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Local Perceptions of Livestock Husbandry and Rangeland Degradation in the Highlands of South Africa: Implication for Development Interventions

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ABSTRACT This study assessed communal farmers' perceptions of livestock husbandry and rangeland degradation in the highland areas of South Africa. Sixty households and 30 elders were interviewed individually and as a group, respectively. Cattle are primarily kept for cash generation, goats for cultural ceremonies, sheep equally for cash, meat and wool production, and chicken for meat consumption. Elderly people ranked shortage of feed and grazing, rangeland degradation and water scarcity as the primary constraints of livestock production. Changes in species composition, gully erosion, bare patch frequency and *Euryops floribundus* invasion were perceived as the main indicators of degradation. Elders also grouped consequences of rangeland degradation into direct effects on animals such as hair loss, weight loss and the long distance travelled by animals for foraging, and into indirect effects such as poverty, migration, less marketable animals and stock theft. Community-based rangeland and livestock development aimed at conservation, management and restoration of resources, while maintaining an assemblage of livestock species, is recommended.

INTRODUCTION

Many pastoral and agro-pastoral farmers throughout Africa, referred to here as communal farmers, use their indigenous knowledge and perceptions to make decisions on livestock husbandry, rangeland resource utilisation and management. This has allowed them to keep livestock for generations with little access to modern farming technologies as well as government and/or financial support. Communal people keep livestock for multiple socio-economic and cultural benefits (Shackleton et al. 2005; Solomon et al. 2007; Kassahun et al. 2008) and, in combination and with appropriate valuation, livestock production may yield higher rates of economic return per hectare than commercial ranches (Cousins 1999).

African communal production systems continue to operate under often difficult social and biophysical environments that are spatially and temporally variable. Today, the topic of communal land use on African rangelands provokes concerns about land degradation, desertification and human impacts on the environment. Many researchers have reported that environmental degradation is the main factor leading to increased fragility of African pastoral and agro-pastoral systems (e.g., Bollig and Shulte 1999; Abule et al. 2005; Kassahun et al. 2008). However, the main factors that drive the environmental changes have been debated for several decades. Some ecologists and social scientists (Hardin 1968; Coppock 1994) argue that uncontrolled stocking and livestock management practised by the communal farmers is the major cause of land degradation. Communal people behave opportunistically (like free-riders') and are accessing free resources, and therefore increase livestock numbers in order to maximise their individual benefits but, neglect, or collectivise, the consequences (Hardin 1968). Contrary to this opinion, Ostrom (1990) considered that within communities, rules and institutions can emerge from the bottom up to ensure sustainable shared management of resources as well as an economic return. The attributed blame to communal people and their land use system is also reported by other ecologists who regard communal livestock owners to be less knowledgeable of the environment (Pierotti and Wildcat 2000; Oba and Kotile 2001). Indeed, this stereotype may arise

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from lack of detailed documentation of the local knowledge and perceptions as well as undermine their objectivity. A recent study from Botswana (Mulale et al. 2014) concluded that besides overgrazing and human habitation, implementation of unsuitable land use policy and legislation contributed significantly to communal land degradation. Other researchers consider that indigenous communal rangeland management systems are compatible with the environment (Abule et al. 2005; Solomon et al. 2007; Kassahun et al. 2008). That being the case, sustainable development can be achieved through a community-based natural resource management programme that incorporates the community's participation in providing information, decision-making and development planning (Waudby et al. 2012). This stance is supported by the study of Matlebyane et al. (2010), who reported that in Limpopo province of South Africa communal farmers' knowledge was used to develop a fodder flow programme for year-round livestock feeding. In the Kalahari region of Botswana, pastoralists identified prescribed land management practices that can be suitably adopted in arid rangeland ecosystems (Reed et al. 2007).

In South Africa, the livestock sector of freehold and communal farming contribute 75% of the total agricultural output (Musemwa et al. 2008). Communal farming is characterised by often unclear boundaries that involves the right to open access of forage resources by community members, and is mainly subsistence-oriented. Communal land occupies about 17% of the total farming area of South Africa and supports approximately 52% of the total cattle, 72% of the goats and 17% of the sheep populations (FAO 2007). Mixed livestock ownership is the dominant production system, whereas pure pastoralism is the key production system in the driest areas. Communal livestock production is often regarded as an insignificant contributor to formal agricultural output and is mainly confined to the eastern and northern parts of the country. Of all provinces in South Africa, the Eastern Cape is regarded as the 'Livestock' province and is home to 21% of the country's cattle, 28% of sheep and 46% of the goat population (Gwelo 2012). Communal farming is practiced on a larger portion of the natural rangelands and supports multiple livelihood strategies of the rural people in the province.

