Empowering people through donkey power into the next millennium

E.M. Nengomasha[1], R. Anne Pearson[2] and A. Gebre Wold[3]

[1] *Department of Research and Specialist Services, Matopos Research Station, P. Bag K 5137, Bulawayo, Zimbabwe.*
[2] *University of Edinburgh, Centre for Tropical Veterinary Medicine, Easter Bush, Roslin Midlothian, EH25 9RG, Scotland, UK.*
[3] *Ethiopian Agricultural Research Organisation, Holetta Research Centre, P.O. Box 2003, Addis Ababa, Ethiopia*.

Abstract

Tractor programmes, designed to provide the much-needed draught power for the smallholder farming sector, have proved unsustainable and difficult to implement in most developing countries. Therefore, notwithstanding the continued promotion of tractors, the dependency of small-scale farmers on draught animal power (DAP) for crop production, is likely to continue into the next millennium. Cattle have been the predominant and preferred source of DAP in most parts of Southern Africa. However, recurrent droughts since the early 1980s have decimated their population in this region. This has resulted in DAP shortages, seriously threatening the food security of the rural folk. Because of the apparent ability of donkeys to survive droughts better than cattle, they are becoming an important source of DAP in semi-arid areas. The donkey's capabilities and hence their capacity to contribute to the empowerment of rural and urban people are discussed. The issues and challenges that are likely to face users in the 21st century and possible interventions are identified.

Land cultivation is the most important task in the crop-livestock farming systems. The capacity of donkeys to plough has been assessed and results, some of which are very encouraging, are highlighted in this paper. The suitability of donkeys in semi-arid areas has largely been attributed to their ability to withstand long periods without drinking water and to digest high fibre diets. Studies have been conducted to evaluate these abilities and some findings are presented here. With the increasing importance of the peri-urban agricultural sector, donkeys provide one of the most cost effective sources of transport in this sector. The role donkeys play in empowering peri-urban smallholder farmers and traders, which has been expounded particularly in Eastern Africa, is discussed. Sectors of society who can or do benefit from using donkeys are also highlighted. The comparative ease of handling of donkeys over cattle, make them more suitable for use by the elderly, women and children. With the increasing labour constraints caused by high mortality rates due to the HIV/AIDS pandemic, orphans and the elderly now constitute the majority of the available labour in some areas. This group can be empowered by increasing the use of donkeys. People without land in the peri-urban sector can obtain an income through the use of donkeys in transport, while farmers can diversity into transport of road material and of building materials if they keep donkeys.

Introduction

The Hon. Julius Nyerere once said "*While the great powers have been to the moon and back and are now even communicating with the stars.... We are still trying to reach the village and the village is getting even more remote"*. There is every expectation that in the new millennium, as was the case 5 000 years ago, donkey power will still be making a valuable contribution to the livelihoods of a significant number of people. In this paper some of the reasons are considered as to why donkeys have remained central to the life of people in many countries, despite the fact we have been to the moon and back in the last century.

Tractors, cattle and donkeys

Cattle have been the traditional source of DAP on the African continent. However, cattle are generally less tolerant to the effects of drought than donkeys, whose evolution makes them better suited for the semi-arid environments (Janis, 1976), common in the Eastern and Southern African landscape. Cattle mortalities due to drought have been high, particularly since the early 1980s (Ellis-Jones *et al.*, 1994). For example, in Zimbabwe, 1.4 million head of cattle were lost during the 1991-92 drought alone, of which over a million were from the smallholder farming sector (Hagmann and Prasad, 1995). Similar trends have been observed elsewhere in the sub-region, e.g. Botswana (Mrema, 1997) and South Africa (Starkey, 1994). This has decreased the dependency on cattle for DAP and there has been a definite shift towards greater use of donkeys, particularly in semi-arid areas in the Southern African sub-region (Barrett, *et al.*, 1992; Ellis-Jones *et al.*, 1994; Starkey, 1994).

In Botswana, for example there has been a general increase in the number of smallholder farmers owning

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donkeys (Mrema, 1997). This is largely because the farmers with access to donkeys are assured of early planting and better yields than those without (Mrema, 1994).

