Animal traction in South Africa: overview of the key issues

by

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Introduction

Animal traction

In many parts of the world, animal traction is seen by farmers and policy makers as an appropriate, affordable and sustainable technology, requiring few external inputs. Work animals can be used to reduce drudgery and intensify agricultural production, so raising living standards throughout rural communities, benefiting men and women, young and old. Cattle, donkeys, mules, horses and other working animals can provide smallholder farmers with vital power for crop cultivation and transport. Draft animals can also be used for logging, pond construction and road maintenance.

In Asia, Europe, North Africa and Ethiopia, animal power has been used for thousands of years, and it remains important for smallholder farmers. Parts of sub-Saharan Africa have had a long history of using animals for riding and pack transport. It is generally believed that animal traction for tillage and wheeled transport was introduced during the colonial period.

Historical perspective

In South Africa, the first European settlers landed to find the Khoi-khoi training cattle for packing, riding and war purposes. The Europeans started to use teams of oxen for pulling wagons. In 1656 the first imported horses and donkeys were landed and in 1657 it was reported that European settlers were plowing with teams of oxen.

For the next 200-300 years, animal power increased and spread. Oxen pulled the trek wagons and cultivation implements of the settlers. Donkeys worked in the mines. Inter-city freight was generally moved by ox wagon, while horses and mules pulled some inter-city coach services. Donkey carts were common. In many parts of the country, smallholder farming systems became dependent on the use of oxen, donkeys, ponies or mules for cultivation and transport. **At the beginning of this century, animal power was extremely important to all sections of South African society.**

As the twentieth century progressed, mechanical power became increasingly important for transport, mining and large-scale agriculture. **During the middle years of the century (1935–60), the large-scale (generally `white') farming sector moved from almost total dependence on animal power to its present dependence on tractors. However, throughout the century, animal power has remained crucial to smallholder farming and rural transport. Millions of people in the country continue to benefit from draft animals.**

Years of neglect of animal traction

During the 1960s and 1970s, animal traction received almost no attention in South Africa. In other African countries, animal power was also seriously neglected. This was a period when many people in the world thought that the rapid tractorisation recently seen in Europe, North America and on the large-scale farms in South Africa would take place in smallholder systems in Africa. Animal traction dropped out of the curriculum in Europe, North America and most African countries. A whole generation of agricultural students graduated with no formal training relating to animal traction. These agriculturalists with little knowledge of animal traction became responsible for planning and implementing agricultural policies and programmes.

Renewed interest in animal traction

By the late 1970s, sub-Saharan Africa had experienced higher oil prices, foreign exchange shortages and numerous failed tractor schemes. It became clear that rapid motorisation was not, after all, going to be economically viable or practical in the majority of African smallholder farming systems. Animal traction started to be

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perceived by governments throughout Africa as an economically and environmentally appropriate development option that had been neglected. In most of the continent, African governments started to consider animal traction as an important rural power source that could complement mechanical and human power. Even oil-rich countries like Nigeria and Cameroon started to take animal traction seriously, and politicians and agriculturalists promoted animal power as a realistic option for smallholder farmers.

In the 1980s, it was recognised that the use of work animals for smallholder farming and rural transport was *increasing* in most countries in sub-Saharan Africa. The available technology, however, had not changed for more than a generation. There was need for relevant research, development and extension. International networks were formed to promote information exchange and collaboration, including the Animal Traction Network for Eastern and Southern Africa (ATNESA).

Renewed interest in South Africa

In South Africa, not only had animal traction been largely ignored by the authorities since the 1960s, it was actually scorned or criticised in the curricula of some educational institutions. Thus by the 1990s, many people in South Africa had quite negative views on the subject, and failed to perceive its relevance to the new South Africa. To overcome this, the South African Network of Animal Traction (SANAT) was formed in 1993. Its aim was to promote relevant research, development, training and policies concerning the use of animals, and to learn from the experiences of other African countries.

Information on animal power in South Africa was difficult to obtain. Some people thought animal traction had virtually died out. No one was sure of the extent of its use nor of the key issues and constraints. Thus, in 1994 SANAT commissioned the nation-wide animal traction appraisal survey that is reported here.

Overview of the present situation

South Africa presently has a dual agricultural economy. The use of animal power in the large-scale agricultural sector is now uncommon, although hundreds of thousands of oxen, donkeys, horses and mules were employed fifty or so years ago. A small number of large-scale farmers use heavy horses for on-farm transport. They argue that animal-powered transport on farms is a highly profitable option that has been overlooked by most `commercial' farmers. A few large spans of oxen are employed by enthusiasts.

In the urban and peri-urban areas, work animals are no longer common, but some horses are used for local deliveries and scrap collection (eg, Soweto, Thaba Nchu, Bellville, Cape Flats).

Animal power remains both common and important in rural smallholder farming systems (generally the areas formerly known as `Bantustans', `homelands', `self-governing states' and `coloured reserves'). Reliable statistical data on animal power use are unavailable. **The survey team estimates that in the more remote rural areas of South Africa, 40–80% of families engaged in smallholder farming presently make some use of animal power for transport and/or cultivation.**

Historically, oxen were the main work animals. They remain the most popular and important work animals in the country as whole, and in KwaZulu, Transkei, Ciskei and KaNgwane in particular. However, in most smallholder farming areas, the use of work cattle has been reduced by drought, inadequate grazing land and pasture degradation. This has led to increasing use of donkeys by smallholder farmers throughout the country. This is particularly noticeable in the northern provinces.

