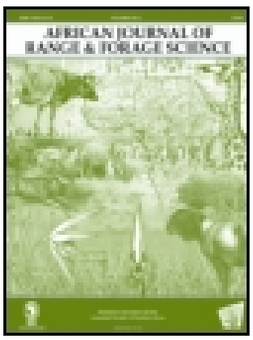

African Journal of Range and Forage Science

ISSN: 1022-0119 (Print) 1727-9380 (Online) Journal homepage: https://www.tandfonline.com/loi/tarf20

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To cite this article: CM Shackleton , SE Shackleton , TR Netshiluvhi & FR Mathabela (2005) The contribution and direct-use value of livestock to rural livelihoods in the Sand River catchment, South Africa, African Journal of Range and Forage Science, 22:2, 127-140, DOI: 10.2989/10220110509485870

To link to this article: https://doi.org/10.2989/10220110509485870

Published online: 12 Nov 2009.

African Journal of Range & Forage Science 2005, 22(2): 127–140
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AFRICAN JOURNAL OF
RANGE & FORAGE SCIENCE
ISSN 1727–9380

The contribution and direct-use value of livestock to rural livelihoods in the Sand River catchment, South Africa

CM Shackleton[1,2]*, SE Shackleton[1,2], TR Netshiluvhi[1,4] and FR Mathabela[3]

[1] *Environmentek, CSIR, PO Box 395, Pretoria 0001, South Africa*
[2] *Dept of Environmental Science, Rhodes University, Grahamstown 6140, South Africa*
[3] *PO Box 683, Bushbuckridge 1280, South Africa*
[4] *Current address: Vegetable & Ornamental Plant Institute, Agricultural Research Council, Pretoria 0001, South Africa*
* *Corresponding author, e-mail: c.shackleton@ru.ac.za*

Received 12 July 2004, accepted 28 January 2005

The productive functions of livestock ownership in communal areas are multipurpose in character, comprising a mix of stock types and a range of goods and services used. When all these multiple uses are accounted for, the cash and direct-use returns of livestock in communal areas can be comparable to commercial systems, although temporally and spatially variable. Yet previous work has generally excluded small stock from such analyses, as well as benefits and costs to non-owning households. This paper presents empirical results of a study in the Sand River catchment, assessing the benefits and costs accruing to owners and non-owners for both cattle and goats within a livelihoods analysis framework. Results indicate that cattle are used for a greater variety of goods and services than are goats. The savings value represented the most important function, followed by milk and then manure. Even if savings value was excluded, cattle ownership made a significant contribution to local livelihoods. Goats also provided a net positive benefit, represented largely by the savings value, followed by meat and cash sales. Non-owners also benefited through donations of manure, milk, draught and meat for free, or at a cheaper rate than alternatives. The majority of non-owners aspired to livestock ownership, although the risk of theft of animals was of growing concern. Averaged across the whole catchment, the net value of goods and services from livestock was just over R400 per hectare, with an annual return to capital of 36%. Cattle contributed the bulk of the value by virtue of their greater numbers and larger size, but on a per kilogramme basis goats provided higher value. Many of the goods and services obtained from livestock were not enumerated in regional or national economic statistics.

Keywords: cattle, costs, goats, goods and services, non-owners

Introduction

Livestock ownership and production in the rural, communal areas of South and southern Africa is multi-purpose in character, with both cattle and small-stock providing several goods and services (Cousins 1999, Ainslie 2002). As a result, this multiple use system may potentially have a higher value per hectare, when all functions are valued, than is expected given the low rates of off-take and conventional wisdom around livestock production and carrying capacity in communal areas. Indeed, these values have been argued by some authors to be higher than those for commercial ranches (e.g. Barrett 1992, Scoones 1992, Hatch 1996). The higher values per hectare are not only a result of multiple goods and services from livestock, but also lower input costs under communal systems (Hatch 1996), except in the face of large capital losses under drought scenarios (Campbell *et al*. 2000). Indeed, Balyamujura and van Schalkwyk (1999) found that the benefit to cost ratio of communal livestock farmers was more than five times greater than returns to commercial cattle schemes. Thus, it appears that livestock farmers in communal areas are rational in the ways in which they use and manage their herds, and economic benefits are contributory drivers of behaviour (Barrett 1992, Ainslie 2002). The primary objectives of herd owners are thus to maximise the yield of consumable products for the household, as well as increase the size of the household 'investment portfolio' or number of animals for savings, security and emergency cash purposes (Tapson 1991).

Studies across South and southern Africa reveal that the range of goods and services obtained from livestock by rural communities are similar throughout, but that the relative importance of individual goods may vary from place to place. Consequently, several authors have come to contrasting conclusions as to the role and value of livestock in communal systems and rural livelihoods. Cousins (1996) reviewed a number of papers dealing with the importance and economic value of cattle in communal grazing systems in South Africa, and the contributions in Ainslie (2002) present new empirical studies. Barrett (1992) has dealt with the Zimbabwean situation. Whilst the most important reasons for keeping cattle vary from region to region they

can be related to a number of factors, including agro-ecological conditions, herd size, alternative sources of income, or a combination of these (Campbell *et al*. 2002). For example, in semi-arid and arid areas, off-take for sales tends to assume greater importance than goods for consumption (especially draught and manure) because arable agriculture is less viable and herd owners cannot rely on crop production for income and food security. Colvin (1985) cited evidence that in Swaziland off-take was highest from the cattle owners with small herds (<17 head) in the lowveld, but in the highveld off-take was highest from larger cattle owners. He argued that lowveld owners relied more on sales of cattle to meet their basic needs than did highveld owners. This was because the highveld owners had greater access to crop income and wage earnings, and that higher selling rates from small herds arose from the greater proportional effect of forced sales to meet essential needs. On the other hand, in former Bophuthatswana, Groenewald and du Toit (1985) found sales were higher from larger herd owners.

Owners' priorities may also change over time according to changes in livelihood strategies, household income, stage of the household development cycle, or in relationship to drought cycles. For example, following a drought the main objective may be herd building and owners may invest in purchasing animals. Any kind of off-take will be negligible, and the amount of draught hours worked per animal will be high. However, as the herd grows, slaughtering and cash sales are likely to increase in frequency and importance (Barrett 1992), and the number of draught hours per animal will decrease (Campbell *et al*. 2000). Another example is the seeming decline in importance of cattle for draught power in some areas, especially for ploughing, as mechanised traction becomes more available and affordable (Ntsebeza 2002). This can be influenced by the economic profile of the area, with the more remote and isolated rural areas relying more on animal draught power than those where there are greater job opportunities and markets and thus ability to pay for tractor hire. This is also influenced by proximity of homesteads to arable fields (Campbell *et al*. 2000). Milk production, mainly for home consumption, is an important function in most areas (Groenewald and du Toit 1985, Tapson 1991, Schmidt 1992), as is 'savings' in the form of animals that can be sold for emergency cash (Vink 1986, Munn and Zonneveld 1990, Ainslie 2002, Campbell *et al*. 2002). The importance of culturally related functions such as bride-wealth payments and ritual slaughtering varies from region to region, but in all areas these were of less significance than other more direct-use functions. Prestige is, to some extent, still associated with high levels of ownership, although this also varies (Düvel and Afful 1996). It may be linked to how generous the owner is with his/her livestock and how often he/she slaughters for communal celebrations and feasts.