Despite the increase in donkey use, it has been argued by policy makers in Zimbabwe that tractorisation of the small-scale farming sector, is the 'only' way to alleviate the persistent draught power shortages in this sector (ARC, 1999). Individual ownership of tractors is not a viable option for most smallholder farmers (Carruthers and Rodriguez, 1992) mainly because of the small arable areas involved (3 ha normally subdivided into 0.5 ha subplots; E. Mbanje, pers. comm.). It was calculated that about 40 ha of arable land are needed to support the costs of a 20kW tractor (E. Mbanje, pers. comm.). Furthermore, tractorisation of this sector has largely failed because of poor planning, and an implementation often accompanied by a lack of spare parts and poor back-up service. Misappropriation of tractor and tillage units and corruption have also greatly contributed to the failure of tractors. This has not helped the smallholder farmers with their draught power requirements and low crop yields then occur due to late planting.

There are advantages of using donkeys for DAP compared with cattle in semi-arid areas:

- They are cheaper to purchase.
- They survive droughts better, probably due to their small size, ability to consume poor quality foods and lower feed and water requirements (Schmidt-Nielsen, 1964: Dijkman, 1992).
- They are generally in better condition than cattle at the start of the ploughing season.
- They are easier to train and handle.
- They are generally less likely to succumb to disease than cattle in tsetse areas (see Pandey and Eysker, 1991) and seem to survive better than horses in areas where trypanosomiasis and African horse sickness are found.
- There are few gender restrictions on their use and it is perfectly acceptable in most cultures for women to own and work with donkeys.
- If well managed, donkeys have a longer working life than cattle, although in some African countries the working life of a donkey is short, due to hard work and minimal management inputs.

The other tacit "advantage" donkeys have over cattle is that they have only one main economic use, that is the provision of DAP (Table 1). This, in theory, suggests that donkeys can channel most of their effort into the production of draught power and farmers do not have to be "concerned" much about the species' other products. However, it must be accepted that this has also been one of the main reasons donkeys have been neglected by farmers. The increased use of donkeys for DAP could also increase the off-take of cattle for beef production.

Therefore, donkeys represent a reliable, sustainable and cheap power source for the smallholder farmer into the next millennium.

Donkey distribution and population

Egyptian tombs have drawings and carvings of loaded donkeys dating back 4 000 years. While it is difficult to be precise about the number of donkeys in the world because statistics on donkeys are rarely collected and if recorded are often not done with any great accuracy. China is the country with most working donkeys, followed by Ethiopia (Table 2). Donkeys are also important in Eastern Europe, Northern Spain and several Mediterranean countries, but in these areas their numbers are declining. In contrast the population of donkeys is increasing in many African countries. In sub-Saharan Africa, the geographical range of the donkey is spreading. This is noticeable in West Africa where donkeys are being seen further south and also in Eastern and Southern Africa, where recent drought have seen an expansion in their range.

Table 1: Estimates of economic use of cattle and donkeys in the small-scale farming sector of Zimbabwe (Ellis-Jones *et al.*, 1994)

Economic use	Per cent of total value	
	Cattle	Donkeys
Draught power	63.6	95
Milk	13.6	0
Meat	8.5	0
Manure	3.9	2
Herd growth	10.4	3-5

Table 2: Numbers and importance of domestic donkeys in Africa in 1997 (FAO, 1997)

Countries with the most donkeys		Countries with the least donkeys	
Country	**Number in '000's**	**Country**	**Number in '000's**
Ethiopia	5,200	Benin	1
Egypt	1,720	Zambia	2
Nigeria	1,000	Malawi	2
Morocco	954	Guinea	2
Sudan	680	Togo	3
Mali	650	Angola	5
Burkina Faso	475	Guinea Bissau	5
Niger	450	Swaziland	13
Zimbabwe[1]	392	Ghana	13
Senegal	376	Uganda	18
Chad	280	Mozambique	20
Botswana	235	Somalia	24
Tunisia	230	Namibia	71
South Africa	210	Kenya	not available
Tanzania	178		
Mauritania	155		
Lesotho	150		

[1] after Nengomasha (1997)

The potential of the donkey in empowering people

The donkey as a ploughing animal

The DAP shortages experienced by smallholder farmers after the droughts, have increased the use of donkeys for ploughing, a task hitherto the domain of cattle.