Several development projects in Africa that attempted to improve rangeland-based communal livestock industries have failed because the development concept is based top-to-bottom approach and has often overlooked local people's knowledge and perceptions. South Africa is no exception, where most development institutes and policymakers still support the view of the tenets of 'the tragedy of commons (Hardin 1968) and believe that communal herders have little knowledge and skills of livestock husbandry and resource management. Contrary to this perspective, Allsopp et al. (2007) demonstrated that South African communal herders possess indigenous knowledge and skills that can be well described and modelled for use in the development of the livestock sector; hence, there is a need to conduct in-depth studies. In the Eastern Cape, the local knowledge and perceptions related to livestock production and environmental degradation are poorly understood. Communal herders are key informants to provide information that may help mitigate poverty, food insecurity and develop sustainable livestock development programmes. Therefore, the objectives of this study were to document in a rural area of the Eastern Cape (1) the local knowledge of communal farmers on livestock production and husbandry, and (2) their perceptions of rangeland degradation and its consequences.

MATERIAL AND METHODS

The study was conducted at Tsengiwe village, a rural settlement located in the Eastern Cape province of South Africa. The population of Tsengiwe is approximately 2 000 (UMVOTO 2012). The area lies 31°34'S, 27°39'E and has an altitude of about 1164 m a.s.l. The area has a temperate inland climate with annual rainfall of 600 –700 mm. About 70 % of the land in the vicinity of the village is communally used for grazing by cattle, sheep and goats (UMVOTO 2012). The vegetation is dominated by grasses with woody plants encroaching some parts of the grazing lands. Many people in the area live in poverty as a result of high illiteracy (90%) and unemployment (80%) (Mlisa 2005). These factors have contributed to the occurrence of many social problems, such as the rapid spread of HIV/AIDS, crime (such as theft, murder and rape), drug abuse, alcoholism, gender inequality and youth suicide. Tsengiwe village contains a very

high percentage of children, young (< 20 years old) and elderly people (> 50 years old). The most economically active people (20–45 years) comprise only 30% of the population (UMVOTO 2012).

Sampling Procedure

Sixty households that own livestock were randomly selected for this study. A household is defined as a man and his wife, a single man or woman with their children and/or any other dependants who live together in the same house. In addition, six groups of elders, which comprised five elders per group, were purposefully sampled. The selection criteria for the elders were age, amount of time they spent in the village and livestock ownership. Accordingly, the selected elders were 60 years old and above, who spent their entire lives in the area and who own one or more livestock species. All elders were recommended by the extension officers and the local farmers. Household data were collected in October 2011, whereas data on elders' perceptions were gathered in April 2012.

Data Collection

Data on livestock holdings and management were obtained by a combination of formal discussions and structured interviews with both male and female adults of the households (a total of 120 interviewees). Data collected in this interview were livestock demography and trends, relative importance of rearing livestock, feeding and management. Opinions on rangeland-related problems were gathered by interviewing a total of 30 elder groups with an open-ended and structured questionnaire. Information gathered included constraints of livestock production, issues related to rangeland degradation and their consequences on livelihood. For ranked data, elders were asked to answer the same questions and only their separate answers were recorded, whereas for descriptive data, an open-ended group discussion was conducted.

Statistical Analysis

Data were analysed using SPSS statistical software programme (SPSS 2011). For ranked data, Friedman's Chi-square test (Steel and Torrie 1980) was used. For data for which Friedman's test revealed significant variation, a set of sign tests for multiple comparison of means were performed. For the remaining data, descriptive statistics such as means, standard deviations and percentages were employed where appropriate.