Donkey carts have major social and economic roles in many rural communities. Local horse breeds are popular in highland areas (around Lesotho, Thaba Nchu, Ciskei) and in the Western Cape. Small numbers of mules are used, but they are seldom bred by smallholders and are generally difficult to obtain.

Social and economic issues

Social roles of animal traction

Animal power in South Africa can be seen to reduce drudgery and increase speed of operations for both men and women. This applies to both tillage and transport operations, when considered in relation to manual alternatives, such as hand hoeing or head loading. Animals are also seen to enhance rural mobility and improve local marketing systems, for both men and women. Until water

distribution systems are widespread, there will be a continued need for drudgery reduction relating to water transport. Naturally, motorised systems of tillage and transport can provide even more drudgery reduction. However, compared with these, animal power has the advantage to rural families of being available, timely and affordable.

Oxen have been the major draft animals, with cattle fulfilling diverse social and economic functions. Cattle are generally considered within the male domain, and the inspanning of oxen has usually been performed by men and boys. Within traditional societies, horses also tend to be male-domain animals, but donkeys are much more gender-neutral.

`Bantustans' made animal traction difficult

In many parts of the country, smallholder farmers spoke with pride about their long-standing animal traction traditions. **Farmers had found that the use of animals had become increasingly difficult since the late 1950s for reasons directly or indirectly associated with the formation of `Bantustans'**. They lacked sufficient land to graze their animals. Pasture was degraded on available communal land. This was exacerbated by droughts (many parts of the `Bantustans' were in areas where farming conditions were relatively poor and of high risk and there had not been the same investment in irrigation as was found in the `white' farming systems).

The authorities did not approach the associated problems of high stocking density, erosion and inadequate pasture by allocating more land. Instead, they attempted to regulate animal numbers. Thus families that required perhaps ten cattle to form a span, were limited to four, making it difficult or impossible to continue to use animal power. Since cattle no longer thrived as they had in the past, farmers in the northern communal areas tended to turn to donkey power, but the authorities actively discouraged or prohibited donkey ownership, so making continued animal power use unfeasible.

Within `Bantustans' the police (according to farmer interviews) took a laissez-faire attitude to the `internal' problems of stock theft (in contrast to police reaction to cattle-rustling elsewhere in South Africa). Thus the risk of animal loss became (and remains) a key constraint to animal power use.

The authorities promoted policies that led to reduced local employment and the underdevelopment of rural economies. Effective marketing (vital for income generation and farm capital accumulation) was generally either ignored or actively discouraged. Smallholder tractorisation was sometimes encouraged, even though when used on small land areas it was not economically viable. Tractors also effectively exported work and money from rural areas to urban centres and abroad (imported fuel and machinery).

Changing economic circumstances

Smallholder farming families in South Africa used to meet most of their subsistence needs from their own production, with income from surpluses being vital for the household economies. Animal power allowed greater and more timely production than was possible with human labour alone. It therefore led to a higher standard of living.

Agriculture is now dominant only in the more remote areas. For many South Africans, economic survival on the small plots of land available (often less than three hectares) is virtually impossible. Remittances from urban wage-earners, pensions and other non-agricultural income have become increasingly important for rural households. Agricultural technologies no longer have the over-riding importance they once had.

Traditionally children were responsible for looking after animals, but with increased schooling, some more labour-intensive farming practices have become impractical.

Female-headed or female-managed households are increasingly common. In many rural families, the men who traditionally undertook work with draft animals now work in towns. Those remaining in the rural areas tend to be old people and women, for whom the inspanning of cattle can be physically difficult or culturally unacceptable. (Some villages reported that the recent recession had increased rural labour as it was more difficult for male workers to obtain urban employment.)

Changing images, attitudes and aspirations

In the more remote areas, farmers still have great pride in their traditional systems of using animals and in the work animals themselves (whether oxen, donkeys or horses). However, in urban and peri-urban

areas, animal power is often perceived as an old-fashioned, backward and outmoded technology, particularly among the young. Farm families increasingly aspire to the `modern', affluent life-styles illustrated on television and in films. Animal traction is not portrayed as part of `modern' systems, nor is it associated with the obviously affluent and economically successful groups in South Africa, such as the urban elites and large-scale, `white' farmers. The negative image has been reinforced by agricultural and administrative authorities in several parts of the country that have actively discouraged the use of animal power.

Almost all farmers, whatever their scale, would like to own or to use tractors and motor cars. The only farmers who expressed some doubts about this were those who had suffered financially from the attempted ownership of such technology.

Because of the poor public image of animal power, some farmers interviewed were reluctant to admit to using work animals. They did not wish to be perceived as `backward'.

Widespread concern was expressed that the young were not interested in taking up the technology. It did not have a modern image and at school they were taught that it was old-fashioned. Existing knowledge and expertise were not automatically being passed on within villages.

Education, knowledge and perceptions

For more than a generation, there has been an almost complete neglect of animal traction technology in the curricula of schools, agricultural colleges and universities. Nevertheless, some `misinformation' appears to have been disseminated, so that students and agricultural staff often have incorrect concerns about animal traction in general and the role of donkeys in particular.

Agricultural extension workers graduating this year will have had no instruction in either old or new ways of employing draft animals, even though the technology may well be used by the majority of their clients.

