Socioeconomic, health and management aspects of working donkeys in Moretele 1, North West Province, South Africa

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ABSTRACT

Structured interviews using a questionnaire were conducted to gather information on socioeconomic aspects, health, nutrition, breeding and management of working equids in 3 study areas of Moretele 1 near Hammanskraal, North West Province, South Africa. The questionnaire addressed questions about the role of animals with a focus on donkeys used for work in these areas. Extension and animal health officers and donkey owners participated. The analysis highlights the use of donkeys for transport of water, wood and people; that ticks, wounds and harness sores are the conditions reported most frequently by owners; and that the range for the body condition score index of 2.7–4.0 suggests that an overall adequate level of nutrition and management is maintained in the donkeys in these villages.

Key words: animal health issues, management, resource-limited communities, socioeconomic questionnaire, working donkeys.

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INTRODUCTION

There are more than 300 000 working (traction or draught) equids, including donkeys, in South Africa, which complement mechanisation in resource-limited communities[8,10]. Little is known about the socioeconomics, health, nutrition, breeding or management of these animals or their role in communities in South Africa.

Studies on the health and use of donkeys in Zimbabwe include characterisation of the donkeys and their draught performance[5,6]. Although cattle are the preferred source of draught animal power in Zimbabwe, donkeys are becoming increasingly important[5,6,10]. This has been a result of the decrease in cattle numbers following droughts since the 1980s. Cattle losses in the semi-arid regions of Zimbabwe are up to 75 % and donkeys 10 %[7]. In Zimbabwe, the same author reports that ploughing is the most important draught task and is done by cattle, whereas donkeys are used for lighter tasks, mainly transport. With appropriate training, level of experience and use of implements, donkeys can be used for ploughing in Zimbabwe where they are needed[7]. In Botswana, the demographics and use of donkeys were studied[1], and key issues for donkey users in both a rural and an urban area of the Eastern Cape region were examined[3]. In the Eastern Cape studies, reasons for keeping donkeys included poverty, unemployment and disability, while the role of the donkey is ploughing and transport of wood[11]. These authors also highlighted the lack of access to veterinary services as a key issue to the animal owner.

Following extensive investigations (national workshops and reports) to assess the status of veterinary research and training and status of working animals in South Africa[2,4,10], one of the recommendations was to develop a socioeconomic questionnaire to focus on animal traction (or draught animal power) and to conduct a survey in suitable communities[4]. The aim of the current study was to evaluate the socioeconomic role, health, nutrition, breeding and management status of donkeys in several villages of a resource-limited area in the North West Province of South Africa, where they are used for work, by using the questionnaire. Such information is vital to develop appropriate recommendations to owners to improve the use and management of these animals.

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MATERIALS AND METHODS

A questionnaire was implemented near Hammanskraal in the Moretele 1 area of the North West Province of South Africa during a 1-year period (1995/1996), chosen for its proximity (*i.e.* 35 km north of the Faculty of Veterinary Science, Onderstepoort) as well as the willingness of the staff of the Department of Agriculture (previously AGRICOR), North West Province to assist with this study and help liaise with donkey owners in the area. At the same time, faecal samples for assessing helminth parasite levels were collected (reported previously[12]), animals were examined clinically and basic primary health care services rendered when required.

Moretele 1 is located approximately 60 km north of Pretoria, in an area of the North West Province that was part of the former Bophuthatswana homeland. There are an estimated 350 000 inhabitants in the area. Three study areas were selected in the Makapanstad district of Moretele 1: Tladistad, a semi-rural community, and 2 rural communities, Transactie and Thulwe (Fig. 1). Each study area was visited monthly. One was also visited weekly during a 3-week period. Moretele 1 is part of the summer rainfall region of South Africa. Summer months include October to April while the winter period, often a dry, minimal or no rainfall period, is from May to September.

The questionnaire comprised 3 sections. Section 1 was given to 3 animal health or extension officers, 1 from each study area, to complete as far as possible according to their experiences. Section 1 included questions on the number of equids and work performed, the average price paid for an animal, type of feed, advantages and disadvantages of using donkeys for work, perceived problems and conditions/diseases observed.