RESULTS AND DISCUSSION

Livestock Holdings and Trends

Mean livestock number owned by Tsengiwe households was estimated to be 11 sheep, 11 chickens, six cattle, three goats and one pig (Table 1). Livestock holdings, except pigs, showed a high level of variation between households. The mean cattle and goat holdings recorded in this study compare well with the study of Gwelo (2012), but were lower than the values reported by Mapiye et al. (2009) (cattle = 9, goats= 7) and Mngomezulu (2010) (cattle = 12, goats = 6) in the same province, and by Shackleton et al. (2005) (cattle = 12, goats = 6) in a different province. The mean size of the sheep population was relatively higher than those reported by Mngomezulu (2010) and Gwelo (2012), and lower than that of Mapiye et al. (2009). The chicken population in the current study is comparable to those recorded by Mapiye et al. (2009) and Mngomezulu (2010), but was lower than the value reported by Gwelo (2012). Differences in the livestock holdings per household between the current and previous studies could be related mainly to variations in agro-climatic conditions, local preference and/or time series factors. Mapiye et al. (2009) and Mngomezulu (2010) conducted their

Table 1: **Livestock holdings (mean ± SE) and species of livestock kept by the communal people in Tsengiwe community (respondents, n = 60).**

Livestock species	*Holdings*	*Livestock*	*Respondents (%)*
Cattle	6±4	Cattle only	4
Goats	3±3	Cattle and goats	2
Sheep	11±9	Cattle and sheep	7
pigs	1±1	Cattle and chickens	13
Chickens	11.9±9	Cattle, goats and sheep	20.3
		Goats	2
		Goats and sheep	0
		Goats and chicken	4
		Goats, sheep and chickens	2
		Sheep	0
		Sheep and chickens	6
		Chickens	11.2
		All species	4

studies in areas of the province that experience a mild temperature and lower rainfall areas of the province, which is dominated by savanna vegetation. This ecology favours the production of cattle and goats compared to sheep. On the other hand, the current study was conducted in an area with cooler temperatures and higher rainfall dominated by grasslands, which is a more favourable environment for sheep than cattle and goat production. The influence of agro-climatic factors on livestock distribution and herd size was similarly reported by Andrew et al. (2003).

The majority of the respondents (82.8%) keep a mixture of livestock species. Keeping cattle, goats and sheep together accounted for 20.2% of the total households, and cattle and chickens together accounted for 13%. The percentage of households that owned chickens only was about 11%. No respondents were involved in keeping sheep alone or goats and sheep together (Table 1), and there was no explanation for this. Herd diversity could be considered as an indicator of poverty levels. Households who own more diversified livestock species may have a stronger economy and ability to respond to risks than those who own a single species (Alary et al. 2011). Households who possess chickens only may experience sever poverty and, as a result, they may be more vulnerable to risks. Raising diverse livestock species is commonly practised by many communal production systems in eastern Africa (Abule et al. 2005; Solomon et al. 2007) and southern Africa (Shackleton et al. 2005; Dovie et al. 2006; Mngomezulu 2010; Gwelo 2012; Tavirimirwa et al. 2013). Communal farmers in South Africa keep mixed livestock species primarily to maximise consumable products and services as well as to increase income, savings and security (Dovie et al. 2006). In the southern part of Ethiopia, Solomon et al. (2007) reported that keeping a mixed herd reflects a diversification strategy in response to food insecurity during drought periods. Herd diversity was considered a key strategy to maximise the efficient use of diverse feed resources in order to produce the desired products and services (Abule et al. 2005). Keeping mixed species may also aid with maintenance of social and cultural identities within the community.

In terms of herd structure, cows comprised the largest population (60%), followed by oxen (23%) (Table 2). The high proportion of oxen observed in this study may mean lower reproductive rates in the herd (Buchan 1988), but this may favour the availability of draft power for crop farming in the study area although draft power is regarded as the least important reason for keeping cattle. The bull to cows ratio was about one bull to every 20 cows (Table 2), which is far lower than the one bull to three cows ratio reported by Shackleton et al. (2005) and is marginally higher than the one bull to 30 cows reported by Mapiye et al. (2009). The ratio observed in the present study matches well with the common breeding ratio practised by many commercial farmers in South Africa (Colvin and De Jager 1989 cited in Shackleton et al. 2005).