Donkeys are traditionally used mainly for transport and lighter tillage operations such as weeding. It is often considered that donkeys are not capable of ploughing owing to their small frame-size and the higher draught forces required to pull the ox-ploughs (about 700-1300 N) compared with other draught tasks such as carting. However, there has been a scarcity of information on the capacity of donkeys to plough, resulting in extension agencies failing to address issues raised by smallholder farmers on the proper use and management of donkeys for ploughing (see Hagmann and Prasad, 1995). Since the 1991-92 drought, there has been heightened interest and research work in DAP, with particular emphasis on the use of donkeys (Prasad *et al.*, 1991; Barrett *et al.*, 1992; Ellis-Jones *et al.*, 1994; Hagmann and Prasad, 1995; Nengomasha, *et al.*, 1999).

Despite its small frame-size when compared with cattle, the donkey is considered the most efficient power unit in agriculture (MacDonald and Low, 1985). The work of Prasad *et al.* (1991) showed that calculated on the basis of metabolic live weight, work output of donkeys pulling a sledge was higher than that of cattle teams doing similar work (Table 3).

However, the donkeys could only work for up to 2 hours. Hagmann and Prasad (1995) also concluded that donkeys could not work beyond 2.5 hours when ploughing, which they attributed to the state of the donkeys which were weak, recovering from drought. However, these workers acknowledged that with proper management, working duration of donkeys could be prolonged. Nengomasha *et al.* (1999) observed that the performance of four donkeys in good condition, ploughing soils typical of those found in SW Zimbabwe (clay, red soil, sandy and sandy clay soils) using an ox-drawn plough, was comparable to that of a team of two cattle of similar total team live weight (LW) to the team of four donkeys. Calculated per kg LW and kg $LW^{0.75}$, there were similarities in the performance of donkeys and oxen (Table 3). The team of four donkeys ploughed for 4 h without apparent signs of fatigue. Although they were slower than the cattle, and generated less power, they stopped less often and gave the same field efficiencies (Table 4: Nengomasha *et al.*, 1999). Kunze and Loos (1991) have also found donkeys to perform effectively in ploughing in a team of four.

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Table 3: Power output (W) of donkey and cattle teams pulling a sledge (Prasad *et al.*, 1991) or ploughing (Nengomasha *et al.*, 1999) as a function of live weight (LW) and metabolic live weight ($kgLW^{0.75}$).

Species	Prasad *et al.* (1991)[1]		Nengomasha *et al.* (1999)[2]	
	per kg LW	per $kgLW^{0.75}$	per kg LW	per $kgLW^{0.75}$
Donkeys	1.3 (±0.2)	6.4 (±0.7)	1.1 (±0.13)	4.0 (±0.45)
Oxen	0.7 (±0.1)	4.0 (±0.6)	1.3 (±0.17)	5.6 (±0.76)

[1]teams worked for up to 2.5 hours; [2]teams worked for up to 4 hours

Table 4: Comparative results of draught force, speed, power output, area ploughed, ploughing depth, ploughing width and effective field capacity of a team of donkeys and a team of oxen ploughing on clay, red soil, sandy and sandy clay soils with an ox-drawn plough at Matopos Research Station[1].

Performance parameter	Team of 4 donkeys	Team of 2 oxen
Mean live weight (kg)	169	323
Draught force (N)	867	900
Speed (m/s)	0.87	1.03
Power output (W)	689	920
Area ploughed (m^2)	770	597
Ploughing depth (cm)	13.5	15.0
Ploughing width (cm)	26.5	28.0
Effective field capacity (h/ha)	14.2	14.5

[1] except for live weight, results presented here are medians

The potential of the donkey in empowering people

The donkey as a transport animal

Why are donkeys still used in many rural and urban societies for transport?