Sections 2 and 3 of the questionnaire were designed for a structured interview. Section 2 focused on which animal species were owned and on the work carried out by equids. Section 3 was the most extensive part of the questionnaire, since donkeys were the predominant working

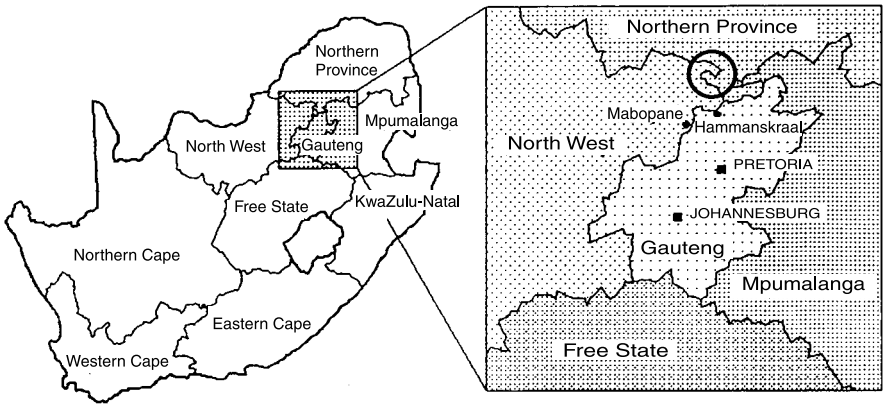

Fig. 1: **Map of South Africa showing the provincial location of the study areas. Enlargement includes Hammanskraal and the 3 study areas, Tladistad, Transactie and Thulwe, which are encircled and are in the North West Province.**

animals observed during preliminary visits. Questions included source(s) of income, how often donkeys were used and distances travelled, who made use of these animals, problems with their health and actions taken by owners, which products or remedies were used and their costs, disease conditions, nutrition, water availability, perceptions on the condition of animals and grazing, origin of animal, cost of donkey cart, where and how animals are managed, which implements are used and for what purpose as well as sources, and who trained the owners to use their animals.

Owners were interviewed at the initial meetings arranged with the community to introduce the study. Each question that appeared on the questionnaire was asked, and rephrased or translated as required and recorded. During each interview, which lasted approximately 30 min, owners were encouraged to talk about all aspects of their donkeys. Each study area was visited monthly to gather further information, make observations and hold discussions with interviewees.

Data from the completed questionnaires were transferred to an electronic spreadsheet (Excel®, Microsoft Corporation) for storage and analysis.

RESULTS

General information

Three completed questionnaires were returned from 1 animal health officer from Transactie and 1 extension officer and 1 assistant from Tladistad.

The data indicated that donkeys in Tladistad were used for transporting water, wood and coal by pack, and people by cart and for ploughing. Mules in this area were reported to perform all the above tasks. In Transactie the information indicated that horses, donkeys and cattle were being used for work. The horses were either ridden or transported people by cart. Donkeys were ridden, or transported water or wood by pack, or transported water, wood or people by cart. Donkeys and some cattle were used for ploughing and planting.

The average price of a trained adult donkey was R110.00 (US$15). A male mule cost an average of R300.00 and a female mule R250.00, while a horse cost less (R200.00 for a male and R150.00 for a female). Cattle were estimated to cost an average of R1250.00 for a male and R1150.00 for a female.

Roughage was not readily available for sale, but a bale of lucerne hay was estimated to cost an average of R14.00. In Transactie, peanut residues were sold as animal feed for R1.00 per bag.

The advantages that the officers listed for using donkeys were that they provided a source of cheap, readily available transport that was easy to maintain and an affordable alternative to tractors for ploughing. The disadvantages included that donkeys were slow and that the owners did not have sufficient knowledge of the diseases that affect donkeys or the appropriate treatment.

When asked to list problems concerning the use of donkeys as traction animals that needed further investigation, all the answers related to animal health or welfare. These included using donkeys while they were ill, the owners' lack of knowledge of treatment for donkey diseases or ailments, the unavailability of a veterinarian dealing with donkeys, animal abuse occurring with long distances of work and the limited time animals have during the ploughing season to rest.

Only the extension and animal health officers were prepared to give their opinions on the diseases or conditions occurring in their respective areas. Hoof conditions were reported in both areas, and weight loss, internal parasites, minor respiratory and skin conditions were mentioned.

Demographics and animals owned

Twenty owners of working equids were interviewed between February and October 1995. Of these, 11 came from Transactie, 4 from Thulwe and 5 from Tladistad. Eighty percent of the owners were male and 20 percent female and the average age was 59.2 years. Heavy labour was performed by old men and women with the help of their donkeys. The home language of the residents was predominantly Tswana (85 %) with some North Sotho (5 %) and Zulu (5 %). A total of 19 donkey owners, who together owned 102 donkeys, and 1 mule owner, who had 2 mules, were interviewed. Of the 102 donkeys, 94 (92.2 %) were working donkeys, with the remainder being considered to be too young (usually less than 2 years old) or too old to work, by the owner. Both the mules performed work regularly. Although 55 % of the owners kept cattle, they were not used for any type of work.