Table 2: Herd structure of cattle (%) kept by the communal people of Tsengiwe community (respondents, n = 60)

Cattle group	*Proportion (%)*
Cows	59.9
Bulls	3
Heifers	7
Bull calves	2.2
Heifer calves	4.2
Oxen	23

All farmers considered the present cattle population in the village to have declined over the past 20 years. This declining trend may be associated with shrinkage in the area of grazing land owing to settlement expansion and land degradation, and/or with lowering of the purchasing power of the communal people to own large stocks. About 80% of the respondents perceived that the present goat population was similar to that present 20 or 15 years ago, whereas 60% of the households indicated that the population has recently increased. About 100% and 60% of the respondents indicated that the sheep population has increased over the past 15 and 5 years, respectively, compared to the present. Because of their high reproductive rate and their adaptability to the environment of the study area as well as their lower cost to purchase, sheep are more preferred to meet basic household needs, and this may support the increase in their population. As for chickens, all respondents were unable to trace the population present15 and 20 years ago. However, 80% of the respondents indicated that the chicken population had not changed significantly in size over the past five years.

Relative Importance of Livestock Species

Household respondents at Tsengiwe indicated that cattle are more important to their livelihood, followed by goats, sheep and chicken (Table 3). This finding agrees with the studies of NERPO (2004), Nqeno (2008), Mapiye et al. (2009) and Musemwa et al. (2010). Nonetheless, the finding disagrees with the study of Mapiliyao (2010) who reported sheep to be the most important species followed by cattle, goats and chicken. Households at Tsengiwe keep livestock for different reasons. As ranked by the respondents, cattle are primarily kept for cash generation. Cash obtained from cattle sales is used to finance household requirements, such as food, school fees, agricultural activities, and enterprises (Musemwa et al. 2010). The primary role of cattle as an income source is further explained by their ability to represent accumulated capital, which can be converted to cash as needed (Thornton 2010). Other studies in South Africa have reported that cattle were mainly kept for prestige and ceremonies (Mngomezulu 2010) or for ploughing (Dovie et al. 2006). In the northern Kalahari of Namibia (Katjiua and Ward 2007) and in southern Ethiopia (Solomon et al. 2007), pastoralists raise cattle primarily for milk production.

Table 3: Relative importance (mean rank) of livestock species to livelihood as ranked by the communal people (3 = most important, 2 = important, 1 = least important) (respondents, n = 60).

Cattle group	*Mean rank*
Cattle	2.7
Goats	2.2
Sheep	2.0
Pigss	1.2
Chicken	2.0

The second important reason for raising cattle identified in this study is for cultural and milk production. Cattle are often used in cultural functions such as paying bride price (locally known as *lobola*) and as pacification of ancestors (Maburutse et al. 2012; Tavirimirwa et al. 2013). Interviewees in this study revealed that meat production is tertiary, suggesting that cattle may be slaughtered occasionally to provide meat. Large animals may not be preferred to small animals for meat purposes because they yield bulk amounts of meat beyond a family's needs, and on the other hand, there is no space and facilities available to preserve the surplus meat. The least essential reasons for raising cattle include genetic conservation, ploughing and gifts (Table 4).

Table 4: Relative importance (mean rank) of the purposes for rearing livestock as ranked by the people in Tsengiwe community (respondents, n = 60) (1= least important, 10 = most important, 0 = Not known).

Attribute	*Mean rank (order)*			
	Cattle	*Goat*	*Sheep*	*Chicken*
Cash	8.57^{a}	6.23^{ab}	7.7 ^{a}	5.5 ^{b}
Cultural	7.45 ^{b}	7.85^{a}	5.0 ^{b}	2.0 ^{e}
Milk	7.24 ^{b}	6.00^{ab}		
Meat	5.35^{c}	5.27^{ab}	7.2 ^{a}	7.9 ^{a}
Inheritance	4.87 ^{cd}	5.31^{bc}	4.1 ^{b}	4.6 ^{c}
insurance	4.78 ^{cd}	4.04^{cd}	3.1 ^{c}	3.8 ^{c}
Social	4.77 ^{cd}	3.69^{d}	3.6 ^{c}	4.2 ^{cd}
Genetic	4.52 ^{d}	3.27^{d}	3.5 ^{c}	3.6 ^{d}
Plough	4.16 ^{d}			
Gift	3.28 ^{d}	3.35^{d}	3.2 ^{c}	4.3 ^{c}
Wool			7.7 ^{a}	

Means with different superscripts within the same column are significantly different ($P < 0.05$).

