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Socio-cultural perceptions of communal farmers towards rangeland degradation in selected localities of South Africa

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Abstract

Understanding the perceptions of communal farmers towards rangeland degradation is critical in the design of sustainable and acceptable management strategies. The objective of the study was to gain understanding of the local knowledge base and perceptions on rangeland degradation in selected semi-arid areas of South Africa. In order to achieve this objective a structured questionnaire was administered to 123 randomly selected communal farmers from purposefully three selected villages (Ramatlabama, Loporung and Makgobistad). Microsoft Excel and SPSS were employed for statistical analysis. Structured questionnaire containing open-ended questions were used. Results of the study indicated that farmers from the selected villages expressed different views concerning the condition of the veld. In Ramatlabama, farmers rated rangeland vegetation condition varied widely as poor (25.9%), fair (48.1%), good (11.1%), and excellent (14.8%). In Makgobistad, farmers rated rangeland vegetation condition varied widely as poor (44.4%), fair (33.3 %), good (18.5%) and excellent (3.7%). In Loporung, farmers rated rangeland vegetation condition varied widely as poor (28.5%), fair (26.2%) good (26.2%) and excellent (19%). Furthermore, rangeland degradation was attributed to lack of knowledge of appropriate management practices among rangeland users. Farmers keep large numbers of animals on the rangelands thus exacerbating rangeland degradation. Farmers agreed that reduction in livestock numbers, introducing watering points and controlling bush encroachment are best practices to mitigate land degradation. However, despite this new-found knowledge, some farmers were still not keen to implement mitigating strategies such as selling animals during the dry season to reduce stocking rate. The challenge of over grazing in these areas can be resolved by involving rangeland users in the identification of acceptable, easy-to-apply technologies that can mitigate undesirable effects of grazing.

Keywords: Bush encroachment, Land use, Semi-arid, Subsistence farming, Vegetation condition

Introduction

For decades, semi-arid South African rangelands have been prone to degradation, which ultimately manifests itself in the form of bush encroachment at the expense of palatable perennial grasses (Graz, 2008; Jeltsch *et al*., 2000). Rangeland degradation leads to severe decline in ecosystem services such as grass and livestock production, groundwater recharge, carbon sequestration and prevention of soil erosion (Graz, 2008; Lehmann, 2010) as well as significant losses in biodiversity across taxonomic groups (Blaum *et al*., 2009). Rangeland degradation is the main ecological factor limiting livestock production in communal areas (Lesoli, 2008). The livestock management systems that are employed in these areas are a product of indigenous knowledge, farmer's objectives, economic pressures, and affordability (Chinembiri, 1999). The conventional explanation of rangeland degradation assumes an essentially stable system that has been perturbed by mismanagement such as overstocking and untimely utilization of forage (Selemani, 2014). However, the definition of land degradation, according to the users of rangelands, is likely to substantially differ from available textbook definitions. Literature has identified many factors, both proximal and distal, that influence the progression of rangeland degradation in different localities. It is imperative that these locality-specific factors are investigated in order to generate information that may form mitigation strategies against rangeland degradation. Equally important, are the perceptions of communal

farmers towards rangeland degradation, its causes and possible mitigation strategies.

The limited success of a number of strategies designed to arrest rangeland degradation in communal farming areas is well documented (Stringer and Reed, 2006). There is an obvious need to integrate scientific expertise with farmers' knowledge. Most communal farmers manage their herds according to their economic situation (herd size and account balance) but may not take environmental variability (rainfall and vegetation) into account (Lohmann *et al*., 2014). For these farmers, the rangeland constitutes a valuable, yet inexpensive resource. Utilizing it in a sustainable manner is the social responsibility of the land users although concepts such as soil erosion and maintenance of biodiversity have very little emotional appeal (de Bruyn, 1998). It is most likely that farmers have their own local indicators of land degradation that may be different to existing indicators found in the scientific literature. Understanding these different indicators is important for the formulation of integrated solutions to land degradation that farmers may identify with and thus ensuring successful implementation. Thus, using farmer knowledge, the objectives of this study were to identify local rangeland degradation indicators and assess whether there are overlaps or divergence with indicators documented in scientific literature. The study further identifies challenges encountered by the communal farmers on the management of rangelands and how socio-economic status of communal farmers affects their perception towards land degradation.