Animals kept by owners included chickens, cattle, goats, donkeys, sheep, mules, dogs and cats (Fig. 2).

Both mules were used for transporting water and wood in a cart and for ploughing and planting. All 94 (100 %) of the working donkeys were used to pull carts carrying various commodities (Fig. 3), while 14.9 % were used for pack work and 6.4 % for riding. Agricultural work (ploughing, weeding or planting) was performed by 72.3 % of the donkeys, but only during certain seasons, July to September.

Focus on working donkeys

Role in community

Of the 19 donkey owners, 30 % cited their main source of income as that from the work done by these animals. A further 20 % said that they derived their income from the traction animals together with farming, and another 20 % said that they were full-time farmers. Out of the 8 owners who farmed, 7 used donkeys for ploughing, 3 used them to help with planting and 1 used them for weeding. The remaining owners derived their income either from a pension (20 %) or were employed full-time by someone else (5 %). One owner (5 %) said that he was unemployed or did part-time work.

The donkeys were used approximately twice a week (50 % of owners), but the frequency ranged from daily (15 % of owners) to once every 2 to 3 months (5 %). Owners who had more than 2 or 3

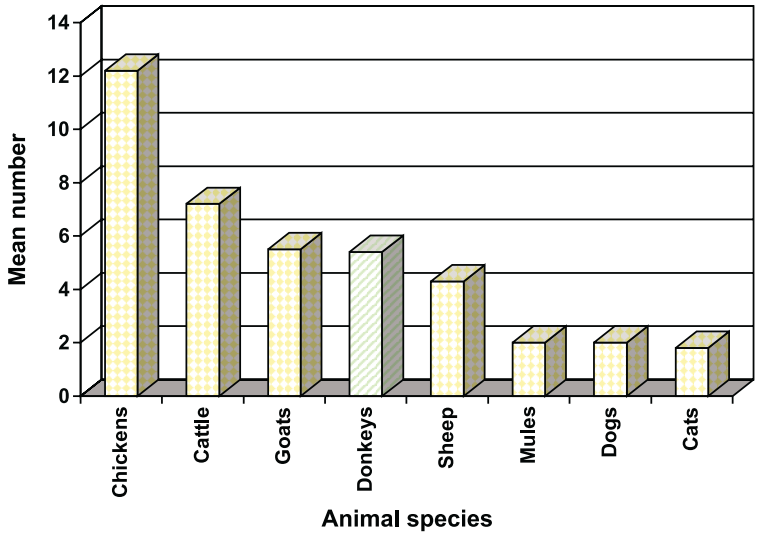

Fig. 2: **Mean number of each animal species owned by people in the 3 study areas.**

donkeys said that they tried to rotate them if they needed them to pull the cart every day. They also performed more work during the ploughing season, July to September.

Forty percent of the owners traveled between 1 and 2 km with their animals in 1 day. A further 30 % of owners travelled between 3 and 5 km in 1 day and 20 % of owners reported distances of 6 to 10 km per day. Only a few (10 %) owners travelled over 11 km per day. Of these, 1 estimated that he sometimes travelled over 30 km in 1 day.

The donkeys were most commonly used by their individual owners and 30 % of these never lent them to anyone else. The other owners allowed family members to borrow these animals, children being the most common (35 %), followed by spouses (10 %). Other family members (20 %) included uncles, grandchildren, nephews and sons-in-law. Five percent said that they hired men to drive their donkeys.

Health

A variety of disease conditions were reported in donkeys (Fig. 4). Ticks (30 %), wounds (30 %) and harness sores (25 %) were the most prevalent. Twenty percent of owners said that their donkeys never suffered from ill-health and a further 20 % said that they did not treat them when they did become sick or were injured. Seasonal effects were not apparent.

Forty-five percent treated the animals themselves and 20 % used an animal health inspector, 15 % asked a friend or neighbour who had knowledge of donkeys and 5 % requested the advice of a traditional healer. Twenty-five percent of the owners questioned said that they never treated their donkeys with any product or remedy. Of the remedies used by those who did treat their animals, 35 % were commercial and purchased from a shop or cooperative and 10 % were natural or herbal. Other remedies included old motor oil (20 %), Jeye's fluid (strong disinfectant and cleaner) (10 %), paraffin (5 %), salt (5 %) and aloes mixed with water (5 %). Aloe plants (probably *Aloe diviana*) are used as a dewormer and are most commonly eaten by donkeys in winter, when conditions are dry, and water is less available in dams. The succulent leaves seem to provide a partial alternative source of water when dry pasture conditions exist.