Most of the studies revealed that livestock ownership is highly skewed in most areas (Vink 1986, Fischer 1987, Hatch 1996, Ainslie 2002), with those households with higher off-farm income usually owning larger herds, accounting for a disproportionate percentage of the total number of cattle. For example, local businessmen, government bureaucrats or members of the traditional authority structures often have larger cattle herds than the average local household. Furthermore, the majority of households own either no livestock or just a few animals (Ainslie 2002). However, transactions between households in the form of bride-wealth payments, loaning of animals, cooperative ploughing arrangements, meat and milk sharing and hiring out and selling of goods and services can extend the benefits of cattle to many more households. Thus overall, cattle continue to have an important role in the community as a whole (Campbell *et al*. 2000, 2002, Kepe 2002, Crookes 2003).

Key omissions from some of the previous work have been: (1) inclusion of small stock when valuing the contribution of livestock of livelihoods, (2) a more systematic analysis of the role of livestock in the livelihoods of non-owners (benefits are suggested but rarely quantified), (3) the costs associated with livestock production, and (4) use of the household and livelihoods as the unit of analysis. In terms of the latter, many studies have not provided values for several goods and services, or where given, these have been expressed as outputs from either the national herd, or a herd of say 100 head (Barrett 1992), or per animal unit, or as a value per hectare, rather than as accruals to the household. This does not easily allow comparison with other sources of household livelihood (as per Campbell *et al*. 2002), or help in understanding the relative importance of cattle to sustainable rural livelihoods (Ainslie 2002). Our study therefore attempted to address all these aspects.

Study area

The Sand River catchment is located in the Bushbuckridge region of the Limpopo lowveld. It covers an area of 1 910km^2 between the Drakensberg mountains in the west and the confluence of the Sand River with the Sabie River in the Kruger National Park, approximately 86km to the east. There is a marked elevational and climatic gradient across the catchment from the Drakensberg escarpment to the lowlands in the east. The mountains and foothills are wetter and cooler than the hot and dry conditions in the east. Most rain falls in summer between October and April. Annual rainfall is approximately 1 600mm at the base of the Drakensberg, decreasing to approximately 500mm in the east. The increasing aridity moving eastwards is accompanied by increasing variability around the mean annual rainfall, and increasing evaporative demand. Drought is a common feature in the central and eastern portions of the catchment.

The Sand River catchment spans four veldtypes (Acocks 1988). The Drakensberg is largely North-Eastern Mountain Sourveld (veldtype 8), giving way to Lowveld Sour Bushveld (veldtype 9) along the foothills. Most of the catchment is classed as Lowveld (veldtype 10) dominated by trees of the Combretaceae (*Terminalia* and *Combretum*) and Mimosaceae (*Acacia*). The north-eastern corner falls into the Arid Lowveld (veldtype 11). Local dominance varies considerably in relation to the catenal sequence and land-use patterns.

The central region of the catchment is under communal tenure (57.4%), characterised by numerous small settlements. Inhabitants engage in a variety of livelihood strategies, including dry-land agriculture, animal husbandry, harvesting of wild plant and animal resources, local wage

labour, migrancy and informal economic activities. The total population within the catchment was estimated to be approximately 336 640 people in 1998, although there are several sources of error within that estimate (Pollard *et al*. 1998). This gives an average population density across the whole catchment of 176 people km^{-2}. Mean household size is 6.2 people. Approximately 55% of the entire population is female, and approximately 44% of the population is below the age of 15. Livestock numbers are close to ecological carrying capacity (Parsons *et al*. 1997).

Procedures

A number of complementary approaches were employed. Firstly a household survey was administered to 101 households throughout the catchment by means of a structured interview schedule (Shackleton *et al*. 1999). A randomised clustering approach was adopted to identify sample households. Eleven villages were randomly selected from a list of all 69 villages within the catchment, along with two others identified as important for supplying data for a complementary project, resulting in 13 villages in total. Each village was divided into two equal sections and a separate interview team sampled households within each section. The selection of the first household was randomised. Thereafter, each interview team sampled a further three or four households based on information provided by the first respondent, so as to stratify the sample according to number of livestock owned (many, few or none). At the end of the survey interviews had been conducted with 26 households that did not own livestock, 23 that had five or less animals, 24 that had from six to ten livestock and 28 that had more than eleven livestock.

The household samples were complemented by: (1) a group interview with 22 people (15 men and 7 women) at one village using a variety of Participatory Rural Appraisal (PRA) exercises such as informal discussion, time-lines with respect to animal numbers, calving calendars and utility ranking of values, and (2) key informant interviews (semi-structured) conducted with Animal Health Officers from the Department of Agriculture in Thulamahashe and Bushbuckridge. Other interviews were conducted with three butchers, mainly to verify prices.

Lastly, secondary data were analysed. This was useful because the household interviews were not based on a random sample. Therefore, we examined unpublished results on livestock ownership from the data of Griffin *et al*. (1992). This study conducted a fully random sample (using households numbered on aerial photographs) of five settlements. We relocated 300 of the original data forms. Historical records of livestock numbers were obtained from Mr Richard Silanda and Ms Jelita Mabunda of the Department of Agriculture in Thulamahashe. These data apply only to the Mhala portion of the region (approximately 50.6%). Data for the Mapulaneng region were unavailable. We used the existing summary annual tables for the Mhala region from 1978 to 1998. The annual records correspond to the government financial year of 1 April to 31 March of the following year. The Department did not have data for 1985/86 and 1991/92. Although theft of animals is reported to be a major problem in the region, thefts are not recorded by Animal Health Officers. In the records, thefts are included under the 'animals died' section. These data are largely based on dip-tank records compiled by Animal Health Officers. It is recognised that these data have certain sources of error, but assuming the error factor is relatively consistent, then a meaningful picture of animal trends over time can be obtained, even if the absolute numbers are unreliable.

From the household interviews and subsequent phases, details were captured of the goods and services used per household, the amount used, frequency of use, associated costs and local unit prices. From these, the annual direct-use value was determined as the mean unit price for the good or service (local or 'farm-gate' prices) multiplied by the mean rate of production or consumption for that good or service. This was summed across all goods and services to provide a gross, total value. All values are expressed in 1998 terms corresponding to the time of the field work. Details of specific amounts and calculations are given in Shackleton *et al*. (1999). Net annual value was determined as gross value minus costs. No costs were attributed to own labour within the household, but the costs of labour supplied by others involving a cash or in kind transaction were incorporated. Where respondents gave a range in response to questions pertaining to amounts, prices, frequencies, etc. the mid-point of the range was used in subsequent calculations. Because the determined values were largely a function of: (1) the amount of product produced, and (2) the local price from trade in that product, the value due to selling any portion of the product is already accounted for. Thus, selling does not result in an increase in value to the household, but serves to convert some of the product that would have been consumed at home or given away (at the same value) to cash. The unit prices for specific goods were calculated separately for owners and non-owners as separate sub-groups within the overall sample. A linear depreciation function was applied to capital costs over the reported lifespan of the asset to derive an annual cost.