Donkeys make an important and often unrecognised contribution to the economies of many regions through their use in transport, whether for riding, pack transport or for carting loads. Their unique features make them ideal for use by resource poor people in rural and urban areas. The main features, which encourage their use in transport and are likely to do so in the foreseeable future are:

- Convenience, donkey transport is a door-to-door service, which does not rely on good or wide roads. Pack donkeys can go down narrow alleyways and over rough terrain, inaccessible to many motorised forms of transport.
- Being smaller than cattle, they are easier to manage, cheaper to purchase and therefore within the range of more people's budgets.
- Being small, they have the advantage of being easier to load, although the loads carried cannot be as great as those of a horse or mule. This ease of use makes them ideal for the short journeys involved in household chores such as fetching and carrying water, firewood, grain milling, and the purchase of essentials from markets.
- They are more versatile than cattle in that they can pull, carry, and be ridden, fast or slow. They are also eaten (in Ghana donkey meat is currently very popular) and the milk is thought by many cultures in West and East Africa to have medicinal properties.
- They can travel at a greater speed than cattle, when not overloaded and so this makes them useful for transport.

What contribution can the donkey make in transport?

In many parts of Africa local production and trade has been restricted by the capacity of people (generally women) to "headload" produce and goods. Donkeys can remove such limitations. Nowhere is this more noticeable than in Ethiopia, which has one of the highest concentrations of pack donkeys in Africa. Their role in empowering the

poorer part of society in Ethiopia is an example the rest of Africa should consider. Problems and constraints do exist and are worthy of consideration as it is likely that donkey power will continue to be used in transport in the next millennium. Tesfahunegan (1986) suggests that in Ethiopia the contribution of traditional equine transport to the Gross Domestic Product is underestimated. He maintains that this traditional system of transport could be appropriate for Ethiopia in the short to medium term because:

- The sector's resource base (the equine population) reproduces itself and is not subject to depreciation.
- The sector is wholly dependent on locally available resources and not on imported technology and foreign exchange.
- Its operation is not dependent on the provision of transport infrastructure and therefore has great flexibility and hence high penetration capacity in these areas.

The total number of donkeys in Ethiopia is about 5 million (Table 2). Four recognised donkey types exist, unevenly distributed in all agro-ecological zones and the two landscape patterns (Highlands and Lowlands). The small-scale farmers and farmers in the Highlands, have the largest share with 2-3 animals per family. Female donkeys are the most common (70%). In the country as a whole, donkeys provide pack services, carrying over 15 kinds of commodities weighing loads of 60-100 kg. They cover distances of 15-20 km over 4-5 hours (Gebreab *et al.*, 1997). A study by ILCA in 1988 (Crossley, 1991) revealed that donkeys were used for a total of 433 h per year (average 8.3 h/week) in the Debre Brehan area, which suggests a relatively low use in pack transport. However, recent figures for donkey use in peri-urban areas suggest that these animals are used at least 5-6 days per week (Zenebe and Fekade, 1997).

Marketing produce

A donkey provides a means of transporting a range of products more rapidly to market and in greater amounts than can be done on foot, but cheaper and easier than relying on public transport or motor vehicles. It increases the range of distances over which produce from a farm can be sold. As it is a door-to-door service, perishable products such as vegetables (especially tomatoes in Ethiopia), milk, eggs, poultry, grain and animal fodder can arrive safely with less damage, stress or effort, than if they had to be transferred from one means of transport to another and back again. Tesfahunegan (1986) calculated that even with a single animal, the potential cost reduction from substitution of pack for human carriage is of the order of 50%. Observations undertaken along the main roads to and from Addis Ababa revealed that the use of donkeys as opposed to manual transport by people is directly related to the distance covered (Wilson, 1991).

Rural people with donkeys seem to have larger circles of contacts and trade. This enhanced market access allows them to increase their production and trade, thus increasing profits and overall economic activity. Several studies have shown that farmers with a cart or pack animal can get a higher price for their goods than those without access to animal transport (see review by Anderson and Dennis, 1994). Howe and Garba (1997) in a study of subsistence farmers in Kaffecho Zone in Ethiopia found that pack animals offered the only realistic way of obtaining returns from agriculture above mere subsistence. Ownership of an animal in this area significantly reduced total transport costs and increased both the returns to the farmer and the range of distances over which it remains economic to trade. In marketing crop products, high value products such as seeds offered better returns than the food staples such as maize and sorghum (Howe and Garba, 1997).