The cost of these health treatments averaged R12.20 per month per interviewee. Other costs associated with the donkeys were fodder (an average of R11.06 per month) and the implements and harnesses (an average of R33.83 per month).

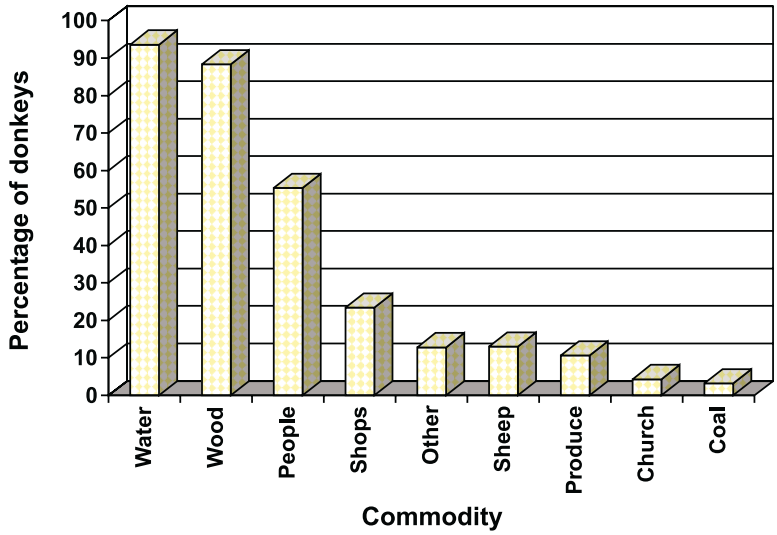

Fig. 3: **Proportion** (%) **of working donkeys used to pull carts to transport various commodities or to transport people to specific destinations in the 3 study areas.**

Nutrition

Fifty percent of the owners did not give supplementary food to the animals and relied upon grazing all year round. Only 20 % of the respondents owned the land where their donkeys grazed; the remaining (80 %) used communal land in their village. Forty percent supplemented the grazing during winter (May to August) with lucerne hay (5 %), maize residues (15 %), both lucerne hay and maize residues (10 %), hay (5 %), or cabbage leaves or other vegetables (5 %). Ten percent gave extra feed (5 % maize and 5 % lucerne) all year round. Owners sometimes gave the donkeys leftover maize porridge, vegetables or sorghum beer residues.

Donkeys belonging to 55 % of respondents obtained water from a nearby dam or river (2 km from the home on average). Thirty-five percent of respondents watered their animals from the same pump from which they obtained water for themselves and their families (an average of 0.89 km from home) and 10 % purchased water for themselves and their donkeys (mainly in the dry season or May to September).

The opinion of the owners was that their donkeys were in good condition both in summer and winter (Fig. 5) and 60 % said that the condition of the grazing was good in winter, while 40 % thought that the grazing was poor in winter (Fig. 6).

Breeding

Many owners initially obtained their donkeys by buying (85 %) or inheriting (20 %) them and other respondents (35 %) had bred them themselves. A donkey could cost between R10.00 and R100.00 (average R60.50), while most owners said that they could sell one for an average price of R93.30 (R40.00 to R150.00).

Fifty-five percent of owners had 1 or more donkeys that had been castrated and 45 % did not own a castrated male. Of

those who did castrate their donkeys, 40 % asked a friend or relative to do the operation and 5 % asked an extension officer. The remaining 10 % had bought their donkeys already castrated. Of the 57 male donkeys belonging to the 19 owners, 21 (36.8 %) were castrated. The 2 mules were entire. The total number of 102 donkeys was made up of 57 males and 45 females.

Mating occurs between the donkeys that roam free rather than between selected individuals (planned mating). The result is a small donkey (mean height at the wither 103 cm), which can survive on poor grazing and reproduce under relatively unfavourable conditions. The average weight of an adult donkey in the current study was 158.2 kg (± 30.9) using a Ruddweigh G3 cattle scale. Many of the jennies foal during mid-winter, and since the gestation period is approximately 1 year, they must have been sexually active throughout the previous winter, unlike many horses that stop cycling as winter approaches. No supplementary food is given to pregnant or lactating jennies, and some work until the day of foaling and start work again within a few days. Fights between jacks occur with the weaker jacks being chased away. Many receive serious bite wounds.