Analysis of the records supplied by the Department of Agriculture on the total number of cattle were tested for normality. Total numbers and calving percentage were normally distributed, whereas the percentage slaughtered, died and percentage total off-take were not and were thus transformed using the natural log. Pearson's correlation coefficients were determined for each of these against total cattle numbers for each year in the record. A relationship between the number of cattle in each household and the goods and services the household obtained from their cattle was explored via linear regression and analysis of residuals. The number of cattle per household was not normally distributed and was transformed using a $\log_{10}$ function. Two significant outliers were identified and were omitted from the final regression analysis. The relationship between cattle herd size and whether or not a herder was hired was tested using a contingency table after splitting the data set into small herds (less than, or equal to, the mean number (10) of cattle in a household herd), and large herds (greater than the mean number across the sample).

Results

Ownership distribution and trends

District herd size, trends and off-take

Analysis of the dip-tank records from the Department of Agriculture indicated that there was wide fluctuation in the numbers of cattle in the Mhala district, primarily in response to major drought events (Figure 1). Over the twenty year period (1977 to 1998), the number of cattle ranged from 25 000 to over 73 000. There was less variation in the numbers of goats, which fluctuated between 32 000 and 47 000 animals since 1984, with a mean of 40 429 ± 1 493 (n = 12).

Over the same period, there was a significant increase in the number of cattle owners (r = 0.896; P < 0.001), as well as a steady increase in the mean number of cattle per owner, up until the major drought of 1991/1992 (Figure 2). The increase in owners, from 2 752 in 1977/78 to 5 090 in 1997/98 represents an 84.8% increase, or 4.2% per annum over the 20 year period. This was greater than the rate of population increase, suggesting that a greater proportion of households are becoming owners. There was a 10% drop in the number of owners following the 1991/92 drought and a 51% drop in the mean number of cattle per owner (Figure 2). These two statistics suggest that it was the households with smaller numbers of cattle that were hardest hit during that drought. Large decreases during and immediately after a drought were not solely due to increased animal mortality, but also increased sales and slaughter by some owners. Overall, the mean percentage removal of animals per year was 19.3 ± 2.6%. Just over one-third of this was attributable to animal deaths (including theft), and the remainder to home slaughter and net exports (Table 1).

None of the off-take mechanisms were correlated with cattle numbers, indicating that off-take is not density dependent. This was probably largely due to the overwhelming influence of drought on cattle numbers. However, the number of calves born (as a proportion of total cattle number and not cows only) was strongly density dependent (r = –0.63; P < 0.01), ranging from over 30% when total cattle numbers were low to approximately 7% at peak numbers (Figure 3).

Household livestock ownership and numbers from secondary data sources

Across the random sample of Griffin *et al*. (1992) the mean number of animals per household was 5.9 ± 0.6. This was composed of 3.3 ± 0.5 cattle, 2.1 ± 0.21 goats and 0.4 ± 0.08 pigs. Additionally, there was a mean of 5.9 ± 0.63 poultry per household. The number of livestock per household is skewed by the few owners with large numbers, in that 76% of households did not own any cattle (Table 2), with the corresponding number for goats being 66%. Overall, 4.7% of households owned only cattle, 15.0% owned only goats, 19% owned both, and 61.3% did not own either.

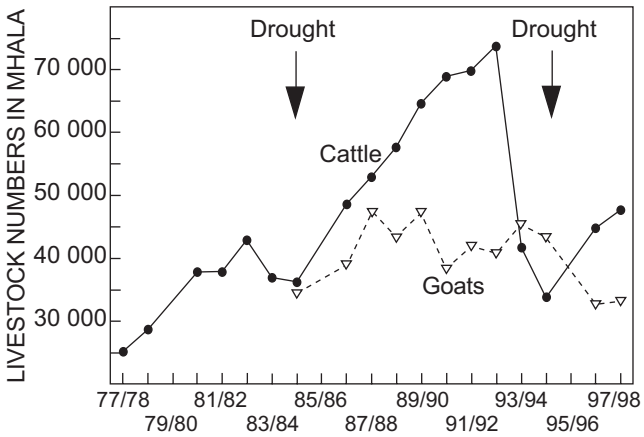

Figure 1: Number of livestock in the Mhala district over 20 years (1977 to 1998)

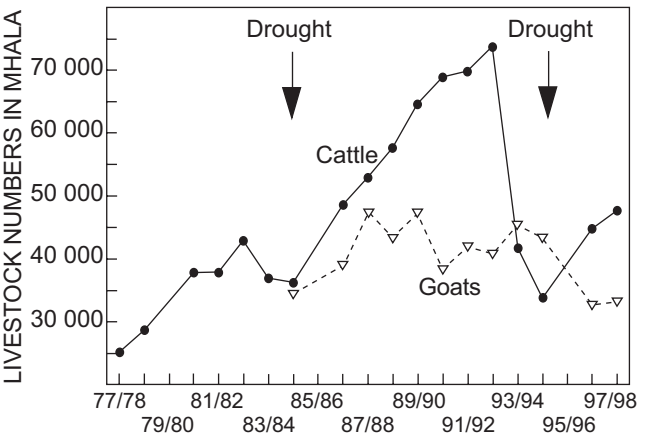

Figure 2: Trend in the number of cattle owners and the mean number of cattle per owner in Mhala

Cattle ownership and herd structure from this survey

This sample is representative of both large and small cattle owners (i.e. greater or less than 10 cattle, respectively). The mean number of cattle per household during the survey period (1998) was 10.1 ± 1.3. The total sample herd was

Table 1: The proportion of cattle removed per year (n = 16 years) and correlation with total cattle numbers. (Net exports = number of animals exported plus the number sold, less the number imported)

	% Slaughtered	% Died (incl. Theft)	% Net exports	% Total removal
Mean	8.6	7.2	3.6	19.4
SE	1.04	1.78	1.27	2.64
Range	4.8–21.8	2.5–28.9	–3.2–13.9	8.2–50.4
Median	7.9	4.4	3.2	14.7
Correlation to total animal no. (r)	0.224	0.027	0.03	0.426

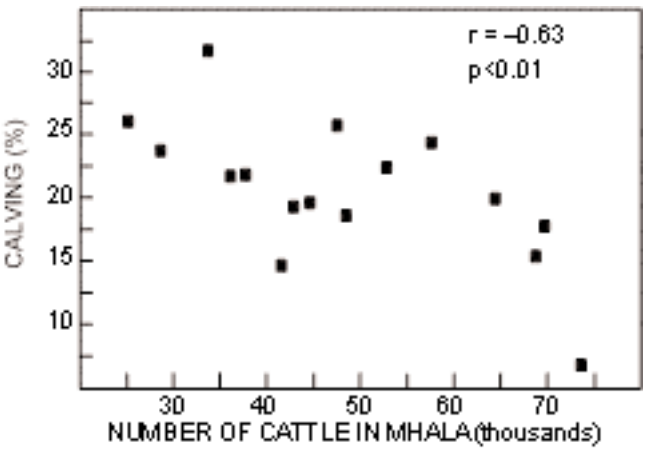

Figure 3: The calving percentage relative to total cattle numbers in Mhala

556 animals. Of this, cows constituted the highest proportion at 58.8%, followed by calves (19.6%) and then bulls (18.2%).