Household respondents in this study attach goat rearing primarily to cultural functions, followed by cash generation, meat and milk production for consumption. The importance of culturally related functions is mainly associated with slaughtering during traditional ceremonies, funerals, weddings and ritual sacrificial purposes, and with the making of house mats or cattle whips. Other studies in southern Africa (Dovie et al. 2006; Katjiua and Ward 2007) have reported that meat, cash generation, hides and skins are the main purposes of rearing goats. According to the interviewees in the present study, goats are least used for genetic conservation and as gifts, both of which were not mentioned by studies from the other parts of southern Africa (Dovie et al. 2006; Katjiua and Ward 2007). Sheep are primarily raised for cash generation, meat and wool production; secondarily, they are raised for inheritance. This finding concurs with the report of Kunene and Fossey (2006) from Kwa-Zulu Natal province of South Africa. However, it conflicts with the study of Mapiliyao (2010) from the Eastern Cape province, who ranked savings and investments as the secondary key reasons. Other reasons for raising sheep include insurance, breeding, gifts and social-related values. Household respondents in the current study revealed that the most important reason for keeping chickens is meat production fol-

lowed by cash generation. Keeping chickens for cultural purposes was rarely known (Table 4).

In summary, small ruminants are cheaper to raise by resource-limited rural people and provide a higher rate of economic return compared to cattle. They are a preferred source of cash to pay immediate debts or to save money to meet immediate family needs such as paying school fees (Kosgey 2004) and buying medicines. Communal farmers prefer to keep small stocks in order to raise capital for housing projects and to buy cattle (Dovie et al. 2006). They may also be used to accumulate urgent capital to start a small-scale business by young unemployed residents. Small ruminants help to provide goods and services to the households by coping with feed scarcity and periods of drought better than larger animals. From the foregoing discussion, it is important to note that the livelihood roles of livestock may vary from place to place depending on several factors, including agro-ecological conditions, herd size, alternative sources of income, or a combination of these factors. However, it is common to all that livestock represent the means through which the continuity of communal traditions and cultural ties are assured and are the currency for strengthening social relationships between families and community members. Labour migration, the main sources of income in the study areas has decreased precipitously and has forced people to rely more on livestock as a primary source of income.

Livestock Feeding and Herd Management

Raats (1999) reported that poor-quality forage is the most limiting factor to livestock production in the highland grasslands. The grasses grow quickly (because of high rainfall) and become poorly nutritious for an extended period of grazing. Nevertheless, the household respondents indicated that seasonal fluctuation in the quantity and quality of forage is a common phenomenon, but the former is the most detrimental. About 40% of the respondents in this study indicated that they totally depend on natural pasture in order to feed their livestock throughout the year. The remaining households pointed out that during the extended dry season, they supplement their animals feeding with conventional and non-conventional feeds. The common feed supplements used by the farmers are lucerne (10.7%), maize (9.7%), maize stalk (9.7%), pellets (4.5%) and salt (3.2%). About 59% of the households provide supplements using two or three feed items together (Table 5). The majority of the respondents (50%) provide the supplements between May and July (50%), and between June and August (20%). Overall, the dry period requiring supplementary feed may last for six months (May–October) (Table 4). The respondents also mentioned that availability and low quantities of feed was the major problem associated with supplementation of crops and crop residues, whereas scarcity at local level,

Table 5: Types of livestock feed supplements used by Tsengiwe community (Respondents, n = 36).

Feed supplement	*Respondents (%)*	*Period of supplementation*	*Respondents (%)*
Lucerne	10.7	Aug–Sep	2
Maize	9.7	Aug–Oct	2
Maize stalk	9.7	July–Sep	10
Pellet	6.5	July–Aug	7
Salt	4.5	June–Aug	20
Maize + lick + grass hay	3.2	June–Sep	2
Maize +maize stalk+silage	3.2	May–July	50
Maize stalk + pellet	7.5	May–Sep	2
Maize + pellet	4.0	May–Aug	2
Maize stalk + pellet + lick	3.2	none	5
Maize + silage	3.2		
Maize stalk + silage	6.5		
Maize stalk + hay	4.2		
Maize stalk + lucerne	3.2		
Maize stak + salt	3.2		
Maize stalk + silage + hay	4.2		
Pellet + lucerne	5.2		
Pellet + silage + lucerne	3.2		
Silage + lucerne	3.2		

transportation, high feed price and lack of knowledge were the main problems associated with feeds purchased from the market.