Materials and Methods

Study area: The study was carried out in Ramatlabama, Loporung, and Makgobistad villages located at Ngaka Modiri Molema district, North-West province during the year 2015. Makgobistad and Loporung villages are adjacent to each other. Ramatlabama village is more than 60 km away from Makgobistad and Loporung villages. All the villages are dominated by subsistence farmers. All areas are currently dominated by native grass species such as *Aristida congesta* and *Eragrostis bicolor* (Ravhuhali, 2018). Thicket and bust land areas are interspersed with some limited pockets of bare patches due to land degradation. The landscape is mostly covered with closed to open grassland. Ramatlabama grazing area has evidence of light bush encroachment, with a subtropical thorn woodland bio-zone and some herbaceous plants and forbs when moving to Makgobistad and Loporung villages. All villages experi-ence temperatures that range from 2-31.8 °C and average rainfall of about 450 mm per annum (SAWS, 2017).

***Population, sampling and instrumentation*:** The data were collected from all three villages by interviewing communal farmers using a structured questionnaire administered by well-trained enumerators proficient in the local language. The data used in this study was collected from a sample of 123 livestock farmers and local leaders, who were selected from all three target villages. The questionnaires were designed to gather information related to historical trends of rangeland and vegetation conditions, on rangeland degradation, trends and consequences as well as indicators and appropriate management strategies. The study adopted conceptual framework designed by Masozera (2002).

***Data collection procedure and analysis*:** The questionnaire survey was pre-tested in five households in order to improve clarity and reliability. On an average the duration of the interview per farmer was one hour. The collected data were analyzed using SPSS for Windows version 22.0. Both quantitative and qualitative T analysis was conducted to provide overall descriptive statistics as well as describing the differences between farmers from the three villages and to search for relationships between farmer demographics, socioeconomic status and perceptions on rangeland degradation.

Results and Discussion

***Demographic characteristics of respondents*:** The frequency distribution of gender and marital status of the respondents was recorded (Table 1). In Ramatlabama village, 92.6% of the respondents were males and 7.4% were females. However, in Makgobistad 63% of respondents interviewed were males and 37% were females. Gender distribution among respondents in Loporung village was closely balanced compared to other villages with 57.1% of farmers interviewed being male and 42.9% being females. It was observed that a larger number of farmers from Ramatlabama (51.9%) and Makgobistad (53.7%) were married whereas in Loporung a smaller number (40.5%) of respondents were married.

Age of the respondents: The frequency distribution of age among respondents was also recorded (Table 2). Within Ramatlabama village, the age-group with the highest frequency (53.8%) was 51-75 years followed by

Table 1. Frequency distribution (%) of gender and marital status of the respondents across three villages

		Village		
		Ramatlabama	**Makgobistad**	**Loporung**
Gender	Male	92.6	63.0	57.1
	Female	7.4	37.0	42.9
	Total	**100**	**100**	**100**
Marital status	Married	51.9	53.7	40.5
	Single	44.4	31.5	52.4
	Divorcee	0.0	1.9	4.8
	Widow	3.7	13.0	2.4
	Total	**100**	**100**	**100**

Table 2. Frequency (%) distribution of age classes among respondents within villages