The figures obtained in this study are comparable to those obtained from other areas (e.g. Colvin and de Jager 1989). Herd composition appears relatively well balanced and consistent with the subsistence demands of households for milk, other products and herd growth. The low percentage of oxen (3.4%) may affect the availability of draught power, although bulls can also be used to pull ploughs. The primary constraint is that they are more difficult to train. The ratio of bulls to cows (1: 3.2) (which is typical of communal systems) was higher than that recommended for commercial herds, which is about one bull for every 20 breeding females (Colvin and de Jager 1989).

Five respondents were unable to provide information on the sizes of their herds for the previous year (1998), although 91.1% of the total sample of cattle owners (n = 51) was able to respond. Several households reported a decrease in the size of the household herd between the date the survey was conducted and the same date the previous year, although a few had grown in size. Based on a sample of 51 cattle owners, and including both losses and gains in stock, the total herd size for 1998 was calculated as 509, with a mean household herd size of 10.2 ± 1.3, whereas the total herd size for 1997 was 547, with a mean household herd size of 10.7 ± 1.2. This represented a decrease in herd size of 38 animals or 6.9% of the herd between 1997 and 1998.

Total off-take for 1998 was higher at 82 animals, with the balance of 44 animals being replaced through calving and purchases. Annual off-take, for a variety of reasons including mortality (Table 3), was thus 14.9% of the sample herd, which is comparable to the 19.4% for the 16 year mean from the Dept of Agriculture records, which includes drought periods.

Although the total off-take during 1998 was comparable to the long-term mean, the reasons for off-take were not. For example, the rate of slaughter in 1998 was 0.4%, but in the long-term data it was 8.6%. The death rate in 1998 was 12.1% (6.6% died, 4.2% theft and 1.3% other), whereas the long-term rate of death (including theft) was 7.2%. The problem of theft came up repeatedly during discussions and informal sessions, and people felt relatively powerless to deal with it. Schmidt (1992) also reported that theft of cattle was a problem in the Taung area of the former Bophuthatswana, up to 17% of adult animals per year, as did all the case studies in Ainslie (2002). Mortality due to disease was approximately 6% of the herd. The PRA session revealed that much of this was blamed on the Animal Health Technicians for not providing an adequate and reliable service. As the result of the proximity of wildlife conservation areas, attacks on livestock by predators frequently occur.

Goat ownership and herd structure from this survey

The mean number of goats per household (n = 39) was 7.3 ± 0.84 including kids, with a total of 285 animals. This compares favourably with the data from Griffin *et al.* (1992)

Table 2: Ownership patterns of livestock and poultry (data from Griffin *et al.* 1992)

% of households owning No. of animals	Cattle	Goats	Cattle and goats	Poultry
0	76	66	61.3	38.7
1–5	5.7	17.7	13	31.7
6–10	6.3	11.7	8.3	12.3
11–15	4.7	4	6.7	7.3
16–20	2.7	0.7	5.3	5.3
21–25	2	0	2.3	2
>25	2.7	0	6.7	2.3
Summary statistics across all households in sample (owners plus non-owners)				
Mean	3.35	2.14	5.49	5.26
Median	0	0	0	3
Mode	0	0	0	0
Range	0–70	0–17	0–75	0–50
Summary statistics for households owning each animal type (excl. non-owners)				
Mean	13.94	6.29	14.07	8.59
Median	11	5	10	5
Mode	9	4	5	3
Range	1–70	1–17	1–75	1–50

Table 3: Reasons for herd off-take between the survey date (1998) and 12 months before

	Died	Sold	Slaughtered	Stolen	Returned	Other
Respondents (n = 82)	36 (2 struck by lightning, 1 injured, remainder died of disease)	9	2	23	5	7 (6 bitten by lions and 1 eaten by a hyena)
Percent of off-take in 1998	44.0%	11.0%	2.4%	28.0%	6.1%	8.5%
Percent of herd size in 1998	6.6%	1.6%	0.4%	4.2%	0.9%	1.3%

Table 4: Annual costs of keeping cattle across all owning households (hh)

Costs	% of owning hh	Annual costs per hh (Rands)	Notes
Hiring herders	29.0	317.31	The costs of labour inputs by family members is not included. This cost is for situations where services are paid for in cash
Taxes/fees and dipping costs	76.0	16.85	Not gathered regularly since 1994
Supplementary feed	33.3	65.57	Mainly used in drought years when this cost would increase, costs of own labour not included
Kraal construction and maintenance	100.0	22.32	Initial capital outlay discounted over 20 years, plus a maintenance cost of R20 per year
Equipment (plough and yoke)	42.0	4.67	Capital outlay discounted over 40 years
TOTAL — direct costs (excluding stock purchases)		426.72	
Losses from annual herd growth due to mortality and theft of offspring	100.0 (extrapolated)	364.00	Mortality and theft of offspring represents a cost. Loss of adult animals represents a loss of capital and not an annual cost
TOTAL — including stock losses		790.72	
Purchases of stock	29.0	319.87	Not a real cost as the animal becomes a saleable asset as soon as it is purchased
TOTAL — including stock purchases		1 110.59	This value is not used in any further calculations for the reasons stated above

(Table 2). Of the 285 goats, 17.9% were rams, 63.9% ewes and 18.2% kids. The number of ewes was three times that of either rams or kids. Ewes were, according to most respondents, productive and therefore rarely slaughtered or even sold. For the previous year (1998) the same households reported a total of 313 goats. The reasons provided for the drop in numbers from 1998 to 1999 were that some goats had: (1) died from disease (39.2% of households), (2) been slaughtered (26.1%), (3) been eaten by dogs (13.0%), (4) been stolen (13.0%) or (5) sold for cash (8.7%). Theft appeared as a problem and, increasingly, dogs were seen as a major threat to small livestock production.

Costs of owning livestock

Costs associated with keeping cattle

The total costs to households of keeping cattle are summarised in Table 4. The total direct cost to all households was approximately R426.72 per annum, excluding the costs to purchase animals and the loss of livestock to illness, injury, drought or theft. Including the latter increased the annual cost to R790.72 per cattle-owning household. If stock purchases were included as a capital outlay, the annual cost increased to R1 110.59 per year. However, since a purchased animal becomes productive and an asset or investment immediately following purchase, this outlay is not a true cost and was excluded from the cost estimates in calculating total, net, direct-use value in Table 7. Possible additional costs not accounted for were medicines (although injections are usually given free by the Animal Health Technicians), fines for damage caused by straying cattle, castration costs, and the capital or maintenance costs of equipment for sledges and carts (only 3% of households).

Costs associated with keeping goats

The total annual cost of keeping goats was approximately R311.00 per year excluding the costs of purchasing stock (Table 5). Including purchase of stock increased the costs to R346.08.

Direct-use value of cattle goods and services to owners

The frequency of use and relative importance of goods and services obtained from cattle

Before commencing with the detailed valuation of cattle goods and services, interviewees were requested, with prompting from a list, to indicate what uses and outputs they received from their cattle herd, and of these, which they ranked as the three most important (Table 6).