Approaches to agricultural development have tended to be centralised and paternalistic, ignoring the social complexity of rural communities and neglecting the importance of indigenous knowledge and skills. Senior agricultural staff, based in urban or peri-urban locations, have seldom had practice in listening to the concerns and needs of smallholder farming families. They have generally equated development with adoption of the labour-saving practices used in large-scale farming, seldom considering the implications for small-scale farmers.

In some provinces, senior agricultural staff dismissed local use of animal traction as `negligible', even though the majority of smallholder farmers in their rural areas were actually using animal power.

Changing policies and perceptions

Official perceptions about animal traction are not all negative. With the momentous political and social changes of past two years, rapid changes can be expected. **The Reconstruction and Development Programme (RDP) makes many references relevant to animal traction concerning farmer-driven extension, appropriate technology, sustainable agriculture, rural transport and assistance to rural women.** Officials in some areas, notably Transkei and Ciskei, were very positive about animal traction, and at least one African National Congress (ANC) politician in Eastern Cape has publicly spoken about actively encouraging animal traction.

Survey team members found that in many areas they themselves had helped to create new awareness simply by visiting agricultural institutions and posing questions. As a result of such discussions, the people visited started to consider the extent of animal power use and the present lack of training, extension advice and backup services. Recent workshops arranged by the Foundation for Research Development and SANAT have stimulated enthusiasm in the topic. **There is now considerable interest among some professionals in the investigation and development of animal traction technologies.**

Animal issues

Choice of draft animals

Farmers expressed many views concerning their past, present and future choices of draft animals. In some areas, one type of animal was strongly preferred (eg, oxen in much of KwaZulu, donkeys in Namaqualand, horses in Ebenhaeser, Western Cape).

In many societies, the ownership of cattle is very desirable for several agricultural,

economic and social purposes. This is one reason why cattle tend to be the most available and preferred work animals. Oxen, mules and horses were often considered animals of high status, and often had strong masculine connections within communities. Much depended on the land and capital resources available to the farmer. Larger and more numerous draft animals allow greater work, but they cost more money. Increasingly important for farmers were the characteristics of survivability and low labour and management requirements. Such criteria favour donkeys.

Cattle

Oxen have been, and remain, the main draft animals in South Africa. While reliable statistics on the numbers of work oxen are not available, it may be estimated that over 500 000 draft oxen are used each year. This figure represents 10% of the cattle owned in the former `Bantustan' areas.

Oxen are perceived as powerful draft animals for plowing, but quite slow and labour-intensive. Some cows are used for work when there are not sufficient oxen, and bulls may sometimes be worked as part of a team.

Cattle have many different functions, of which work is but one. Thus reduction in the use of work oxen does not necessarily mean reduction in the numbers of animals owned or grazed.

Forty years ago, most smallholder farmers in the country used cattle for plowing. Since then, their use has gradually decreased, although very large numbers of cattle are still spanned each year. In some areas, it was reported that the use of oxen for plowing had started to increase again, following the failure of tractor schemes.

More commonly, farmers reported the number of work oxen was slowly decreasing due to lack of land and grazing, lack of labour, lack of interest by the young generation and the availability of tractors. The use of work cattle appears particularly persistent in Transkei. In many parts of the country, farmers reported that although the practice of plowing with oxen had been decreasing, their continued use for seeding and weeding was still very widespread.

Donkeys

Until recently, donkeys have been used mainly in the drier areas (Northern Cape, North-West Province, Northern Transvaal) for transport purposes (packing in hill areas, carting in flat regions). Farmers reported that their range was now expanding and they were increasingly being used for plowing and weeding as well.

There are probably over 150 000 donkeys employed in the country. There used to be many more in the days when they were used on large-scale farms and in the mines.

Donkeys are renowned for their exceptional survivability, longevity, low cost and low management requirements. They are used by men, women and children. In some areas over half the donkey carts are controlled by women.

In many areas, farmers reported that their working cattle were replaced by donkeys due to the overcrowding, drought conditions and veld degradation that started in the late 1950s. **Farmers were clear and adamant that their decision to use donkeys followed the problems of drought, poor pasture and low cattle survival. This was in marked contrast to the views expressed by several government agencies that blamed the donkeys for causing the problems of veld degradation.**

Donkeys now have a particularly bad image among agricultural staff. According to older people and from the farming publications of earlier years, this was not the case in the days when donkeys were widely used by large-scale farmers and transporters. Since many people reported the same myths and misconceptions about donkeys, it appears there has been some educational `misinformation' (whether intentional or unintentional). For example, it was widely, but erroneously, reported by officials (never by farmers) that donkeys eat more than cattle, they are non-productive, they destroy the veld, they are unowned and expendable and that there are too many donkeys. (These misconceptions are discussed in the final chapter.)

The great value of donkeys to rural communities has been largely ignored by the authorities and by urban and peri-urban people. Donkeys are often seen as pests, animals that should be discouraged or eliminated. Even some of the more affluent and influential rural residents have negative views on donkeys. This appears partly the result of official `misinformation' and partly arises from a conflict of interests (donkeys may compete for grazing with their livestock and could be a threat to their vehicles).

Anti-donkey campaigns

In most South African societies, donkeys are mildly ridiculed in conversation and through traditional words and phrases. However, the present `bad name' of the donkey among agricultural officials and extensionists appears to be a quite recent phenomenon, perhaps dating from the 1950s. It appears that at some stage the central authorities initiated a policy of actively reducing the donkey population. Donkeys were deemed unnecessary and unproductive animals (as indeed they were to those members of society with adequate access to tractors and motorised transport). Since this time, donkeys have been officially discouraged or culled in almost all former `Bantustans'.

