use of tractors was constrained by high cost, poor state of repair and maintenance. A critical shortage of service centres, particularly in remote areas, and qualified mechanics has had a serious adverse effect on the efficient use of tractors in the country.

### **Potential for draught animal power use**

Oxen and donkeys are the main sources of animal draught power. Donkeys and cattle are found in all districts of the country, although cattle are increasingly raised for beef. Table 1 shows the distribution of donkeys in Botswana. Donkeys are vital draught animals in Botswana since they are used for transport (Aganga *et al.*, 1994), tillage and riding. The size of a donkey is a limitation to the amount of work that it can do. On average, an adult donkey weighs about 140 kg in Botswana (Aganga and Maphorisa, 1994). Consequently, the donkeys need to be teamed in sufficient numbers to provide the necessary draught force required to accomplish a task. Use of draught animals for weeding is limited because a lot of traditional farmers do not row-plant their crops instead they practise broadcasting seed. MOA (1991) stated that over 80 percent of the crop farming population still broadcast their fields, thus adoption rate of animal draught power for weeding is low. Mrema *et al.* (1993) stated that lack of farm power was limiting smallholder crop production because labour requirements were inadequate during critical periods (ploughing, planting and weeding). The use of draught animals and animal-drawn implements reduced crop labour requirements and increased total land area planted which resulted in improvements in labour productivity and led to increased yields.

Donkeys are very cheap compared to work oxen. A donkey costs about 100 Pula (US\$ 25) while an ox costs about 1000 Pula (US\$ 250). Consequently, more small-scale farmers can afford donkeys compared to oxen. Good, well - trained donkeys can be kept for many years until they become unserviceable. Donkey power is important for transporting water in rural areas and the animals assist greatly in relieving humans especially women and children of the burden of water transport by head or wheelbarrow. Donkey power, tractors and vehicles exist side-by-side in Botswana. Donkey-drawn carts are efficient and profitable for on- and off-farm transport and do not require imported fuel for operation. Donkey-drawn carts provide reliable and readily available rural taxis at the cattle posts. Donkey power technology remains highly relevant to

people in the rural areas and in the development of agricultural production.

### **Constraints to increased use of animal draught power**

Animal draught power usage is faced with a number of constraints:-

#### ***Diseases and poor health***

This is a constraint especially with the cattle and donkeys. Botswana experienced an out-break of contagious bovine pleuro-pneumonia (CBPP) in 1997/98 which wiped out a large number of cattle in the north-western part of the country. Diseases and poor health lead to reduction in animal power available. Donkeys harbour a myriad of infectious and parasitic agents, not all of which have been thoroughly investigated. Donkeys are susceptible to *Trypanosoma brucei*, *Babesia caballi* and *B. equi* (De Waal and van Heerden, 1994). Pearson *et al.* (1997) reported that donkeys are host to a wide diversity and high prevalence of helminth parasites, which can lead to disease when the animals are underfed or overworked. Helminths reported from donkeys in Southern Africa include roundworms, tapeworms and flukes. Effective disease control methods and disease treatments along with good husbandry and adequate nutrition can play an important role in resisting diseases. Wounds on the skins of donkeys cause discomfort and reduction of tractive force. Poor quality harnesses made out of old tyres connected by chains and ropes often cause these wounds. These common home-made harnesses usually cause friction and then sores on the back and ribs of the donkeys especially in the hot summer months. The wounds expose the animal to infection especially when covered by flies. Donkeys' wounds should be treated promptly and proper harnesses should be used to reduce the occurrence of skin wounds. Farmers need to be informed about proper harnessing, for optimal animal care.

#### ***Preference of some farmers for oxen***

Oxen are sometimes not readily available. This problem can be solved by farmers' adoption of donkey traction, which is cheap and more readily available. The donkey has a generally poor image in the Botswana culture, partly due to the fact that work is often the only productive output of a donkey. Therefore, donkeys have low monetary value compared to cattle and consequently, do not attract the attention of extension officers, scientists and decision-makers. The negative image of the donkeys, based on unsubstantiated information, needs to be corrected for farmers to employ the animal into productive work.