Peri-urban dairying

Small-scale dairy enterprises are increasing in many developing countries as demand for dairy produce increases in the urban areas. A symposium on dairy marketing at ILRI in 1992 highlighted the problems that are involved in smallholder dairy marketing, one of which is the lack of rapid and cheap transport to urban markets for smallholder dairy enterprises and the other in supplying inputs to these dairy enterprises, especially fodder in the cut-any-carry systems common on the urban fringe (e.g. Debrah, 1992; Kurwijila, 1992; O'Connor, 1992).

Crop production

Timely movement of agricultural inputs (seeds, fertiliser and manure) is essential for successful crop production. Where there are short and less dependable periods of rain, then timeliness is even more important. This is particularly true in places that have recently suffered from droughts and where transport problems appear to be more acute. Efficient transport is equally important after the harvest to market the crops and to minimise losses caused by pests and moisture. Donkey transport allows greater use to be made of manure, crop residues and fertiliser, increasing farm production. Many farmers in rural Ethiopia use donkeys to transport inorganic fertiliser from road heads or distribution centres to their farms.

Reducing drudgery

The work burden of poorer people, particularly women, in peri-urban and rural areas is sometimes not appreciated and it is only when looked at in detail that the size of the work burden is identified. A

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study of the transport needs of poorer sectors of the population in Ghana and Tanzania (Harrison and Howe, 1989) produced the following findings: the transport activities of a rural household in Tanzania occupy 2600 h/annum and involve a load carrying effort of 100 tonne-kms. The figures for Ghana are 4800 h/annum and 200 tonne-km. Most of this transport is effected by women, on foot. Most trips are undertaken to meet agricultural requirements, including marketing and essential domestic needs (Harrison and Howe, 1989). Donkeys provide one of the best and most acceptable ways of reducing this workload in many different situations (e.g. Barwell and Dawson, 1993; Leyland, 1997).

Empowering women

Climate changes, deforestation, population pressure and urban migration are having an impact on women's work and traditional gender divisions of labour are being disrupted. Women are increasingly responsible for managing rural households and farming enterprises. The ease of acquisition, use and the 'gender neutrality' make donkeys popular with some rural women. However, since many societies marginalise both women and donkeys, the benefits of their productive associations are not always encouraged and need to be publicised with sensitivity. There is no doubt that many more women could benefit from the use of donkeys and one of the targets for the future should be to promote, and encourage schemes whereby more women have the opportunity to use donkeys. In rural areas where modern technologies (e.g. motorcycles, power tillers, pick-ups) are being adopted mainly by men, overall transport and work capacity may increase and access to animals may improve for disadvantaged groups. For example, the use of motorcycles by men can release donkeys for women.

Diversification of income

Donkeys offer an opportunity to diversify income in rural areas. In Tigray and the Rift Valley areas the contribution of donkeys in terms of firewood trade to the family income was found to range from 156 to 1404 Ethiopian Birr (ETB) annually (US$ 1 ≅ ETB 6.3). In Ejersa, sand is transported in 20 litre containers fitted on the back of a donkey. Each day a donkey makes 80 shuttles from the river basin to the roadside transporting a volume of sand amounting to 4 m^3 and costing ETB 90. Transport of building materials provides an additional income for many rural and peri-urban donkey owners.

Income generation for landless people.

Pack animal transport is an enterprise that can be, and often is, undertaken by disadvantaged or displaced people. Zenebe and Fekade (1997) investigated the role of donkey pack transporters (DPT) in the major grain market (Yehil Berenda) of Addis Ababa. Their findings are impressive: The number of DPTs working in and around Yehil Berenda was estimated to be between 800 and 1 200, while the number of donkeys is estimated to be between 2 500 and 3 500. In April 1997, the total amount of grain transported by donkeys from Yehil Berenda during the major market days is between 5 000 and 7 000 quintals per day. In comparison to other alternative sources of employment, for example, working as daily labourers at construction sites, most DPTs see the business as a more reliable source of income.