Age class (years)	**Village**			**Overall frequency**
	Ramatlabama	**Makgobistad**	**Loporung**	
0–25	11.5	1.9	2.4	4.1
26–50	23.1	25.9	52.4	34.4
51–75	53.8	53.7	31.0	45.9
76–100	11.5	18.5	14.3	15.6
Total	100.0	100.0	100.0	100.0

the 26–50 years age group (23.1%). Similar frequencies (11.5% each) were observed for the 0–25 and 75 100-year age-groups in the same Ramatlabama village. In Makgobistad, most respondents (53.7%) were found to be aged between 51–75 years. Only 25.9% of farmers in Makgobistad were aged between 26–50 years, while 18.5% fell within 76–100 years age group. The village of Makgobistad had the lowest number of respondents aged between 0–25 years of age. Loporung had the highest number of farmers that were within the 26–50 years age-group, while 31% fell within the 51–75 year group. Over-aged respondents constituted only 14.3% of the respondents in Loporung village. Across all villages, respondents aged between 51-75 years constituted the largest (45.9%) group compared to other age-groups. This is an indication that most of farming in these areas is practiced by older members of the community, who might be close to retirement from formal jobs and those who are already on retirement (Nagaratna *et al*., 2013). In a study by Underson (2014) it was observed that farming in rural areas of developing countries is mostly undertaken by the older generation and not by the youth. De Jager (2012) further stipulated that in South Africa the average age of farmers is 62 years, a situation that threatens future food security if the current crop of farmers is not augmented by younger generations.

Education and employment status: Education has been defined as the process through which knowledge, skills attitudes and values are imparted for the purpose of integrating an individual in a given society or changing the norms and values of the society (Lewa and Ndungu, 2012). Illiteracy has been known to dominate in communal areas where majority of subsistence farmers are located. However, the literacy level was fairly high in the study areas (Table 3). Within Ramatlabama, 56.0% of the respondents were undergone secondary school training. Twenty percent of the respondents had primary school education as their maximum qualification, while only 8% attained tertiary level education. Sixteen percent of respondents had no formal education. Makgobistad had the highest proportion (56.6%) of farmers with secondary school education, while 35.8% of the respondents in the study area only had primary school education. Respondents with no formal education and those with a tertiary education each constituted 3.8% of the all respondents. Loporung had the highest percentage (52.4%) of farmers who went to secondary school. Overall, 33% of the interviewed farmers had primary school education, 9.5% had tertiary level and only 4.8% had no formal education. It was observed that more farmers had no formal education in Ramatlabama, whereas Makgobistadhad a lower number of farmers with no formal education (3.8%). A study conducted by Schultz (1961) indicated that formal education tends to be positively correlated with farm productivity given that education improves human capacity to be innovative and makes farmers more open to adopt new ways of farming. It is thought to be most important factor that influences farm production in a rapid changing technology or economic environment (FAO, 1996).

Table 3. Frequency distribution (%) of respondents' highest educational level within villages

Education level	Village		
	Ramatlabama	Makgobistad	Loporung
Primary	20.0	35.8	33.3
Secondary	56.0	56.6	52.4
Tertiary	8.0	3.8	9.5
None	16.0	3.8	4.8

Distribution of livestock: Highest number of respondents (69% Ramatlabama; 81.1% Makgobistad and 89.3% Loporung) owned between 1 and 20 cattle whereas less than 20% owned between 21 and 60 cattle across all villages (Table 4). In Ramatlabama, all farmers had no more than 40 goats each while in Makgobistad and Loporungthe goat population was lower with 80.4% and 82.6%, respectively, owning up to 20 goats. Sheep were not a common species in all the villages with most farmers owning 20 or less sheep across all three villages. Owing high number of livestock is regarded as an important part of local people in addressing poverty without looking at the impact of livestock in rangeland degradation (Singh *et al*., 2014).This overstocking guided by poverty and food insecurity normally leads to competition for grazing land and water and this can result in a conflict where a long term goal of sustainable rangeland use become compromised (Bedunah and Angerer, 2012; Selemani, 2014). Vetter (2005) also highlighted that keeping high number of livestock beyond the ecological carrying capacity of the land can lead to severe degradation of the communal grazing areas.