### **Poor nutrition and management of donkeys**

These limit the animals' potential tractive power, therefore they cannot produce maximum power for agricultural use. The donkeys in Botswana are known to survive with little management, but their body condition fluctuates depending on forage available for grazing and the occasional supplementary feed provided to some of them. Inadequate nutrition restricts the growth of growing donkeys, thus limiting the production of maximum tractive capacity. There is a need for strategic supplementation of the donkeys before they are used for ploughing since the condition of the ranges are poor just before the heavy rains, which is the time that the land preparation for planting is undertaken. The suitability of available supplements as complements to forages and grazing to provide required nutrients for the donkeys need to be investigated. This will generate the necessary information that is required for recommendations to be developed on feedings systems for donkeys in Botswana.

### **Reproduction**

Reproductive behaviour and pregnancy lead to reduce tractive power in pregnant females. Animal sex has little apparent direct effect on work output of donkeys (Jones, 1997). Castration of male donkeys has been reported to reduce blood levels of hormones that trigger much of the inter-animal aggression and a lessening of the impulse to wander. Aggression

among donkeys is almost certainly due to the sexual urge of males (Hutchins and Hutchins, 1981). Sex drive in intact male donkeys increases their tendency to wander long distances on their own in search of females on heat, thus making them difficult to locate and making them less available for draught functions at those times.

### **Alternative uses for donkeys**

Alternative usage for donkeys for example meat production is a possibility. Early in 1999 an announcement for a donkey meat plant was made (Daily News, February 2, 1999). The establishment of the abattoir could lead to a reduction in the donkey population in Botswana and it is envisaged that it could play a positive role in reducing overgrazing due to high stocking rates at the moment.

### **Conclusions**

The potential for increased use of donkey draught power exists in Botswana and the government has encouraged the use of draught animals with favourable agricultural policy. Farmers are aware of the uses of animal power but this is a case of accepted yet neglected technology, in terms of research into draught animal development. Research is required on the nutritional requirements of donkeys in Botswana, and their performance capabilities to enhance increased adoption of animal traction technology in the country, in those areas and systems where tractor power is not feasible.

### **References**

- Aganga, A.A. and Maphorisa, K. 1994. Characteristics and uses of donkeys in Botswana. In: *Improving Animal Traction Technology* (eds P. Starkey, E. Mwenya and J. Stares), pp. 146-149. Proceedings of the 1st workshop of ATNESA, January 18-23 1992, Lusaka, Zambia, Technical Centre for Agricultural and Rural Co-operation (CTA), Wageningen, The Netherlands.
- Aganga, A.A., Tsopito, C.M. and Seabo, D. 1994. Donkey power in rural transportation. A Botswana case study. *Appropriate Technology* 21, 32 - 33.
- De Waal D, T. And van Heerden, J. 1994. Equine babesiosis. In : *Infectious Diseases of Livestock with special reference to Southern Africa*, (eds, J.A.W. Coetzer, G.R. Thomson, and R.C. Tustin) Vol 1. pp. 293-304. Oxford University Press, Cape Town.
- Hutchins, N, and Hutchins, P.1981. *The Definitive Donkey*. Hee Haw Book Service, Denton, Texas, USA.
- Jones, P.A., 1997a. Determination of optimal sex for working donkeys: experience from Zimbabwe, In: *Improving donkey utilisation and management*. ATNESA Workshop, 5-9 May, 1997. Debre Zeit. Ethiopia.
- Workshop Reader *Donkey power benefits*, Volume 2, pp 70-73.
- MOA. 1989. *Relative economics of different draught power applications in Botswana*. Ministry of Agriculture, Gaborone, Botswana.
- MOA. 1991. *Botswana's Agricultural Policy : Critical sectoral issues and future strategy for development*. Ministry of Agriculture, Gaborone, Botswana.
- MOA. 1993. *Botswana Agricultural Census Report*. Division of Agricultural Planning and Statistics, Ministry of Agriculture. Central Statistics Office. Private Bag 0024, Gaborone, Botswana.
- Mrema, M., Aganga, A.A. and Aliwa, J. 1993. Evaluation of different types of traction in small-scale crop production. The case of Botswana. Proceedings of Silsoe organised workshop on Draught Animal Power. Paper 3.26. Pages 121 - 123 W/V 21 50E/119.93/3000, FAO Rome. Harare - Zimbabwe.
- Pearson, R, A, Nengomasha, E, Krecek, R, C 1997. The challenges in using donkeys for work in Africa. In: *Meeting the Challenges of Animal Traction*. Proceedings of an ATNESA Workshop, 5-9 May 1997, Debre Zeit, Ethiopia. (in press).