Stock owners' perceptions of the most important reasons for keeping cattle, the frequency of use of different outputs, and the value of these outputs do not necessarily coincide. Furthermore, different groups of people, for example old men, young men and women, have differing viewpoints on the most important goods and services provided by cattle.

Table 5: Annual coats of keeping goats across all owing households (hh)

Costs	% of goat-owning hh	Annual costs per hh (Rands)	Notes
Hiring herders	18.0	135.78	The costs of labour inputs by family members is not included. This cost is for situations where services are paid for in cash
Taxes/fees and dipping costs	31.0	2.48	Not gathered regularly since 1994
Supplementary feed	28.2	0.00	All used own labour. Mainly used in drought years when this cost would increase.
Kraal construction and maintenance	95.0	2.44	Initial capital outlay discounted over 20 years. Annual maintenance via own labour
TOTAL — direct costs (excluding stock purchases)		140.70	
Stock losses due to mortality and theft		170.30	Mortality and theft of offspring represents a cost. Loss of adult animals represents a loss of capital and not an annual cost
TOTAL — including stock losses		311.00	
Purchases of stock		35.08	Not a real cost as the animal becomes a saleable asset as soon as it is purchased
TOTAL — including stock purchases		346.08	This value is not used in any further calculations for the reasons stated above

Table 6: Frequency of use of different cattle goods and services, and direct and weighted rankings for the top three uses/products

Product/service	% of households using cattle goods and services	importance ranking (number of times ranked as being amongst the three most important uses; value in brackets is weight assigned for weighted ranking)				
		Most important (1.0)	2nd most important (0.5)	3rd most important (0.33)	Total no. of times ranked	Weighted ranking
Cash sales	76	19	8	2	29	23.7
Savings	93	12	8	3	23	17.0
Ploughing	42	8	5	4	17	11.8
Ritual slaughter (includes funerals)	75	4	11	5	20	11.2
Meat	83	2	9	8	19	9.1
Milk	42	2	6	7	15	7.3
Manure	91	1	3	7	11	4.8
Celebrations	49	1	3	3	7	3.5
Lobolo	45	0	4	2	6	2.7
Dung for floors	56	0	1	3	4	1.5
Hides	67	0	0	3	3	1.0
Dung for fuel	18	0	0	0	0	0.0
Transport	25	0	0	1	1	0.3
Loaning	0					
Other (giving to children and grand children to start own herds)	6					

Overall, cash sales, savings, ritual slaughtering, meat, and ploughing received the highest importance scores and percentage usage in the household survey, with the exception of draught, where only 42% of households interviewed were using their cattle for ploughing (Table 6). Milk and manure had relatively high frequencies of use but lower importance ranking than the above products and services. These results are, in general, in agreement with those obtained from a PRA pairwise ranking exercise, except for the group consisting of older men who felt that milk, ploughing and meat were more important than cash sales and slaughtering for celebrations and rituals. In this sense, it appears that they still hold a more traditional attitude to livestock keeping. On the other hand, young men ranked cash sales as the most important function of livestock, although they did not appear to recognise the relationship of this to 'savings', which was placed near the bottom of the list. In contrast, women viewed savings as the most important use of cattle, followed by ploughing and cash sales. Detailed questioning around cash sales and slaughtering revealed that this was not as high as might be expected given the above results. The reason for this

was that owners saw the *potential* for sales or slaughter to be high, and this was what was important, rather than the actual number of sales or slaughtering events. What was interesting throughout was the high value placed on ploughing, particularly when relatively few households were still using animal traction. This again may be a reflection of the potential that exists to plough if one owns stock, rather than the actual use of animals for draught power.

Overall, the number of goods and services obtained from cattle per household was a function ($r^2 = 0.19$; $P < 0.005$) of the number of animals owned by that household, summarised in the form:

Number of goods/uses obtained per household = $3.44(\log_{10}$ No. of cattle) + 5.03.

Thus, the more cattle a household owns, the more uses it gets from its herd, as well the greater quantities of specific goods such as milk and manure. Previous studies have shown that sales and off-take frequently increase with increasing herd size (Groenewald and du Toit 1985).

Total annual value of cattle goods and services to cattle owning households

The total net direct-use value of cattle per owning household was estimated as R4 973.10 per annum (Table 7). With a mean herd size of 10 animals, this total value was the equivalent of R497.21 per animal per year. The goods and services contributing most to this value were herd growth (43.2%), followed by milk (15.3%), manure (13.2%), slaughtering (12.5%) and cash sales (9.4%). Draught, as an important function of cattle, had relatively little overall monetary value. However, Barrett (1992) argued that a better approximation of the value of draught services would be the value of agricultural outputs rather than the local hiring rates. Milk has been reported in a number of studies to make a significant contribution to the overall value of livestock (Barrett 1992, Buchan 1988, Gandar and Bromberger 1984). Excluding herd growth (or savings value) the net value of direct goods and services from cattle was R2 848.80 per year. There was no correlation between the gross direct-use value ($\log_{10}$) per good or service and its perceived importance ($r = 0.42$; $P > 0.05$; $n = 10$). The correlation between gross direct-use value ($\log_{10}$) and proportion of households using each good or service was also not significant ($r = 0.34$; $P > 0.5$; $n = 10$). The net value was 86.3% of the gross value.

Direct-use value of goat goods and services to owners

Frequency of use and relative importance of goods and services provided by goats

Goods and services from goats were widely used by the sample households (Tables 8 and 9). Almost all households used meat (97.4% of households), usually during ceremonies (84.6%) and celebrations (82.8%). Most households (66.7%) also sold goats to earn money. The same proportion of households used the hides of goats (66.7%).

From the importance rankings provided by respondents, meat was rated as the most important product from goats followed by ceremonies, selling and savings. Milk was the least consumed product and has a low importance value. There was a strong correlation ($r = 0.67$; $P < 0.05$; $n = 5$) between the percentage of respondents using a particular good and the composite importance ranking of that good.

Total annual direct-use value of goat goods and services to goat-owning households

The value of goats to local households was less than that of cattle. This was probably due to a combination of factors: (1) there are fewer goats per household, (2) goats offer fewer goods and services than cattle, (3) goats are smaller, and (4) the unit price of goat products is less than the equivalent product for cattle. The net value (including savings and mortality) was R415.44 per household per year (Table 9).

Given that the mean herd size per household was 7.3 animals, this is the equivalent of R56.91 per goat per year. The largest contributors to the total value were savings (58.6%), meat (24.3%) and cash sales (16.9%). Net value was 57.2% of gross value. The correlation between the value of each product from goats ($\log_{10}$(net value to user house- holds +1)) and perceived importance was not significant ($r = 0.82$; $P > 0.05$; $n = 5$), but it was with the percentage of households using livestock goods and services ($r = 0.90$; $P < 0.05$; $n = 5$).

Direct-use value of livestock goods and services to non-owners

Reasons for not owning livestock

Two-thirds (66%) of households did not own any livestock whatsoever. There was a range of reasons for this, the two most common being that: (1) they did not have sufficient capital to purchase an animal (60%), and (2) they did not have anyone to herd the animals during the day (24%). Consequently, they did not wish to get into disputes with their neighbours if their animals should damage someone's crops. Related to the problem of no herder was that of theft (8%). Even though most households did not own livestock, most aspired to do so. Two-thirds (65.4%) of the households sampled stated that they would like to own livestock. The primary reason (unprompted) for wanting livestock was savings and/or being able to sell for cash (46.2%), followed by meat (19.2%).