Zenebe and Fekade (1997) found that the donkey pack transport of grain from Yehil Berenda was expanding. It was considered a lucrative business, particularly for those who had a large number of donkeys and regular customers. The activity also provided the opportunity to switch into other preferred activities. There were, for example, some ex-DPTs who have now established themselves as grain traders, mini-bus taxi or mini-truck operators. Zenebe and Fekade (1997) estimated that the minimum monthly net income of a DPT with a single donkey (most DPTs own 2-5 donkeys), was estimated to be ETB 125 in 1997, which was considerably higher than the minimum legally fixed monthly salary of civil servants at the time (ETB 105). This was calculated assuming that the gross income they earned during the major market days (three days in a week) account for 75 per cent of their total monthly income, and correcting it for a monthly food cost of about ETB 25 per donkey.

Success with donkey transport is not confined to the grain markets of Addis Ababa. Recent studies of the use and management of donkeys by poor societies in peri-urban areas in other areas of Ethiopia (Debre Zeit, Holetta and Zeeway) have identified many other 'landless' men who rely on their donkeys as their only source of income, an income they earn through transporting goods for other people. These DPTs have very often started with a female donkey, have bred from her and have gradually built up a group to work. Male donkeys are preferred in general by DPTs as the females require time off around the birth of their offspring. In Zeeway, which is flat terrain, carts predominate over pack donkeys. The main transport tasks are in the peri-urban and urban areas, moving goods from shops to homes, grain from the wholesale centres and markets to the traders, to retail outlets and to households. Donkeys also service the building trade, transporting construction materials to building sites, with some companies even owning their own donkeys.

The donkey in the HIV/AIDS environment

The advent of HIV/AIDS in sub-Saharan Africa, has greatly reduced the capacity of the labour force. This has been particularly evident in the smallholder

farming sector in Zimbabwe where the HIV/AIDS pandemic has taken its toll on the economically active and able-bodied. Orphans, ailing adults and the elderly, now constitute the majority of the labour force (Ncube, 1998). It is therefore, imperative that the introduction of new technologies should take into account this "new" clientele (Ncube, 1998). In this situation, donkeys provide a more appropriate draught power source since they are usually easier to handle than cattle. Since donkeys are also cheaper to purchase and maintain than cattle, this is particularly important for this group of farmers, most of whom are poorer than before, having lost the breadwinners in their family to the pandemic. This clientele is expected to rely heavily on donkey power in the next millennium as the other draught power options are either beyond their reach, financially (tractors) or risky in dry areas (cattle).

The donkey is suited to harsh environments

Water economy

Water is the most limiting factor in semi-arid and arid areas and also during droughts. Reports indicate that donkeys survive better than cattle in these areas and during droughts. In Zimbabwe, Ellis-Jones *et al.*, 1994 reported cattle mortalities of about 75 per cent during the 1991/92 drought compared with only 15 per cent mortalities in donkeys. This ability of donkeys to survive droughts and the harsh conditions in dry areas, has been attributed to their frugal water economy, which is second only to the camel (Wilson, 1981). Nengomasha *et al.* (1997) studied the effect of typical water access of local donkeys on food intake. Donkeys had access to water *ad libitum*, every 48 h or every 72 h. Although the differences in water intake were large ($P<0.001$) between the treatments, the differences in the dry matter intake (DMI) of the donkeys were less ($P<0.05$) than the corresponding difference in water intake (Table 5). Donkeys with limited access to water (48 and 72 h) tended to lose less water through the faeces than their counterparts with *ad libitum* access of water. Faecal water loss can account for 50 per cent of all water lost from the body (Maloiy, 1970). This reduction in faecal water loss could be a survival mechanism particularly when water is limiting. This mechanism has not been detected in cattle (see Houpt, 1993; Forbes, 1995), making donkeys the more reliable resource for the dry areas. With the increasing desertification and warnings on global warming, and predicted severe reduction in water availability, the role and importance of the donkey to the smallholder farmer in the dry areas will continue into the next millennium.