***Farmer perceptions on veld condition*:** Farmers from all three villages differed in their views concerning condition of the veld (Fig 1). In Ramatlabama, farmers rated rangeland vegetation condition varied widely as poor (25.9%), fair (48.1%), good (11.1%), and excellent (14.8%). In Makgobistad, farmers rated rangeland vegetation condition varied widely as poor (44.4%), fair (33.3 %), good (18.5%) and excellent (3.7%). In Loporung, farmers rated rangeland vegetation condition varied widely as poor (28.5%), fair (26.2%), good (26.2%) and excellent (19%).

Although, climate change could be one of the contributors to vegetation changes, overgrazing is the major cause in the studied areas. Overgrazing normally occurs when the grasses are exposed to severe grazing for extended periods of time without allowance for sufficient recovery periods. The condition of the veld in most communal rangelands is very poor because there is no controlled grazing (Kwaza, 2013). Overstocking is considered a major characteristic of communal rangeland use resulting in degradation, reduced carrying capacity and lower efficiency indicators such weaning percentages (Forbes and Trollope, 1991; Snyman and du Preez, 2005; Tefera *et al*., 2007).

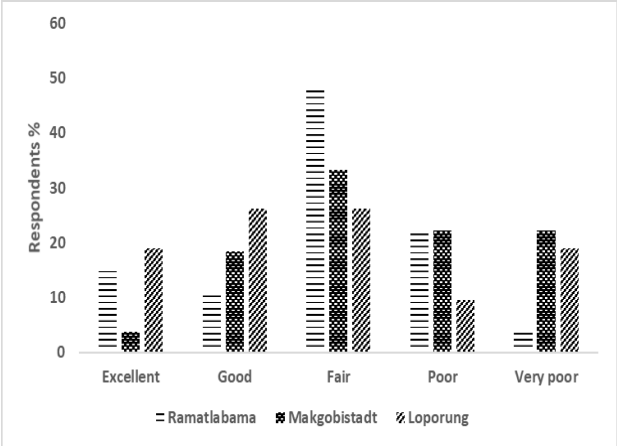

Fig 1. Opinion of respondents on the condition of the communal rangelands across the three study sites

Table 4. The distribution of livestock numbers across animal species and villages

	Village		
	Ramatlabama	Makgobistad	Loporung
Number of cattle			
1 – 20	69.2%	81.1%	89.3%
21 – 40	3.8%	16.2%	10.7%
41 – 60	15.4%	2.7%	0.0%
61 – 80	0.0%	0.0%	0.0%
81 – 100	11.5%	0.0%	0.0%
Number of goats			
1 – 20	50.0%	80.4%	82.6%
21 – 40	50.0%	13.0%	8.7%
41 – 60	0.0%	6.5%	4.3%
61 – 80	0.0%	0.0%	4.3%
81 – 100	0.0%	0.0%	0.0%
Number of sheep			
1 – 20	100.0%	72.7%	66.7%
21 – 40	0.0%	18.2%	0.0%
41 – 60	0.0%	0.0%	0.0%
61 – 80	0.0%	9.1%	33.3%

***Causes of land degradation*:** Over-utilization by livestock has been a major concern and the main cause veld deterioration and degradation in dry lands leading to the desertification (FAO, 1993; Rosenberg, 2007; Sanews,

Table 5. Perceptions of respondents regarding proximal and distal causes of rangeland degradation

Attributes	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Ramatlabama village					
Burning (man-made fire)	0.0	22.2	48.1	22.2	7.4
Wild and domestics animals	0.0	0.0	3.7	55.6	40.7
Deforestation	0.0	0.0	18.5	51.9	29.6
Climatic events	0.0	0.0	15.4	38.5	46.2
Makgobistad village					
Burning (man-made fire)	9.4	24.5	26.4	26.4	13.2
Wild and domestics animals	0.0	17.0	28.3	35.8	18.9
Deforestation	5.7	9.4	24.5	37.7	22.6
Climatic events	3.8	11.3	24.5	17.0	43.4
Loporung village					
Burning (man-made fire)	11.9	4.8	21.4	19.0	42.9
Wild and domestics animals	2.4	2.4	14.3	38.1	42.9
Deforestation	23.8	11.9	19.0	31.0	14.3
Climatic events	7.7	7.7	25.6	28.2	30.8