Total annual direct-use value of livestock goods and services to non-owning households

The total annual value of livestock goods and services received by non-owning households was high given that they do not posses livestock (Table 10). The gross annual value is estimated to be R231.02. Deduction of assumed costs of protecting one's crops from damage by other people's livestock resulted in a net value of R162.98 per year. This was almost equivalent to the benefits from having three goats, just under half of the mean household herd size for goats. The assumed costs of protection were made the equivalent to the cost of employment of one herder across all households, which balanced the calculated value due to employment as herders of 3.8% of non-owner households. Although such employment potentially offers a large contribution to the value accrued by non-owning households, the small sample size and low incidence of employment make it unwise to extrapolate this amount across all households. Hence, the logic of balancing it out

Table 7: Total annual direct-use value of the goods and services provided by cattle to cattle-owning households (hh)

	% of hh	Value to user hh (R)	Value to all cattle-owning hh (R)	Proportion of total value
Draught	42%	88.25	37.06	0.6%
Draught hired out	12%	225.5	26.70	0.5%
Transport	15%	654.90	163.72	2.8%
Milk	42%	2104.68	883.97	15.3%
Manure	91%	838.47	763.51	13.2%
Dung as a sealant	56%	88.72	49.68	0.9%
Dung for burning	18%	407.81	73.26	1.3%
Slaughtering	83%	867.27	719.83	12.5%
Hides	49%	20.06	13.44	0.2%
Cash sales	76%	725.81	544.35	9.4%
Herd growth (savings)	100%	2487.3	2487.3	43.2%
GROSS VALUE				
a) Direct use of goods and services only (excluding savings)		a) R3 275.52		
b) Including savings value of herd growth		b) R5 762.82		
COSTS				
a) Direct costs excluding stock losses from herd growth		a) R426.72		
b) Costs including stock losses from herd growth		b) R790.72		
NET VALUE				
a) Direct use of goods and services only (excluding savings and stock losses)		a) R2 848.80		
b) Including savings and stock losses		b) R4 972.10		

Table 8: The importance ranking of goods and services from goats

Goods/Services	% of respondents	Importance ranking (number of times ranked as being amongst the three most important uses)			
		Most important (weight = 1.0)	2nd most important (weight = 0.5)	3rd most important (weight = 0.33)	Weighted ranking
Meat	79.5	14	11	6	21.5
Ceremonies	61.5	11	7	6	16.5
Cash	46.2	5	9	4	10.8
Savings	48.7	5	5	9	10.5
Celebrations	15.4	2	2	2	3.7
Hides	5.1	0	1	1	0.83
Milk	2	0	0	1	0.33

through the cost of protection. It is conceivable that non-owners reciprocate the benefits through sharing or gifts of non-livestock products or labour. If so, these would represent a direct cost to the household, whilst simultaneously building social capital. However, this was not considered in the study. Moreover, in all likelihood, the sharing or gifts of non-livestock products will also occur from livestock owners to non-owners and not just *vice versa*.

Advantages and disadvantages to non-owners of there being livestock in the community

At the end of the interview respondents were invited to list any overall advantages or disadvantages to their household due to the presence of livestock in the area. In terms of benefits, the most frequently mentioned ones were access to the direct goods that livestock offer, such as meat, milk and dung (Table 11). However, access to ploughing, as a service, was highly rated. Less obvious ones included job creation because of the need for herders, maintenance of traditional customs and lifestyles, and the benefit of livestock eating the stover in the fields after harvesting ('cleaning up the fields').

Most of the respondents cited damage to crops as a disadvantage. They emphasised that when it occurs it causes conflict between neighbours and community members. The owner of the livestock that caused the damage is supposed to pay compensation. This was not always readily forthcoming and the dispute may then be referred to the tribal court, which serves to intensify the conflict. One household pointed out that they had incurred financial loss because they had to fence their property due to the presence of livestock. However, several households said that they would fence their property irrespective of the presence of livestock or not. Another stated that they always needed to have a family member at home to ensure that livestock did not damage their crops. This suggests that the onus on protection is shifting to the cultivator, rather than there having to be a herder to prevent crop damage.

The approach in this section has highlighted the monetary value of particular livestock goods and services even to households that do not possess livestock. Whilst this is important, it undoubtedly underrates the non-financial values. A percentage of households received one or more goods

Table 9: Summary of annual values of goat goods and services

Goods and services	% of households	Value to user households (R)	Value to all goat-owning households (R)	Proportion of total value
Milk	2.6	0	0	0
Meat	97.4	184.5	176.33	24.3%
Hides	51.3	2.52	1.29	0.2%
Bride wealth payments	0	0	0	0
Cash sales	66.7	184.5	123.06	16.9%
Savings (herd growth)	100	425.76	425.76	58.6%
GROSS VALUE				
a) Direct use of goods and services (excluding savings)		a) R300.68		
b) Including savings value of herd growth		b) R726.44		
Direct costs		R140.70		
Mortality and theft		R170.30		
NET VALUE				
a) Direct use of goods and services only (excluding savings)		a) R159.98		
b) Including savings and costs due to loss of stock		b) R415.44		

Table 10: Summary of annual values of livestock goods and services to non-owning households (hh)

Good/ service	Buying/hiring			Free		
	% of hh	Value to user hh (R)	Value to all hh (R)	% of hh	Value to user hh (R)	Value to all hh (R)
Meat	48	42.55	20.42	16	24.00	3.84
Milk	45.5	137.98	74.23	8.3	R5.70	0.47
Ploughing	41.6	45.74	19.03	4.2	83.06	3.49
Floor sealer	0	–	–	46.2	45.26	20.91
Manure	20	42.89	8.58	28	42.89	12.01
Employment	n/a	–	–	3.8	1 800.00	68.04
Gross value		122.26			108.76	
TOTAL GROSS VALUE			R231.02			
Costs (assumed cost of protecting crops and gardens)			R 68.04			
NET VALUE per household per year			R162.98			

from livestock (such as dung for sealing floors, milk, manure and meat) free of charge. This not only saves that household certain costs, but it also maintains and strengthens familial and neighbour relationships. Both of these are necessary for building social capital and safety-nets. It is possible to hypothesise that the contribution of such free goods to total household requirements is greater for poorer households in a community than for wealthier households.

Discussion

Total annual value or returns from livestock goods and services

This study has indicated that the household use of goods and services from livestock has considerable direct-use value. The exclusion of goats from previous studies meant that there was no comparative literature. Additionally, the inclusion of non-owning households as a means to value the benefits of livestock to the broader community has not been considered before. Combining the total values for cattle owners, goat owners and non-owners presents a picture of the Sand River catchment as a whole (Table 12).

Households owning both goats and cattle capture by far the greatest proportion of the total annual value 'available' in the catchment. This is due to there being more households with both forms of livestock rather than either one alone, as well as the combination of the net positive value represented by each. At first glance, the total annual value for the catchment appears high, but composite values for most resources for any catchment usually are, since they involve large areas and large numbers of households. Additionally, 43.2% of the value attributed to cattle and 58.6% of the value attributed to goats is in the form of savings through herd growth. The net value of direct goods and services was R45.07 million per year for the whole catchment. This is the equivalent of R411 per hectare in the communal areas of the catchment. Distribution of the total net, annual, direct-use value corresponded to R1 431 per year across all households, owners and non-owners.