Shelter is provided to small and large ruminants by 44% of the respondents (Table 6). In the study area, animal herding is a common practice and the collective responsibility of elders, women and relatives (96%). Similarly, Dovie et al. (2006) reported that 89% of households in the communal areas of Limpopo herded animals either themselves or delegated the responsibility to other members of extended families. The majority of the respondents use rivers (32%) as a source of livestock drinking water, followed by rivers and dams together (26.8%), and dams alone (19.6%) (Table 6). All respondents indicated that the source of water is within 1 km from the grazing lands.

Constraints of livestock Production

Respondents indicated that shortage of feed, grazing lands, veld degradation and water scarcity were the primary constraints of livestock production (Table 7). Regardless of rangeland types and the environment, feed shortage has been reported as the most important constraint of livestock production in several communal production systems of Africa (Yambayamba et al. 2003; Solomon et al. 2007; Mapiye et al. 2009; Mngomezulu 2010; Gwelo 2012). In contrast to these reports, Kassahun et al. (2008) in eastern Africa, and Mapiliyao (2010) and Mutibvu et al. (2012) in southern Africa ranked population growth, and diseases and parasites as the most critical constraints. Respondents in the present study perceived that feed shortage is worsened by the shrinkage in the area of available grazing land, and rangeland degradation. Mngomezulu (2010) added that poor feed quality is also a common challenge in the communal areas of South Africa, where grazing lands are degraded. Most interviewees from both genders suggested that provision of local feed supplements, growing pasture and fodder crops, and training in pasture management skills may help to alleviate feed

Table 7: Constraints of rearing livestock identified by six groups of elders (n = 30) Tsengiwe community in order of importance (1= least important, 7 = most important 0 = not known or not important).

Attributes	*Rank*
Shortage of herder	3.3 [b]
Shortage of adequate quantity of feed	6.2 [a]
Shortage of adequate quality of feed	1.5 [c]
Water scarcity	5.9 [a]
Lack of markets to sell animals	2.2 [c]
Not enough grazing land available	6.6 [a]
Lack of adequate experience in animal management (growing, feeding, breeding, grazing management	4.8 [b]
Veld degradation	5.5 [a]

Means followed different superscript letters are significantly different ($P < 0.05$).

Table 6: Shelter provision, responsibility of herding, source of water and disease and parasite problems as reported by Tsengiwe community (respondents, n = 60).

Animal housing	*Respondents (%)*	
Shade/shelter(large and small ruminants)	44	
No shelter (large and small ruminants)	56	
Herding animals		
Elders only	2	
Elders + relatives	2	
Elders + women + relatives	96	
Source of water for livestock		Remark
River	32	All respondents indicated
Dam	19.6	that a source of water is within 1
Streams and others	3.6	km from grazing lands
River + dam	26.8	
River + others	3.6	
Dam + other	3.2	
All sources	5.3	
Animal health problem		
Diseases	7.1	
Ticks	5.1	
Diseases + ticks	10.7	
No major problem	70.8	

shortages. Although few farmers practised cultivation of lucerne, they showed strong interest in plant other forage crops in their backyards. This suggests that a forage development programme could be planned for a cut-and-carry feeding strategy, for foggage or hay production. Indeed, this requires intensive research to select suitable forage species for their adaptability and sustainable utilisation. In addition, it is vital to consider the ''founder effect'' of the introduced species because they may influence the direction of ecological succession in the local vegetation (the founder effect refers to the effect of the genetic composition of small initial populations on the characteristics of subsequent larger populations). A forage development programme may consider indigenous knowledge in exploring potential local forage species that are well adapted to the environmental conditions and comply with the aims of the production and/or conservation. Unquestionably, to develop effective feeding and conservation strategies, a holistic intervention should take account of demographic, socio-economic, political and environmental issues.

Second, respondents in the current study ranked lack of adequate skills in animal–pasture management, and shortage of herders as limiting factors to livestock production. Lack of production skills was reported by Mapiye et al. (2009) as the major constraint to alleviating feed shortages, and animal health issues. Respondents expressed their interest in skill development; and this may provide an opportunity for initiating participatory-based development programmes for skills improvement. In this study, poor-quality feed and marketing were given the lowest rank, although these are well-known limitations in many communal areas of Africa (Kassahun et al. 2008; Mapiye et al. 2009; Mapiliyao 2010; Mutibvu et al. 2012). In terms of animal health, most of the household members (71%) indicated that they had no serious animal health problem. This finding supports the studies of Solomon et al. (2007) and Kassahun et al. (2008) from pastoral areas of East Africa, but it conflicts with the studies of Perret et al. (2000) and Marufu (2008) from the Eastern Cape, and Mbati et al. (2002) from the Free State provinces of South Africa.