In some areas donkeys were totally banned (eg, Thaba Nchu) or taxed much more than cattle (eg, Transkei). In some areas, donkeys were castrated or limits were placed on the ownership of females. Some authorities favoured the collection of `surplus' donkeys, for crocodile farmers or lion parks (eg, KwaNdebele, Lebowa). In some areas donkeys were simply shot (eg, Bophuthatswana). Attempts at reducing donkey numbers voluntarily (eg, KwaZulu) failed, because farmers still wanted and needed donkeys. The worst case was in Boputhatswana where in 1981/82 large numbers of donkeys that farmers owned, wanted and needed were shot by the authorities (farmers reported they were `still crying' about this `massacre').

Although all donkeys are owned and have names, farmers now tend to be reluctant to acknowledge donkey ownership. In many areas (despite the claims of agricultural authorities of excessive donkey numbers) farmers reported there was a shortage of donkeys. **In all areas, farmers expected that the use of donkeys would increase in the coming years.**

Horses and ponies

The use of horses and ponies is quite localised. They are mostly maintained for riding in highland areas (notably in the Eastern Cape). Their wider distribution has been limited by the enzootic disease African horse-sickness. There are about 180 000 in the former `Bantustan' areas, mainly in Transkei.

Some horses are used to pull carts in urban and peri-urban areas, as well in rural parts of the Eastern and Western Cape. Some are hardy `Basuto ponies' which work well for years. Others are `thoroughbreds', bought cheaply from the racing industry. These culled horses, which have not been bred as draft animals, are said to have quite short lives pulling urban delivery wagons.

Horses are perceived as strong, fast transport animals, but they do not have the hardiness of other draft animals. Horses maintained for transport may assist with agricultural operations, such as weeding. In parts of the Western Cape they are used for plowing. A few (perhaps 100) heavy horses (mainly Percheron, some Clydesdales and Shires) are employed, mainly in the Eastern Cape for on-farm transport and some logging.

Mules, hinnies and zebra

Small numbers of mules (formed by crossing a female horse with a male donkey) are found in most areas of South Africa. They amount to perhaps 2000 in the whole country. They are perceived as strong and resilient work animals. They require regular work to keep them tractable, and for most of the year mules pull carts or wagons. They may also be employed for plowing, seeding and weeding. In Transkei, mules may be worked in mixed spans with cattle.

The size and temperament of mules mean they are generally considered as animals suitable for use by men, rather than women or children. They are very expensive relative to donkeys, but similar in price to oxen. They tend to be bought by farmers who have established profitable transport businesses using animals.

Until recently, mules were highly valued for logging operations. Logging with mules is still likely to be efficient, profitable and environmentally friendly (animal-based logging is increasing again in industrialised Europe). Its decline may well have been based on ideas of `modernisation'.

The apparent demand for mules outstrips the very limited supply. Most mules are bred as side-line enterprises on large-scale (`white') farms. These farms have ample land, so that there are few direct costs in maintaining the female horses for breeding. Mules are seldom bred in the smallholder farming areas where they are used, and traders may travel long distances to obtain them. There are two government-owned mule-breeding stations (in Northern Transvaal and Eastern Cape) but their output is presently small and income from sales is insufficient to cover the annual costs of maintaining the breeding horses.

There is little evidence relating to the use or breeding of hinnies (female donkey and male horse), perhaps because this cross is more difficult to produce. Although it has proved technically possible to harness zebra for work and to produce donkey/zebra crosses, such initiatives have had no effect on smallholder farming systems.

Animal nutrition and health

Drought conditions and the linked problems of communal grazing, `land-hunger' and pasture degradation have been major factors in the recent reduction in the use of work animals, particularly oxen. Farmers reported that they had seen the pasture quality decline and the plant species present change. In some areas fire was a problem. Few farmers conserved forage for their animals. It was unusual to supplement the diet of work animals other than horses. Farmers whose cattle were in too poor condition for effective work due to lack of feed often responded to the problem by buying donkeys to undertake the work.

During the survey, animal disease was seldom cited as a major constraint to the use of draft animals. Poor cattle survival was attributed to pasture problems rather than disease. The almost legendary ability of donkeys to survive (up to twenty-five years) without any veterinary intervention was often cited.

Farmers sometimes regarded the veterinary services with great suspicion. In several areas veterinary agents have actively tried to discourage farmers from using animal traction, arguing that it reduces production. They have argued that using cattle for work reduces meat quality and quantity. They have also said that donkeys and mature oxen are `non-productive'.

Animal supply and marketing

Farmers frequently complained of the lack of availability of draft animals. This was partly associated with the problems of drought, inadequate grazing and limits on stock numbers. In some areas stock theft is very serious. Donkeys are often in short supply, partly due to the culling or shooting by authorities.

Some authorities have been promoting exotic breeds, less suited to multipurpose meat/work uses. In some areas, it was reported that the price paid per kilogram for culled work cattle at sales had been intentionally marked down. This was specifically to discourage animal traction. It was apparently a policy issue, and was not due to market forces, for there was no suggestion that consumers paid any less for such meat.

Technology and operational issues

Operations using animals

In different parts of South Africa, draft animals are used for a very wide number of operations including plowing, harrowing, seeding, weeding, mowing, raking, crop lifting, fertiliser-spreading, pond excavation, logging and transport. **The great majority of animals are used mainly for plowing and for transport.** Animal-drawn planters are used to a small extent in most areas and animal-powered weeding is well established in the Western and Eastern Cape (notably in Transkei).