Taking the mean herd size per owning households and the number of households with particular livestock types, the capital value of the current entire herd was approximately R214.29 million. This fluctuates from year to year. The annual net value of goods and services produced (R77.71 million) is thus approximately a 36% return on investment.

It is noteworthy that the net annual direct-use value per kilogram live mass was approximately 22% higher for goats than for cattle. The net annual value per goat was R56.91 for a sample herd size of 7.3 animals. Using an average mass of 35–40 kg per goat (mid-point = 37.5), the value per kilogram was R1.52. Corresponding figures for cattle were

Table 11: Advantages and disadvantages of the presence of livestock in the community to non-owning households

Advantages	No. of times mentioned	Disadvantages	No. of times mentioned
Access to meat	10	Damage to crops or gardens	18
Able to hire cheap ploughing	9	No disadvantages	5
Access to manure	7	Causing conflict between neighbours	1
No benefits	5	Soil erosion along paths	1
Availability of milk	4	Livestock pull thatch from roofs, especially during winter or drought	1
We can buy animals for funerals/ceremonies	4	We must have someone at home all the time to make sure they do not eat our crops	1
Dung for floors	3	We must fence our yard to prevent them damaging our crops	1
Job creation	2	Because cattle have to be grazed far away, many children miss some school classes in the morning	1
We can hire transport	1		
Livestock clean up the fields after we have harvested our crops	1		
Cattle remind us and our children of our culture and traditions	1		

Table 12: Summary of total annual direct-use value and costs associated with ownership of cattle and goats per household and for the Sand River catchment

	Cattle only	Goats only	Both cattle and goats	Non-owning hh
Gross value per household per year (R)	5 762.82	726.44	6 489.26	231.38
Costs per house hold per year (R)	790.71	311	1 041.71	68.4
Net value per household per year (R)	4 972.11	415.44	5 447.55	163.34
Proportion of households	4.7%	15.0%	19.0%	61.3%
Absolute number of households	2 552	8145	10 316	33 284
Total value in catchment per year (million R)	12.69	3.38	56.2	5.44
Total annual net value of livestock goods and services (annual turnover)			R77.71 million	
Total annual net value per household across all households (owners and non-owners)			R1 431.20	

R497.21 net value per animal, with an average mass of 400kg, resulting in a net unit mass value per year of R1.24.

The value of livestock in rural livelihoods

It is important to appreciate that the values determined through this work are effectively a snapshot of the potential value at that time. The values at both the household and catchment level are not static. At the household level they will fluctuate according to individual management and investment decisions, and the prevailing climatic conditions, particularly drought. At the catchment level, the total value will change in response to density dependent effects, such as calving success, drought and changes in land use. The extrapolation to catchment level is based on the current number of approximately 48 000 cattle in Mhala and probably a more or less equal number in the Mapulaneng region (Pollard *et al.* 1998). Yet, at different times in the past 20 years the number of cattle has ranged between less than half of this to almost double.

The dynamic nature of values attached to livestock and livestock products is a characteristic of many of the other sources of income and resources on which rural livelihoods depend (Shackleton *et al.* 2001). Arable cropping in the area, mostly dryland, requires that there is sufficient rain, labour and cash for input costs such as seed and fertiliser. Frequently the level of one or another of these is insufficient, along with other variable constraints. Similarly, the harvesting of natural resources for home consumption and/or sale is not predictable. For example, the supply of most edible resources (herbs, fruits, insects) is dependent upon rainfall. The supply of thatch is dependent upon rainfall, grazing intensity and the occurrence of veld fires. At the individual household level, the supply of wood for fuel, fencing and carving is dependent on competition from other local and external users, labour, and the rate of land use change, particularly deforestation resulting from the creation of arable fields. The consequence of the fluctuating rates of resource supply (arable, livestock and natural resources) and the ability to extract and process them, is that the value accruing to rural households is variable. Rural livelihoods therefore have to be flexible in response to this, as a mechanism to optimise the values captured across the range of options available (Cousins 1999).

Within the context of a range of livelihood strategies, the values accruing from the ownership of livestock are comparable to those from harvesting natural resources. For example, Shackleton and Shackleton (2000) summarised the value of use of secondary products within the Bush-

buckridge region, reporting a total value of R6 892 per household per year, excluding the value of trading in fuelwood, construction timber and medicinal plants for which no value was determined (but is believed to be significant). There have not been any estimates of agricultural production across a representative sample of villages and households in the region. However, High and Shackleton (2000) found that the value of crops and secondary products in home-gardens was R1 694 per household per year in Dingleydale B, most of which were consumed at home rather than sold. They also reported a value of crops produced as R6 658 per household per year. However, many of the fields were served by the Dingleydale irrigation scheme (although it was not fully operational during the time of the fieldwork), and thus production rates were not representative of the region as whole, most of which does not have irrigation. Assuming that the value in non-irrigated fields throughout most of the region is half of this, i.e. R3 329, plus the value in home-gardens, then the total annual value of arable production is approximately R5 023 per household. However, the value for livestock and arable production are for the 'owning' households only. The above cited value for resource harvesting has already been extrapolated across households. Thus, the annual value due to livestock is R1 431 across all households, only one-quarter of that for resource harvesting. The value for arable production is probably intermediate between the two as considerably more households engage in arable production (home-gardens and/or fields) than own livestock.

Not unexpectedly the value of livestock to non-owning households is less than to owning households. Thus, it is probable that the relative importance of arable production, resource use and external income becomes higher. However, in a similar fashion, not all households harvest the full range of secondary resources available to them, nor do all households maintain an arable field. Thus, the relative contribution of any of these three sources varies from household to household, as well as relative to external sources of income or sources of employment. The process by which a household emphasises one over another, and the criteria considered to reach a decision, still require greater understanding.

The value of individual goods and services attributed to livestock

This study corroborates others demonstrating that in rural areas of southern Africa livestock are kept for a range of purposes, and not simply for cultural reasons, social status and bride-wealth payments, as is a common perception. In the Sand River catchment, the most important reason for keeping cattle reported was to sell for cash. The second was savings, which is conceptually linked to the first. The third most important reason, according to respondents, was draught power. Each of these contributed 9.4%, 43.2% and 1.1%, respectively, to the total direct-use value. The primary perceived reasons for keeping goats were for meat, ceremonies and sale. Goats appear to be replacing cattle for ritual purposes. Cattle were preferred to goats because of the greater diversity of goods and services obtainable from cattle.

There is little doubt that the savings and cash uses of livestock are of significant importance, not totally reflected through assigning a financial value. Several respondents stressed the importance of having livestock to sell when adverse circumstances befell a household, such as retrenchment, death of a breadwinner or divorce. Two elderly female respondents indicated that upon the death of their respective husbands, each had been left without any form of income. At the time of the death of their husbands, they had been too young to be eligible for old-age pensions. They emphasised that they had survived through the sale of livestock (one or two animals per year) that they inherited upon the death of their husbands. Additionally, the results indicate that even non-owners have access to and are given products and services from livestock. This too is an important contribution to resource poor households or those suffering temporary setbacks. They receive meat, milk, dung and access to ploughing through processes of acknowledgement of kinship and neighbour relationships.