Management

In Thulwe, where each person owned 8 morgen of land, the donkeys were usually kept on pasture. In the other 2 areas, when not working they were usually left to roam very large communal camps containing donkeys and cattle belonging to other owners. Donkeys needed for work were often brought into a small enclosure constructed of thorn branches and scraps of wire. These enclosures become very muddy in wet weather and it was not unusual to see 10 or more donkeys crowded into an enclosure only a few metres square.

Many owners (40 %) allowed their donkeys to roam free during the day and night. A further 15 % allowed them to roam during the day but kept them in a *kraal* or yard at night. If the donkeys that usually roamed free were needed for work, they were brought into a small *kraal* or the owner's yard (10 % of owners). Others (15 %) kept their donkeys on their property, either in a field or in the yard during the day and allowed them out to roam at night. The remaining 30 % kept their donkeys in a field or *kraal* both day and night.

Ninety percent of owners cared for their donkeys either themselves or with the help of their children (25 %). Another 10 % allowed their children to look after

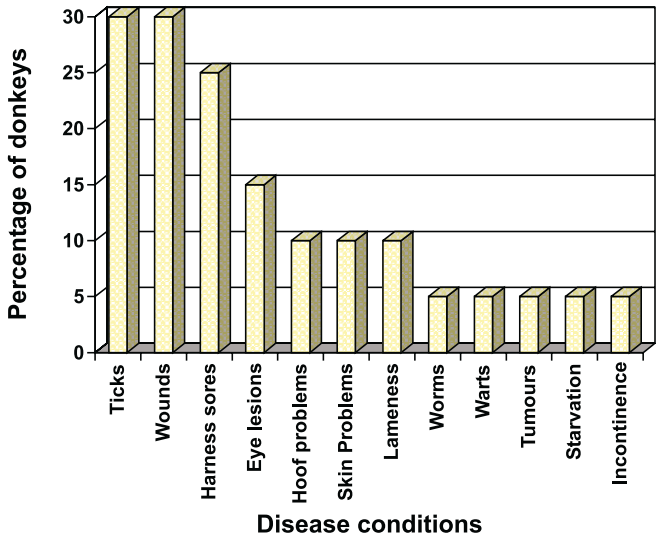

Fig. 4: **Disease conditions that owners reported to be present in their donkeys.**

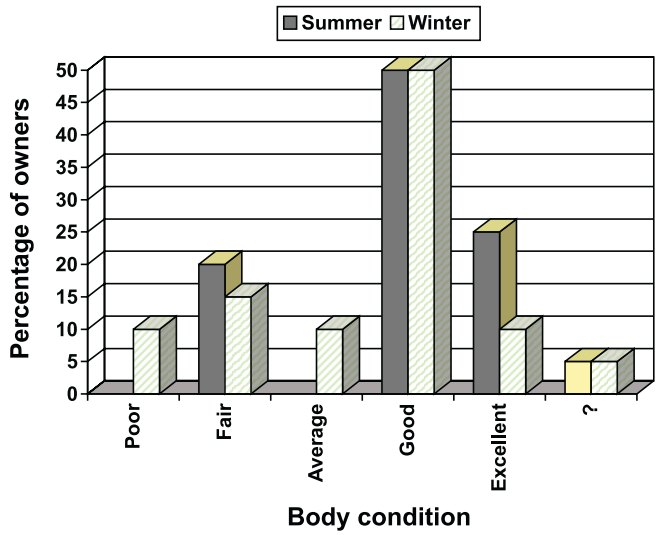

Fig. 5: **Owner perceptions about body condition in the different seasons. Summer includes the months September to February and winter May to August.**