There are probably about 200 000 animal-drawn plows in use. The figure was 330 000 in 1964. New plow sales are about 6000–8000 units a year, with many plows having a working life of more than 20 years. There are also about 90 000 cultivators and 60 000 planters in use (annual sales of each abut 6000).

Yokes, harnesses and spanning systems

Cattle are yoked in pairs, using wooden withers yokes. Many yokes have been purchased from distant retail stores, having been manufactured by large-scale suppliers (elsewhere in Africa and the world, yokes are usually made within the villages). Few problems with yokes were reported or observed. However, in some areas farmers do not know about the longer yokes required for successful weeding.

The number of animals worked together varies from single pairs (common for light carting and weeding), to spans of four or six (most common for plowing) to larger spans of up to 16 animals (now quite rare) used for pulling multi-furrow plows. Two or sometimes three people work with the oxen, whether there be two animals or eight. It is rare for one person to work with oxen alone (although this is standard practice in Ethiopia, Asia, Europe and Latin America).

Horses, donkeys and mules are harnessed with breastbands made from a variety of materials. Leather harnesses are made locally by farmers in Namaqualand. Professionally made harnesses are available (at a high price) from some retail outlets. The use of synthetic webbing is

becoming more common in the formal retail sector, but at village level industrial webbing, belting and tyre rubber are more common. **Farmers often reported problems in obtaining good, cheap harnesses.** Many existing harnesses are crudely repaired with wire, causing problems to the animals.

One problem with donkey harnessing systems is their high cost relative to the value of the animals. A span of six oxen, worth perhaps R 9000 in total, can be yoked for about R 300 (about 3% of their value). A heavy horse or mule, worth perhaps R 1200–2400, can be harnessed for about R 1200 (50–100% of its value). However, at retail stores harnesses for a team of four donkeys, together worth about R 240, costs about R 2400 (1000% of their value).

Either one or two people work with horses and donkeys. Horses are generally worked singly. Donkeys are worked in pairs, with two to four animals being common for transport (up to ten for heavy loads) and four to fourteen for plowing.

The widely used system of harnessing two (or more) donkeys to a two-wheel cart can cause distress to the animals. The weight of the dissel-boom (and any unbalanced load) is taken on the necks of the donkeys and thin straps can cut into the flesh. Elsewhere in the world, this problem is generally avoided by using carts for single donkeys. On these the weight of the two shafts is taken by a broad saddle on the animal's back, which is more comfortable. **Although lightweight carts for single donkeys are very common in several parts of the world, including West Africa, they were not seen during the survey. People in South Africa appeared unaware of such designs.**

Implement supply and suitability

On a national scale, implements and spare parts of the long-established *Safim*-type designs are readily available, with over 20 000 implements and many more plow shares sold each year. Most stocks are maintained in large towns. In the more remote rural areas many implements are unused because farmers cannot obtain spares nearby. For some larger, older equipment such as mowers, rakes and three-furrow donkey plows, parts are generally unobtainable by farmers, and their use will gradually die out unless a source of parts is found.

The *Safim*-type designs are well-proven (more than 50 years old) but are heavy and date back to the era when men worked with large spans of draft oxen. **Nowadays ox spans are smaller, donkeys are more common and women and young people increasingly handle the implements. However, there is no modern or lightweight equipment available.**

Rural transport

Most carts are locally made by artisans using materials derived from road vehicles. They carry both goods and people. There are no standard designs (or standard spares) and prices vary greatly, depending on the supply of, and demand for, scrap axles. Carts tend to be strong but heavy.

Two-wheel carts are generally pulled by two or four animals (increasingly the animals are donkeys). With cattle, the weight of the dissel-boom (plus any unbalanced load weight) is borne by the animals' withers via the yoke. This seldom causes problems. However, with donkeys and horses the weight is taken by neck straps, which can cause problems for the animals (as noted above).

Four-wheel wagons pulled by two to eight animals are used for heavier rural loads, peri-urban contract transport and some urban deliveries. Four-wheel wagons tend to cost at least double the price of two-wheel carts, since the most expensive components are the wheel-and-axle assemblies. Their payload is much greater, but they tend to be less convenient for manoeuvring. Horses and donkeys do not experience the same harnessing problems with four-wheel wagons since the load is entirely carried by the four wheels. Thus the neck bands only take the weight of the dissel-boom itself.

In some areas, notably Transkei, KwaZulu and KaNgwane, sledges drawn by two to eight animals are common. These have the advantage of being very cheap and in hilly areas they do not have the same braking problems experienced by carts. However, their load capacity is low and they may accelerate erosion on hillsides (as would other vehicles).

Tractor issues

General situation and position

The present survey concerned animal traction and not tractors. However, in virtually all interviews, whether with farmers or agricultural officials, tractor issues were discussed. **Tractors are increasingly being used in South Africa as a whole, and it is unrealistic**

to review animal traction without considering tractor issues. The position of the survey team was technologically neutral: both animal traction and tractors were options for farmers, with advantages and disadvantages. The technologies could be complementary, and both could be used on the same farm. They could coexist in any area, preferably operated in a free market by the private sector and with `a level playing field' of policy support.