Savings also played another role in terms of owners' and non-owners' perceptions of the use and value of livestock, namely security. Many households did not use several of the potential range of goods and services that livestock offered, but valued having the option to do so if needed. This was particularly apparent with regard to slaughter, sale and payment of bride-wealth, i.e. they had never slaughtered, sold, nor used livestock to fulfill bride-wealth obligations, but they would if the need arose. Thus, for many households the value of cattle for these goods and services was a potential, or insurance, value rather than an actual value, but this potential value could be realised at any stage.

The off-take (slaughter and sale) of livestock on a household basis was high and refutes the notion that livestock, especially cattle, are kept mainly for social status reasons with little trade or off-take. A similar conclusion was reached by Ainslie (2002) from the Peddie district of Ciskei where off-take was approximately 29%. Theft (as the second highest form of off-take) is of major concern to residents, as also reported in the case studies of Ainslie (2002). Many households have lost animals due to theft. Individual households feel powerless to prevent this, and believe that reporting theft to the police has little or no impact. Appropriate institutional action is required to combat this.

The role of cattle in bride-wealth payments seems to be dwindling, assuming that it used to be the norm. Whilst still important, many households request either cash or a combination of cattle and cash, rather than just cattle as was the custom in the recent past. Goats play no role in bride-wealth payments other than a household may sell some to obtain some or all of the necessary cash.

Of the direct-use goods and services (i.e. excluding savings) provided by cattle, milk contributed the highest value annually, and was R120 per household per year more than the next direct good, which was manure. The importance of milk in rural communities in southern Africa has been stressed by Gandar and Broomberger (1984), Tapson (1991) and Schmidt (1992). This finding also applies to the non-owning households where the reduced price of milk from local owners and suppliers relative to local shops saved non-owning households approximately R75 per year. Meat was the next

most important good to non-owners, but at a value of less than one-third of that of milk. The high value of milk is anomalous in some respects in that it is unlikely that households would purchase anywhere near the equivalent amounts or value of milk if they did not have cattle, irrespective of the price at the local store. There seems to be an element of 'luxury consumption' because it is available.

A noteworthy exception to the general findings across previous studies was the low value attributed to draught power. Additionally, it was ranked only as the fifth most important goods or service out of a potential list of 14 (of which two, loaning and dung as a fuel, were not ranked). From the data it was not possible to ascertain if this was due to: (1) a general inherently low ranking of cattle for draught in the region, (2) a shift away from cattle as draught power in favour of tractors (most respondents offering an opinion stated that tractors were better at ploughing, except for the higher cost), or (3) a biased result from a non-random sample. The first appears unlikely in light of the findings of Fischer (1987) in a single village in the catchment, that draught was the primary reason for keeping cattle and that agricultural yields fluctuated in response to the availability of cattle for draught. Several respondents in our survey stated that they used tractors instead of cattle because most men were migrant workers and were not at home enough to train the cattle in ploughing.

The community value of livestock

This is the only study of which we are aware that has attempted to consider the financial value of livestock to the broader community and not just to owners. The social value of cattle in rural African communities has long been recognised (Smith 1992). The financial value has not. We have documented that even non-owning households receive a net financial benefit from the presence of livestock in their immediate surroundings. Between 40 and 60% of non-owning households bought, or received free, a range of products including meat, milk, manure and ploughing. Even if they paid for the good or service, it was always at a cheaper price than the most immediate alternative available locally. A number of negative reasons were identified against the presence of livestock, the most common one being that they damage crops and gardens and therefore everyone had to fence their fields even if they did not have livestock. If crops were damaged by livestock, the aggrieved household could claim compensation from the owner, but this was sometimes difficult to implement. Nevertheless, our study indicates that even after accounting for the cost of fencing a property, non-owning households still accrue a positive financial benefit due to the presence of livestock. This value is probably not immediately evident to non-owning households, but most do recognise the positive values gained from ownership, as 65.4% stated that they aspired to own livestock, particularly cattle. The rate of increase in owners (4.2% p.a.) in the Mhala region is greater than the population growth rate.

The role of cattle in causing or exacerbating soil erosion was identified during the group exercise, but not during any of the household interviews. Thus, it does not appear to be of concern to local residents, neither owners nor non-owners. The steady increase in numbers of owners, and the desire by most non-owners to acquire livestock, may be cause for concern and therefore a cost factor associated with possible degradation could be considered. This will be a difficult task and mirrors the complexities associated with the determination of the increased value of agricultural produce due the presence of cattle as argued by Barrett (1992). Additionally, it would first have to be established that: (1) there is degradation in the catchment, and (2) livestock are significant contributors to that process over and above other causes, before any costs of degradation could be attributed to cattle. Shackleton (1998) argued that there is little degradation in the Bushbuckridge region, including the Sand River catchment. The most apparent area of concern for soil erosion is the upper catchment, currently under plantation forestry, not grazing (Pollard *et al.* 1998).

The value of livestock products to non-owners and poorer households should not be underestimated. The calculated direct-use value across all non-owning households is not particularly high. Yet, some non-owning households do receive significantly more than this mean value. There is little doubt that the goods and services that these households obtain from livestock represents a meaningful contribution to their livelihood strategies, although the contribution to total mean cash income is unknown. Local perception is that, generally, households without livestock are poor households. The role of livestock in households with only a few animals is probably also more important than to households with greater numbers. However, there was a strong relationship between the number of cattle and number of uses or goods received. Thus, households with larger herds can, and do, reap greater benefits. The proportionately higher off-take of cattle from smaller herds is contrary to expectation. However, Colvin (1985) found that off-take was not just a function of household circumstances, but also the agro-ecological zone, in that it was higher from smaller herds in arid-and semi-arid areas, as is most of the Sand River catchment.

The findings of this study highlight, once again, the multiple and diverse nature of rural livelihoods (Cousins 1999). Some households have livestock, most don't. Some have cattle, others keep goats, and others keep both. The number of animals, and goods and services obtained, are not uniform across all owners. Secondly, it indicates that the economic and social basis to rural livelihoods remains poorly understood. In particular, the economic statistics of production from rural areas, and the poverty characterisation of these areas, deal only with formal sector goods and services, mainly arable production and the sale of livestock. It is clear from this work on livestock, and previous work on the use of natural resources in the same area (see summaries in Pollard *et al*. 1998, Shackleton and Shackleton 2000), that rural households extract significant value from communal rangelands and resources. This is not accounted for in regional and national economic indicators and accounts (Shackleton *et al*. 2001), nor is it appreciated in the land reform process. Cousins (1999) argues that overlooking these contributions to household security and sustainability in rural areas could have dire consequences for land reform initiatives and projects.

Acknowledgements — Funding for this work was provided by the Land Care Secretariat, National Department of Agriculture, as part of the Save the Sand Project. We are grateful to the communities of the Sand River catchment for their willingness to share their knowledge. Carla Willis, Cathy Bailey and Sharon Pollard made useful comments on earlier versions.

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