Feeding strategies

The feeding strategies the donkey adopts when eating forage diets are now more completely understood. Comparative studies of the voluntary food intakes of donkeys and ponies fed good, moderate or poor quality roughage diets have shown that donkeys tend to consume less DM per day (Pearson and Merritt, 1991). As a result, they have a slower rate of passage of digesta through the gastro-intestinal tract and have a higher apparent digestibility of both organic matter and fibre fractions than has been measured in ponies. Higher intakes by ponies fed these forages seemed to compensate for the measured differences in the digestibility of feed components between the donkeys and the ponies when they were allowed *ad libitum* access (Pearson and Merritt, 1991). But donkeys have the advantage when food allowance is restricted.

On poor quality cereal straw diets and stovers, it appears better to feed donkeys *ad libitum*, to allow for the possibility of some selection, which they seem to do well, to improve feeding value of these poor quality diets. On good quality forages, however, donkeys and ponies overeat if allowed *ad libitum* access, something that is likely to be a problem where the good quality feeds are often purchased to supplement basal grazing or cereal straws. on good quality hays and legume forages, restricting access can maximise digestibility of the dietary components, and reduce over-consumption (Pearson *et al.*, 1998).

Table 5: Mean water intake (litres ± sem), dry matter intake (DMI) (kg± sem) and faecal water content (g/kg) of donkeys fed a poor quality hay *ad libitum* with access to water either *ad libitum*, every 48 h or 72 h for 35 days (after Nengomasha *et al.*, 1997).

Access to water	Water intake	DMI	Faecal water content
Ad libitum	8.5 ± 0.61^{a}	3.1 ± 0.14^{a}	662^{a}
Every 48 h	4.9 ± 0.30^{b}	$2.8 \pm 0.07^{a,b}$	642^{b}
Every 72 h	5.1 ± 0.29^{b}	2.7 ± 0.09^{b}	629^{b}

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Other uses of the donkey

With the slow pace of development in the remote areas of most developing countries, donkeys will continue to provide one of the reliable sources of draught power. For example, in the remote parts of Zimbabwe, donkeys are used to ferry the sick to far away health centres (P. Jones, pers. comm.). In the drive to improve the literacy of the rural populace in Zimbabwe, donkeys have also found a new niche in the transport of mobile rural library units. This has enhanced their renowned prowess in pulling carts.

Recently in Zimbabwe, draught implement manufacturers (e.g. Zimplow Ltd.) local artisans (e.g. Walco Manufacturing Pvt. Ltd.) and other organisations (e.g. GTZ), have developed donkey-adapted draught implements. The increased availability of these light-weight implements for use by donkeys, has suggested that there is scope for greater employment of donkeys in field operations such as weeding, ripping, tie-ridging and opening of planting furrows, especially where there is a shortage of DAP. For example, the Toolframe (GTZ), has been developed specifically for use by single donkeys (see Hagmann, 1994). Lighter donkey-drawn ploughs are now being manufactured in Zimbabwe and exported in the sub-region (W. Chipepera, pers. comm.). This offers smallholder farmers, who have generally complained about the unavailability of lighter donkey-drawn implements, opportunities to optimise the use of their donkeys. Trials with the use of a single donkey for cultivating, ripping and harrowing with the Toolframe, have been encouraging (Dube, 1996) making donkeys more versatile for the resource-poor smallholder farmers and those involved in peri-urban food production, particularly horticulture.

Constraints, challenges and interventions required to improve the use of donkeys

Lack of information

Despite the advantages of donkeys as a source of DAP there are still constraints which limit their use in some semi-arid areas. Probably one of the most important limitations has been the general lack of information on the proper management of donkeys. However, there has been an increase in interest in donkeys as evidenced by the recent number of new publications on this species (e.g. Prasad *et al.,* 1991; Ellis-Jones *et al.,* 1994; Mrema, 1994; Hagmann and Prasad, 1995; Jones, P.A., 1997; Nengomasha *et al.,* 1997; Fielding and Krause, 1998. This renewed interest and realisation of the importance of donkeys by farmers, has resulted in improvements in the management of donkeys in for example southwestern Zimbabwe (Ellis-Jones *et al.,* 1994). This is encouraging and offers hope for farmers using donkeys in the next millennium. Research and extension information on donkeys should be readily available to the farmers. This could be achieved by greater sharing and dissemination of available and emerging information on donkeys within the region (Eastern and Southern Africa) in particular, and with other regions, in general.