History of tractorisation

The number of tractors in South Africa increased gradually from 230 in 1918, to 6000 in 1937, and then to 20 000 in 1948. During the 1950s there was rapid tractorisation. There were over 100 000 tractors in use by 1960. These tractors were mainly privately owned by the large-scale (`white') farming sector. Tractorisation on the large farms was assisted by cheap credit secured by land ownership. The main factor that made tractorisation possible was the large size of the farms, which were rarely less than 100 ha. Relatively `small' large-scale farms that were unable to repay tractorisation loans went bankrupt, and the land was bought by neighbouring farms, so the smaller large-scale farms (on which tractorisation was not economic) were gradually eliminated. Similar patterns of tractorisation, with the gradual bankruptcy and elimination of smaller farms have taken place elsewhere in the world.

Tractor economics

Tractors are extremely effective at plowing large areas in a short time. However they are expensive and economically justified only on large farms or farms with high net income. Although it depends on levels of production, most farms on which tractors are economically viable are in excess of 100 ha. Most smallholder farms are less than 10 ha and very many are less than 2 ha, which is well below the size at which tractor ownership can be economically justified.

Despite their lack of economic viability on small farms, tractors are very popular and convey high status. Most farmers would like to own tractors. Some smallholders contacted had purchased their own tractors. These were generally second-hand and had been bought using non-agricultural income (wages or business). Such tractors were often little used due to high running and repair costs.

Tractors are not well suited to smallholder farming systems where small and dispersed fields have to be cultivated in remote areas. This causes a disproportionate amount of tractor time to be spent on travelling, turning and awaiting inputs. The high costs associated with such operational `inefficiency' can seldom be justified by the resulting crop yields, particularly in risk-prone areas.

Most private tractors in the smallholder sector have been bought with non-agricultural income. Even when hired out, they tend to be unsustainable and capital depleting.

In those areas where there has been some success with private tractor hire, there appear to be specific economic conditions. These include profitable cropping systems with good rainfall and/or irrigation on fertile soils, large individual farm areas (eg, sugar cane farms) or land that is consolidated (or not badly fragmented) and nearby infrastructural backup. Such conditions are very rare in the smallholder farming areas.

The lack of intrinsic profitability of smallholder tractorisation is illustrated by the lack of successful tractor entrepreneurs operating in the remote rural sector. This is in marked contrast to the entrepreneurial successes in South Africa of privately-owned taxis, road transport, retailing, etc. Fleets of hire tractors have not been built up in any smallholder areas of South Africa (whereas taxi, bus and truck fleets have).

The lack of intrinsic profitability of using tractors in many smallholder farming systems has been masked by several factors. The high status of tractors has made their use and ownership popular, even when capital-depleting. The system of migratory labour has allowed wage-earners to send remittances to pay for tractor services that could not be afforded from farm income. Bankruptcies among tractor owners have been kept low since commercial credit has been largely unattainable due to lack of land ownership and collateral. Thus unprofitable investments have been made through savings or `soft' public-sector loans, and have not been publicly ruinous. Many tractors have been bought quite cheaply from failed public sector schemes or from the previously-subsidised large-scale sector.

Subsidised tractor-hire schemes

Government tractor-hire schemes have been highly subsidised. They were popular while they were working, but have also proved expensive and unsustainable. Some parastatals have claimed they were not subsidising the services anymore, but in all cases examined there have been some subsidies in the calculations of capital and/or running costs (if there were none, the services would be sustainable by the private sector). **The unsustainability of smallholder tractor-hire schemes is true not just for South Africa, but elsewhere in Africa and the world.** The only `exceptions' prove the general rule (need for consolidated land, high value output, etc).

Although subsidised tractor schemes are no longer on the political agenda, some lessons from previous schemes need to be noted. Subsidised tractors compete against non-subsidised animal traction and this tends to marginalise those people or family members who rely on animal systems. Farmers are encouraged to abandon work animals. When tractor schemes prove unsustainable (as they invariably do) it is much more difficult to re-start animal traction. Not only have some skills been lost in the intervening years, but farmers do not like to move `backwards' from tractors to animals. In some cases, farmers reported that when tractor services failed, fields remained uncultivated for a time, before animal power was seen as the only viable option.

Advantages and disadvantages

Tractors can plow when soil conditions are hard. They are much faster and more timely for those individuals for whom they are available at the right time. **The advantage of tractor timeliness is dependent on tractor availability.** For those people low down on the contractors' plowing list, animals might prove to be both more timely and less risky. Tractors allow larger areas to be cultivated, although this is an advantage only for those with adequate land.

There appear no conclusive advantages or disadvantages of tractors and animals in relation to yields. Much depends on the soils, rainfall, spacing, timing and the operators. Examples were cited of relative benefits of each, in different situations. Row spacing with tractors tends to be wider (eg, in vineyards), and this may reduce yield per unit area. Tractors are more likely to have adverse ecological effects than draft animals.

For every R 100 spent on tractor hire, most is exported from the rural area. For every R 100 spent on the hire of draft animals, most remains within the community.

Tractor availability and supply

Many farmers commented that is was difficult to hire tractors. This `problem' of tractor availability had been confirmed by recent estimates suggesting that there are about 12 000 tractors in the former `homeland' areas. Of these about one half may be operational and may plow 80 ha/year on average. On the basis of these estimates, existing tractors can only be expected to plow one third of the available smallholder arable land (Auerbach and Gandar, 1994). The same source estimated that the cattle owned in these areas were theoretically capable of plowing all fields currently cultivated (assuming 25% of animals were worked for an average of 200 hours per year).