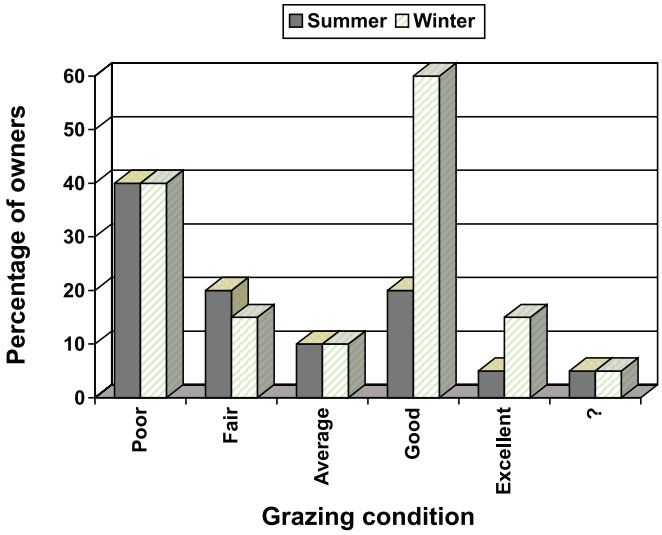

Fig. 6: **Owner perceptions of grazing conditions in summer and winter.**

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their animals by themselves. The average age of the children was 22.5 years (14–36 years). Brothers (5 %) or nephews (5 %) assisted in the management of these animals. Owners were taught to use these donkeys for work by their fathers (55 %), their grandfathers (15 %), husbands (5 %), mothers (5 %), community members (5 %) and uncles (5 %). Ten percent said that they were self-taught.

The total number of donkeys kept per owner had decreased during the preceding year according to 10 (71 %) replies. Donkey numbers increased in 2 instances and 2 other owners reported no change in the number of donkeys they possessed. The increase was, on average, 2 donkeys per owner and the decrease was 4.5 donkeys per owner. The numbers of donkeys increased by the birth of foals into the herd (40 % of owners) and purchase of animals (5 %). A decrease in the number of animals kept by owners occurred due to a number of factors. Donkeys disappearing or being stolen accounted for the greatest decrease. Forty-five percent of owners reported having 1 or more (average of 4.1 donkeys) stolen in the preceding year. Old age was given as the reason for death of donkeys (average of 2.5 donkeys) by 10 % of owners and starvation (average of 2 donkeys) as the cause of death by 5 %. One person reported that 8 out of 11 of his donkeys were shot during the government donkey extermination campaign that occurred in the former Bophuthatswana homeland in the early 1980s[10].

A question concerning the replacement value of various implements was not well answered, with many respondents not willing to even guess the value of their implements. An average of R166.25 was given by 4 owners for the value of a plough and a cart cost an average of R423.07 (13 answers). Another owner had swapped a cow for his cart and one estimated a pack saddle and a saddle each to cost R50.00.

Implements were obtained from various sources or made by the owners themselves (10 %). The most common source was from shops (20 %) an average of 39.6 km away. Five percent of owners had inherited their implements and 5 % had been given implements. A further 5 % did not own implements, but borrowed them when needed.

Harnesses were made by 30 % of the owners and 30 % bought from a shop. Five percent had obtained their harnesses from someone who made them locally. Spare parts were most commonly obtained from a shop or scrapyard (50 %). Others obtained second-hand spare parts (5 %), made them themselves (5 %) or purchased them from someone who made them locally.

General

Crops were grown by 90 % of the owners, on land less than 1 ha in size (25 %), between 1 and 2 ha (25 %), 2.1 to 3 ha (5 %), 3.1 to 10 ha (30 %) and greater than 10 ha (5 %). Maize was the most common crop produced (85 %), followed by beans (45 %), sorghum, sunflowers and pumpkins (each 15 %) and peanuts, potatoes and watermelons (each 5 %). Among the owners interviewed, many gave the type of work that donkeys were able to perform as the advantage of using animal traction. The most commonly cited types of work included ploughing, planting and transportation of water, wood, people, crops and purchased goods. Other replies included: 'Tractors are too expensive', 'Animals are easy to control, I can span 6 donkeys by myself' (82-year-old man)', 'They are cheap to maintain', 'I can earn money with them', 'My wife can also use them, they don't get sick and they don't cost money', 'They give me money and keep me alive', 'It is too far with the wheelbarrow', 'I am comfortable working with donkeys and enjoy using them', 'They are easy to handle' and 'They are stronger and work better than other animals' (mule owner).

When asked what the problems associated with using donkeys were, several of the 11 replies indicated that there were no problems, 2 owners mentioned the theft of donkeys, 1 owner said the provision of food and water, and 1 stated the tumours (sarcoids) that donkeys get and injuries by motorcars and people.

Eleven of 14 replied to the question, 'Would you prefer to do the work without traction animals, and if yes, what would you use instead?' said that they were satisfied using these animals. The remaining 3 replies preferred to use a tractor. Only 1 of 13 replies said that he would prefer to use mules rather than donkeys. The other 12 said that they were happy with their donkeys; 1 respondent replying 'definitely not' when asked if he would prefer to use another animal species. Another said that cattle were too difficult to use.