Rangeland Degradation and Consequences

Elder respondents agreed unanimously that rangeland degradation has occurred in many parts of their grazing lands. The indicators of rangeland degradation as perceived by the elders are presented in Table 8 and showed significant differences in the ranking. Changes in grass species composition, gully erosion and the presence of bare patches were rated as the most important indicators of rangeland degradation, followed by bush encroachment, invasion by *E. floribundus*, other forms of erosion, poor grass cover, low biomass, and poor forage quality. There are commonalities and differences among pastoral communities of Africa in the classification and ranking of indicators of rangeland degradation. Generally, herders classify the indicators into diagnostic eco-physical indicators (Khwarae 2006) and anthropogenic indicators (Dale and Beyeler 2001). The eco-physical indicators are factors related to soil, grasses and woody plants whose changes have direct or indirect consequences on livestock productivity. In the present study, local land-users used grasses, woody plants and types of soil as the domains (parameters) of eco-physical indicators and provided lists of variables within each domain. Species composition, cover, biomass and forage quality fell under the grass domain; bush encroachment and invasion by alien plants fell under woody plants; and erosion and bareness fell under the soil domain. Changes in grass species composition and occurrence of bare patches were similarly perceived as the most prominent indicators of rangeland degradation by pastoral people in southern (Khwarae 2006) and eastern (Kassahun et al. 2008) Africa. In the present study, and some previous studies (Abule et al. 2005; Khwarae 2006; Solomon et al. 2007), species composition change refers to the

Table 8: Indicators of rangeland degradation as perceived by elders (n = 30) of Tsengiwe community

Attribute	*Mean rank*
Bare patches	6.2 [ab]
Bush encroachment	4.7 [b]
Change in grass species composition	7.9 [a]
Gully erosion	7.8 [a]
Invasion by *Euryops floribundus*	4.7 [b]
Erosion other than dongas	4.7 [b]
Poor grass cover	4.7 [b]
Presence of locust	3.7 [b]
Poor biomass and quality of forage	3.9 [b]

Means followed by different superscript letters are significantly different ($P < 0.05$).

replacement of desirable, palatable plants by poorly palatable species. This change reflects a shift in utility potential and suggests that degraded areas may support fewer livestock and ecosystem services even, under the most favourable weather conditions and management. Bush encroachment and the spread of invasive plant species are widely perceived as the most indispensible indicator of rangeland degradation by many pastoral communities of Africa (Abule et al. 2005; Solomon et al. 2007; Angassa and Oba 2008; Kassahun et al. 2008). The communal people surveyed in the current study viewed the invasion of *E. floribundus* as an ecological and agricultural problem that threatens their livelihood from livestock and other natural resources. Lesoli (2008) reported that several parts of the study area are invaded by *E. floribundus* species. This species reduces grass productivity beneath the canopies and itself is not browsed by animals even during periods of feed scarcity.

Interviewed elders also identified major consequences of rangeland degradation, and grouped them into direct effects on the animals and indirect effects on their livelihood and food security. Hair loss on sheep, loss of body weight, poor animal performance and long distance travelled by the animals in search of feed were indicated as the major consequences on the animals (Table 9). In addition, the respondents reported

Table 9: Consequences of rangeland degradation as perceived by elders of Tsengiwe community (n = 30).