The poor perception of donkeys has led to neglect. Now that the importance of the donkey is finally being appreciated, a positive change in their image is possible. One intervention would be to introduce donkey management in the secondary and tertiary education. This should lead to a greater acceptance and awareness of this species as an important DAP resource. Participation of smallholder farmers, peri-urban agriculturalists and transport operators in improving the image of the donkey, is necessary to facilitate prompt adoption of available interventions.

Official attitudes and policies

Despite the apparent advantages and importance of using donkeys to transport goods, recognised by the public who are direct beneficiaries of the service, government planners and officials in general tend to regard it as an inferior occupation and are not keen to support these activities, particularly in urban areas, unless they can be convinced of the economic importance. The perceived adverse effects on traffic congestion of donkeys entering and leaving towns, their nuisance value and large concentrations at market places, also hardens official attitudes against donkey use in the peri-urban fringe. In the future this is an issue that is unlikely to be confined to Addis Ababa but may spread to other parts of peri-urban Africa where road traffic is increasing, but donkeys are currently bringing goods into and out of towns, both by pack and cart.

Environmental issues

In some urban areas donkeys are regarded as an environmental hazard and this issue is already causing some conflict between local authorities and donkey users in Addis Ababa. On a market day, the 2 500 to 3 000 donkeys that congregate around Yehil Berenda, reportedly cause some environmental pollution and smell, despite the fact that the manure is collected and sold as fuel to low income families in the city. This is an extreme case. However, the problems of environmental pollution when large concentrations of animal congregate cannot be discounted. Increased use of donkeys in transport would add to the problem. On the positive side, collection of the manure for fuel reduces demand for firewood although increased availability of donkeys to transport firewood might be detrimental to forests.

Donkey health and welfare

Information on donkeys used in transport particularly in peri-urban areas is largely restricted to records kept by treatment centres, where sick or injured animals are brought (e.g. Lopez *et al.*, 1998; SPANA 1999), or from general studies of transport systems (e.g. Anderson and Dennis, 1994). Zenebe and Fekade (1997) suggested that the main problems in donkeys in the major grain markets of Addis Ababa were shortage of food, municipal regulations and harassment, with donkeys also being overloaded and suffering from wounds. Welfare is a visible problem in other peri-urban areas, as animals are often seen working with harness sores and in poor condition. Predisposing circumstances are rarely determined, treatment being the priority (Bakkoury and Prentis, 1994). Many DPTs in Ethiopia consider the working life of their donkeys is about 5 years "because of the heavy nature of the work". Donkeys in good environments can live to be at least 30 years old and donkeys are mature at 4-5 years of age. Clearly, a major issue to be addressed in the next millennium, is the promotion of better husbandry practices in areas of heavy donkey use to encourage donkey owners to consider their donkeys as a transport vehicle, worthy of more than 5 years useful life.

Credit facilities

Agricultural finance institutions should be encouraged to promote the use of donkeys by making available credit facilities to smallholder farmers for the purchase of donkeys, donkey-drawn implements or other DAP-related financial assistance. This would empower smallholder farmers and other users of donkeys in their quest for food security and sustenance of decent livelihoods into the next millennium.

Conclusions

This paper has attempted to show the advantages of donkeys over cattle for work in semi arid areas for smallholder farmers and other users in the peri-urban areas. The advantages are clear and the onus is on researchers, extensionists and other practitioners to make information on the proper management of donkeys available to the smallholder farmers and peri-urban users.

Therefore, *"....we re-launch the donkey - a successful model from the past with an impressive future as a four-wheel drive agricultural and transport power source for rural* and peri-urban *areas in the tropics."* (after Fielding and Krause, 1998).

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