The majority of tractors owned by smallholder farmers have been bought second-hand. The availability of second-hand tractors has been declining in recent years, as large-scale farmers have been buying fewer new tractors (15 000 new units per year in the 1970s have dropped to 2000–3000 units in the 1990s). Furthermore the second-hand supply from government-owned schemes is unlikely to continue. Most such schemes are being, or have been, phased out. **Thus tractors are unlikely to be widely availabile in the near future and draft animals are likely to continue to have an important role.**

Complementarity

The adoption of tractors for plowing does not preclude use of draft animals for other operations (eg seeding, weeding, transport). Indeed if farmers totally abandon animal traction because of tractor plowing services, their families may lose a very important cultivation and transport resource. For example, if a male farmer disposes of draft animals due to tractor availability for plowing, his wife may lose the use of the animal-drawn cart for carrying water.

In several parts of South Africa farmers consider tractors and work animals to be complementary, with tractors (if available) used for rapid power-intensive plowing and

animals for subsequent control-intensive seeding, weeding and year-round transport.

Research, development and extension needs

On the basis of the information obtained from the field observations, discussions with farming families, literature analysis and the views expressed by students and professionals involved in education, research and agricultural development, the following areas now appear to require attention.

Approaches

In the past, top-down approaches to research, development and extension have been (and remain) widespread. Many of the professionals contacted were unfamiliar with participatory methodologies involving farming systems perspectives, social understanding and recognition of the importance of indigenous knowledge and skills. Due to lack of discussion with farmers, knowledge about animal traction and its role in rural communities is extremely limited. **Farmers (and farming families) should be consulted at all stages in future work relating to animal traction research, development and extension. Where practicable, animal traction research and development should be multidisciplinary, multiracial and multigender.**

In order to maximise benefits, and avoid errors, future research, development and training relating to animal traction should be based on a networking approach: sharing experiences and ideas between institutions (both nationally and internationally). **South Africa has much to benefit from the experiences of other African countries, and much to contribute as well.**

Technology research and development

Animal traction technology research and development programmes should be based on local problem identification, and should be planned and implemented in conjunction with local farmers.

In general, the technologies most likely to be appropriate are those which emphasise one or more of the following:

- **Low draft requirements** (suitable for donkeys or small numbers of oxen)
- **Lower labour levels** (eg, one person working with animals)
- **Acceptability to young people and to women**
- **Convenience and ease of use**
- **Complementarity** (eg, planting and secondary-tillage technologies that complement tractor plowing)
- **A modern image** (eg, use of new techniques, materials and colours), perhaps including systems in which animals can be seen to work profitably in large-scale farming systems.

Three of these areas may warrant specific studies.

- Ways in which animal traction can further benefit women, through drudgery reduction, income generation or the avoidance of further marginalisation.
- Ways in which young people can be creatively and beneficially involved in animal traction technologies.
- Ways in which large-scale farming systems could profitably benefit from animal power.

Training and curriculum development

To ensure that the future generation of South Africa is aware of animal traction issues and technologies, there is a need to ensure that the topic is adequately covered in schools and colleges. A detailed analysis of primary, secondary and tertiary curricula needs is required. Priority should be given to ensuring that draft animal technologies are covered within agricultural colleges and universities.

Given the lack of training in animal traction in the past, the majority of teachers, extensionists and staff of agricultural training institutions have little understanding of animal traction. **There is urgent need for appropriate in-service training with initial emphasis on the training of trainers.** To cater for different levels of staff, training courses or workshops may have to be organised at national, provincial and district levels.

In order to assist the training programme envisaged, animal traction resource centres should be established (or further developed) within national (eg, University of Fort Hare, University of Pretoria) and provincial institutions. While such centres should have appropriate training materials, wherever practicable, emphasis should be on on-farm training and interaction with farmers.

In order that young people are encouraged to value draft animals, SANAT, or an associated body, should develop and disseminate a package of training materials suitable for schools and young farmers' clubs.

A high quality animal traction video should be prepared at the earliest opportunity. It could be screened as a television programme. The main aim should be to make people aware of different animal traction uses and options. This should include images of draft animals being employed in different areas of South Africa (and perhaps elsewhere) with interviews with farmers (of both genders) and with different professionals (socio-economist, animal husbandry expert, agricultural engineer, etc). Such a general, awareness-raising video, would have value in schools and agricultural colleges.

Environmental impact of draft animals

In the past, some agricultural authorities within South Africa have claimed that animal traction should be discouraged due to pasture degradation and limited carrying capacity. Donkeys, in particular, have been blamed for over-grazing and environmental damage (a view disputed by smallholder farmers). There appears no objective, authoritative evidence to either support or reject such contentions. A thorough and reliable research study would be valuable, particularly if it were approached in a constructive, development-orientated way, looking (among other things) at different ways in which the number of animals that farmers require can be maintained.

An associated study (but one not limited to draft animal issues) might review existing research knowledge and farmer observations concerning the changes in pasture quality on communal land. Such a study would be wide-ranging and multi-institutional, with recognition of the importance of indigenous knowledge in this field.

Animal feeding and pasture

The poor condition of draft animals at the start of the plowing season was cited as a constraint. To overcome this, a detailed study of feeding, feed conservation systems and low-cost feed supplements would be valuable, based on present practices and resource limitations. The study should be farmer-centred and multidisciplinary, with a strong socio-economic component.