DISCUSSION

The aim of this study, to evaluate the socioeconomic role, health, nutrition, breeding and management status of donkeys in these 3 villages, was achieved. This is the first study in which owners of working donkeys were intensively interviewed and the animal health and management issues were assessed by visiting the owners regularly over an extended period (1 year). An advantage was being able to observe farmer practices through different seasons and times of the year.

The questionnaire was eventually well received by the people in the study areas and donkey owners participated willingly in the structured interviews. Initially they were suspicious when requested to bring their donkeys to the local crushes, since many of these owners had lost one or more of their donkeys in the extermination campaign of the early 1980s[10]. When they understood that their donkeys would not be harmed in the present study, their suspicion turned to interest and willingness to partake in the questionnaires.

Section I did not meet our expectations, since fewer animal health and extension officers returned questionnaires than had received them and agreed to participate. The questions on disease conditions were poorly answered, possibly because the respondents did not have sufficient knowledge of animal health to understand all the questions.

The replies of the extension/health officers and the owners from the 3 areas largely agreed. For example, the uses of donkeys given by the officers and the owners in each area were similar and both the owners and the officers saw the same advantages in using donkeys for work. Some information, however, did differ slightly: the average cost of a donkey was given as R110.00 by the officers and R60.50 by the owners. Furthermore, the responses given by owners to some of the questions in the questionnaire were corroborated by answers to other questions.

General information

During visits to these communities before the study commenced, senior animal health officers told us that donkeys were not important, or not even present in the villages. By contrast, the animal health and extension officers who worked more closely with the donkey owners, gave answers about the advantages of using donkeys, their usefulness and importance to their owners. All the problems associated with donkeys that they mentioned were to do with the health or welfare of the donkeys. A general concern about the lack of knowledge of donkey diseases, treatment, and lack of availability of veterinarians and services in their areas was expressed.

Demographics and animals owned

When asked about which animals the interviewees owned, many of them initially only told us about the cattle, goats, dogs and donkeys since they

conveyed pride in owning these species. When asked specifically about the number of chickens they kept they could give an answer and they often owned cats but seemed slightly embarrassed to admit this.

Focus on working donkeys

Role in community

These findings confirm the vital role that donkeys play in these resource-limited communities. With the majority of people being either farmers or part-time farmers, or at least growing crops, the animals provide vital transport and help with ploughing. Transporting water is another essential function that they perform. During the rainy season, when they are not needed as frequently, some owners turn them out into large communal camps. This also serves to keep the donkeys from destroying the growing crops.

Health

The donkey owners were generally of the opinion that the animals do not get sick and consequently did not often treat them. The conditions or diseases that the owners reported, were all conditions that are easily visible, wounds, harness sores and ticks being the most commonly mentioned. Only 1 owner was aware that donkeys get worms, and no owners mentioned any occurrence of infectious diseases. Worms, unlike other parasitic organisms (*e.g.* adult ticks), are not observed unless one of the larger ones, such as a pinworm or ascarid, is expelled in the faeces. Other worms tend to go unnoticed because they occur infrequently and they are often difficult to observe with the naked eye. Although the owners admitted that their donkeys sometimes died, they usually blamed it on old age, but were unable to state the age at death. These results concur with the results of other workers who observed the health status of donkeys in the Eastern Cape[3,11].

Nutrition

Half of the donkeys included in the study were not given supplementary feed, but grazed around the village or in communal camps. Water was often supplied to the donkeys when they were brought into the owners' yards before being hitched up for work. This was used to attract the donkeys to be hitched.

Management

The theft of donkeys in these areas is a major problem. It is a popular misconception that those that wander around on the roads are not owned. Some of the owners said that they knew who was stealing the donkeys but the police would not do anything because the perception is that these animals do not have owners and because police regulations that protect livestock do not include donkeys. The owners who said that they would like to own mules were of the opinion that mules are seldom stolen, as they will not work for an unfamiliar owner.

General

This questionnaire addressed information concerning the socioeconomic profile of donkey owners living in resource-limited areas. Valuable insights into the role of the working donkey in the community, the management and health of donkeys were gained. These will allow future workers in these or similar areas to plan their projects appropriately.

Experience was also gained in the techniques employed in the use of the questionnaire. The structured interview was well accepted by the respondents and the answers given found to be accurate when verified in the subsequent visits to the owners' homes. More accurate insights may have been obtained if Section 1 of the questionnaire had been answered by more officers.