Outcome	*On livestock*	*On people livelihood*
Animals travel long distance	2.4 [a]	
Animals lose body weight	2.4 [a]	
Animals lose body hair	2.4 [a]	
Animals have poor performance	2.8 [a]	
Affect human health		5.2 [b]
Fewer animals per herd (less social and other benefits)	5.0 [b]	
Lack of markets for the animals	4.8 [b]	
Poverty		7.4 [a]
More money spent to buy animal feed	5.6 [b]	
Migration		6.4 [ab]
No supplement feed		5.8 [ab]
Food insecurity		4.4 [b]
Low income generated		4.2 [b]
Stock theft		6.2 [b]

Means followed by different superscript letters within the same column are significantly different ($P < 0.05$).

that degraded rangelands contain more abundant poisonous plants that affect their livestock than areas that are not degraded. The two plant species perceived by the elders as most poisonous are Kronxini (vernacular name) and *Acacia mearnsii*. Kronxini is browsed by cattle, goats and sheep and causes bloating and vomiting in sheep and goats, while in cattle, sudden death may occur without visible symptoms. Animals die especially during summer time when these plants become profuse and are consumed in large quantities. *Acacia mearnsii* causes bloating in goats and sudden death in lambs.

Poverty and migration to urban areas were ranked as the major consequences of rangeland degradation in people's livelihoods. This finding is in agreement with Berry et al. (2003) who associated land degradation with migration. According to the elder respondents, the decreasing animal number per herd caused by rangeland degradation exacerbated food insecurity, lowered income from animals and weakened social and cultural systems. This suggests that large-scale and multi-faceted resource degradation may cause a profound sustainability problem for the communal people's livelihoods. On a similar discourse, Kassahun et al. (2008) reported that the long-term rangeland degradation that has occurred in parts of the communal areas of eastern Africa decreased the livestock population. The authors concluded that this seemed to have worsened poverty and weakened the traditional and social systems. At a broader land-use scale, the imminent poverty at the societal level may increase wealth discrepancy, with a possibility of livelihoods ranging from the majority of the poor owning few or no livestock to a minority of stock-rich families who are more diversified in terms of herd composition, animal species reared and income sources (Flintan et al. 2011). Undoubtedly, poverty at the community level becomes a contributory cause of degradation when it limits communal people's investment in maintaining land productivity, and it becomes a consequence of degradation as the decline in productivity reduces income. Interviewed respondents also perceived that animals reared on degraded rangeland could be less marketable because of the poor condition of the animals, and quality of livestock products (Flinatan et al. 2011). Elder respondents also revealed that animal owners spend an increased amount on buying animal feed. However, the

greatest decision made by communal people to cope with the feed shortage is shifting the composition of their livestock. In this study, rangeland degradation was also perceived as one of the causes of stock theft, although there was no parallel explanation given as to how this can be the cause.

CONCLUSION

This study concludes that livestock plays a pivotal role in the livelihood of the rural poor people of Tsengiwe community with a strong potential for development. Current livestock production is constrained by a shortage of feed availability, grazing lands, veld degradation and water scarcity. Degradation of the grazing lands and in particular invasion by *E. floribundus* could be a threat for livestock production. *Euryops floribundus* is an invasive shrub species that is spreading in many communal grazing lands, thus causing a reduction in carrying capacity and land productivity. Many farmers have private pockets of lands to grow winter forage and expressed their willingness to actively participate in a livestock–forage development programme. Further studies are needed to identify local feed and forage resources that could support winter supplementation. On-farm evaluation of forage crops could be established to test their adaptability and nutritional characteristics for use as additional sources of winter feeding.

RECOMMENDATIONS

The present study documented only part of the local knowledge and perceptions of the communal people. Detailed studies of farmers' perceptions of rangeland management, degradation and restoration are essential to integrate with science-based knowledge for development of suitable restoration practises and invasive species control. In addition, extensive field surveys are desirable to establish the nature and extent of degradation as well as invasion by alien species. In this regard, an estimation of the current forage production potential and carrying capacity are imperative. This study recommends implementation of community-based livestock–rangeland development and restoration programmes aiming primarily at conservation and management of resources, tackling feed and water shortage for animals, improving farmers' skills in animal husbandry and creating livestock marketing opportunities. This programme may be designed to include (1) analysis of existing data to identify critical problems, needs and opportunities as well as criteria and indicators, (2) development of a draft project, (3) consultation with government and non-government organisations for discussion and support, (4) consultation with the community to create awareness and to capture their willingness and views, (5) selection of target groups (households) to serve as a model for pasture evaluation, fodder conservation and skill intervention, and (6) selection of the grazing area for restoration. The programme should focus on maintenance of the diverse livestock species for their complementarities' role to sustain rural livelihoods and food security. Certainly, implementation of the programme requires full participation of a local governmental institution (s) that is directly or indirectly involved in livestock and rangeland development.

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