Prospects for mules and hinnies

Mules are not widely used, partly because of limited supply. The mule breeding centres in Northern Transvaal and the Eastern Cape are unlikely either to meet local demand or to be economically viable in the near future. They should not be further developed, nor abandoned, without a detailed technical and economic study of the prospects for mules and/or hinnies within South African farming systems.

Stock theft and fencing

Stock theft is a major problem that affects draft animals (cattle, donkeys and horses) and it sometimes influences whether animal traction is used at all. Associated problems relate to effective animal identification and the adequate fencing of communal lands (and the roads that pass through them). Case histories of successes and failures should be collected and reviewed, to enable an analysis with recommendations to be published.

Weeding technology

In several parts of South Africa, draft animals are used very little for weeding, even though animals often have a distinct comparative advantage over alternative systems (hand, tractor, chemical). This is partly because of lack of suitable implements (or yokes) or lack of training/extension. Lightweight weeders suitable for use with donkeys could prove valuable, as could weeding ridgers. A farming systems research-extension programme would be valuable, particularly in the north of the country.

Tillage systems and implements

Several engineering studies appear to be required. These should be carried out using a networking approach (benefiting from Zambian, Zimbabwean and other experiences) and farmer-based testing procedures. They include:

- Identification and testing of lightweight tillage implements, including plows, suitable for use with donkeys or paired oxen in food gardens and small plots.
- The potential for conservation tillage with animal power.
- The potential for winter tillage with animal power.

A more detailed study should be undertaken on the wide range of animal traction implements that were used in South Africa, and/or which

are still being used in specific areas (eg, mowers and rakes in Ebenhaeser, three-furrow donkey plows in Namaqualand). Recommendations should be made on how to repair and/or replace such implements and whether they should be promoted in other areas.

Harness making

Existing harnesses for donkeys and horses are often poorly designed (and are sometimes both inefficient and cruel). Farmers complained that repair and replacement are problems. There is a need for good but inexpensive local supplies, preferably involving village-level production. Good harnessing skills do exist in the country (eg, in Namaqualand) and a very useful village-level training programme could be developed, using farmer-to-farmer exchanges.

Animal-drawn carts

In some areas the use of animal-drawn carts is presently restricted by limited supply and/or high costs. There was significant farmer-interest in some areas in the possibility of using lightweight donkey carts (as widely used in West Africa). Supplies of good yet cheap axle and wheel sets might well improve rural transport. Emphasis would be on local fabrication and/or assembly.

Horses, and occasionally donkeys, are used for urban transport in several areas. Animal welfare groups have expressed concern about the condition of animals and their short life-span in Gauteng, but in other locations, including Thaba Nchu and the Cape Flats, the technology appears economically viable. A detailed study of such transport systems, and the needs of the operators and animals could be valuable.

In rural areas, local animal-drawn transport is often very beneficial to communities, but problems are encountered in places where fast, inter-city roads traverse rural areas. One answer is to have graded cart-tracks running parallel to the main roads, so that the interests of the rural community and those of the vehicle drivers are both met. This option may require further feasibility studies, or promotion to local planning authorities.

Forestry and logging

In many parts of the world (including European countries) logging with animals is economically viable and ecologically desirable. Draft animals used to be important for logging in South Africa, and in some areas they are still employed, but the technology has recently been neglected. The prospects for complementing mechanised systems with animal-powered logging could be a useful topic for study.

Some policy implications

Animal traction within the RDP

In 1994, the new government was elected and the Reconstruction and Development Programme (RDP) was introduced. This is to tackle many of the issues relating to draft animal power, including land reform and the general need to improve the quality of rural infrastructure and services to make people (including young people) happy to live in and develop the remote rural areas.

With a positive policy environment that recognises the past, present and future contribution of animal power within South Africa, draft animals will be able to serve rural communities in several of the key areas to be tackled by the RDP, including transport, food production, food security and women's needs. **Many of the suggested research, development and extension programmes relating to animal traction, including capacity building, animal-drawn transport and the development of lighter animal-powered systems could well be implemented within the context of the RDP.**

Overall policy approach

Animal traction should be recognised as one valuable option for empowering rural communities that should be promoted alongside other technologies.

Promotion of positive image

Due to the rather negative perceptions that animal traction attained during the previous regime, there is a need to redress the balance. **Animal traction needs to be portrayed with positive modern images, as one valuable component of the RDP**.

Education and training

To counteract the previous educational neglect in this area, there is a need for capacity building, with in-service training of existing staff involved in agriculture and rural development. There is also a need for curriculum development throughout the educational system to ensure that future students are not biased against animal power technology, and that they have appropriate

knowledge commensurate with their courses and level of study.

Revoking past discrimination

The previous policies or legislation designed to discourage the use of animal traction should be reversed (eg, discriminatory legislation or taxation against the ownership of donkeys or other draft animals should be revoked and any price discrimination against draft animals in cattle sales should be stopped).

Complementary technologies

Wherever possible, human, animal and mechanical power should be allowed to compete freely, allowing farmers to select the most appropriate technologies for each need. Thus any government subsidies relating to the provision of power sources, should, wherever possible, be **technology neutral.** Should direct or indirect government subsidies be made available for tractor services (which is not being advocated here), comparable subsidies should be available for those using animal power for cultivation. If there is any promotion of tractors as power sources, efforts should be made to see if complementary animal-based operations should be encouraged at the same time.

Networking

In implementing the programme, efforts should be made to build on indigenous knowledge and South Africa's agricultural past, while benefiting from the lessons and experience of other countries. This would be achieved through policies that support national and international networking activities.