The animal owners in resource-limited communities rely on donkeys and this is confirmed in the present study. Availability, hardiness and size were named as advantages of donkeys. Disadvantages included stock theft. Ticks were reported as the most frequently-observed disease condition, which concurs with findings of workers in the Eastern Cape[11]. Donkeys are indispensable to the people of Moretele 1 where infrastructure is poorly developed, including transport for goods and people, and in particular water. The health problems noted by owners and animal health technicians were similar to those reported in other studies in the subregion.

It is clear from this project that donkeys are a self-renewing resource and provide an important, affordable alternative to mechanisation in these areas. The health problems that do occur are largely preventable, and attention is being given to introducing training programmes and providing appropriate extension in animal health to donkey owners and animal health technicians.

The body condition score index (1–9)[9] was an average of 3.7–4.0 (unpubl. data). This suggests that the overall level of nutrition and management is favourable in these animals. This average score compares with the Moroccan study where almost 40 % were also 4.0.[9]

Future research can continue to improve the use and management of donkeys, thereby increasing the economic value of these animals to their owners. Further studies are being conducted to assess the use, potential and constraints of animal traction in the other provinces. Information on basic donkey management and health, as well as on traction implements and harnessing were identified as needs in this community. Provision of basic veterinary services and availability of training for owners about the correct treatment of their donkeys is also a priority identified by owners. In response to the shortage of donkeys, a breeding programme (*i.e.* the production of hinnies) may be an appropriate step.

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Book review — Boekresensie

Comprehensive reports on techinical items presented to the International Committee or to Regional Commissions

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The 1999 edition of comprehensive reports made to various meetings of the OIE contains some highly pertinent and topical information in the realm of disease control. The first section consists of 3 reports presented at the 67th General Session of the International Committee in May 1999. The first deals with the problem of resistance to treatment of ecto- and endoparasites. It demonstrates the scope of the problem and emphasises the need for integrated pest control, including innovative approaches such as the FAMACHA technique that is currently being validated. Appropriate production systems and a solid knowledge of the epidemiology of the parasites are essential in order to develop sustainable approaches to control. The second paper, on management of disease emergencies, is particularly topical, and is an excellent summary of the elements required for the prevention and handling of animal disease outbreaks. Although it is mentioned, in my opinion the importance of early recognition of disease by farmers and field staff and how this can be achieved are not sufficiently emphasised, perhaps owing to the content of the questionnaire on which the report was based. The third paper evaluates the role that new generation vaccines (gene-deleted, recombinant and DNA vaccines) can play in disease control.

The other 3 sections consist of reports to the OIE Regional Commissions for Africa, the Middle East and Asia. The 2 reports on Africa deal with the effect of structural adjustment programmes on the delivery of veterinary services, and the indications for implementing stamping-out measures for disease control in Africa. The former reports on the results of a questionnaire survey, to which response was unfortunately limited to a relatively small number of countries, to evaluate the effect of restructuring programmes developed to counteract shrinking public sector resources. Although the conclusion was there have been positive effects, the report reflected was that problems are experienced with continued budgetary constraints, downgrading of the livestock sector as a 'poor relation' in agriculture, an inadequate private sector that itself experiences financial constraints, and loss of information and control. Having experienced at first hand some of these constraints in Ghana, I found this a particularly interesting paper. The second paper is based on the Botswana experience with contagious bovine pleuropneumonia, where stamping-out was successfully applied. Two-thirds of the countries that responded to the questionnaire indicated that their financial resources would be inadequate to implement stamping-out measures, highlighting a major constraint for control of disease outbreaks in the African region.

The 2 Middle East reports relate to factors concerning trade of animals and livestock among countries in the region, namely the Agreement on the Application of Sanitary and Phytosanitary Measures, and identification systems for animals. In the light of the recent outbreaks of foot and mouth disease in a number of regions, these papers are relevant for all countries with a livestock trade.

Two of the reports from Asia relate to the Nipah virus outbreak in Malaysia in 1998/1999 and contain most interesting information on the emergence of this new, seriously zoonotic disease and the measures to control it. A paper on the economic impact of foot and mouth disease in the Asian region is of general interest in view of the current global situation with regard to that disease. The fourth paper deals with diseases of farmed fish and other aquatic animals, and emphasises the need for capacity to diagnose and deal with these diseases in countries where aquaculture is a growing industry.

The annual publication of the comprehensive reports is a noteworthy contribution by the OIE to global disease control. The 1999 edition contains information that will be of great value to veterinarians in the public sector, as well as those in other sectors with an interest in the epidemiology and control of animal diseases.

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