Table 6. Perceptions of respondents on the extent of rangeland degradation in the three villages

Village	Extent of rangeland degradation				
	Severely degraded	Moderately degraded	Lightly degraded	Not degraded	Total
Ramatlabama	3.8%	26.9%	53.8%	15.4%	100.0%
Makgobistad	14.8%	61.1%	18.5%	5.6%	100.0%
Loporung	14.3%	26.2%	21.4%	38.1%	100.0%

2013). Severe soil degradation and vegetation loss together with water erosion are often the indicators of rangeland degradation. In Ramatlabama, 29.6% of farmers understand that fire can cause damage to the rangeland, while 96.6% view wild and domestic animals as contributors to the damage on rangelands (Table 5). A large proportion (81.5%) of farmers acknowledges the role that humans play in the damage to rangelands in communal areas. Climatic events were regarded as the main cause of rangeland degradation with 84.7% of farmers either agreeing or strongly agreeing with that statement. 33.9% of farmers did not believe that burning can cause rangeland degradation while an equal proportion (39.6%) had an opposing view. Uncontrolled burning results in the soil being exposed to erosion. The growing population in rural areas pushed people to build homes in rangelands designated for livestock use. This has also increased deforestation as more people use fire wood as an energy source (Makhado *et al*., 2009). *Acacia* species and sickle bush (*Dichrostachys cinerea*) are the main trees that are used for fire in those areas. Since rain is very scarce, in semi-arid areas like North West province, farmers are convinced that rainfall shortage is one of the factors behind rangeland degradation. Indeed, lack of rain normally creates severe deterioration of vegetation due to failure of plants to recover from grazing. Sporadic heavy terrestrial rains that are also common in these areas can cause severe run off and loss of topsoil. The study areas are characterized by rapid changes in spatial distribution, seasonal variation, and inter-annual variability varied intensities of sporadic showers and changing lengths of the growing season (Ravhuhali, 2018).

***Extent of rangeland degradation*:** A larger proportion of respondents consider their communal rangelands are degraded (84.5%, 94.4% and 61.9% in Ramatlabama, Makgobistad and Loporung villages, respectively), while 15.4% in Ramatlabama, 5.6% in Makgobistad and 38.1% in Loporung believe that their rangelands are not degraded (Table 6).This is despite that most of the areas are degraded, especially in Loporung and Makgobistad villages where pedestals are visible in the rangelands. Physiognomy of eroded and degraded land is the presence of terracettes, rills as and gullies and these are more visible in Loporung village compared to Ramatlabama. The degraded areas had low vegetation productivity, which was consistently lower than non-degraded areas relative to rainfall (Gibson, 2006). Even though in some areas difficulties are encountered in

tracing the extent of the problem of land degradation, there is no doubt that population are suffering from its effect. In terms of analysis, North West province communal areas are noted as a fairly degraded due to the fact that it is located in semi-arid zone of the country, which is caused by many households who are living on small space of land which has poor infrastructure.

***Knowledge of vegetation indicators*:** There are many views on what is meant by vegetation conditions. Vegetation is in good condition for one purpose (grazing) and it may be considered in poor condition for other purposes. So no single approach to describing vegetation condition can satisfy all stakeholders (Thackway *et al.,* 2006). The respondents in this study understood that rangeland indicators such as grass cover, soil condition, bare patches and encroachment around the areas can be used to determine the degradation status. Most farmers (61.8%) were of the opinion that grass cover is decreasing (Fig 2), while 16.5% thought that grass cover is not changing. Farmers (59.7%) reported that bare patches are increasing in their grazing areas, but 19.3% of respondents indicated there are no bare patches in their grazing lands. Respondents (28.2%) also reported that they have seen some dead trees due to fire and human involvement in their areas. Again 52.7% of farmers reported a decrease in plant diversity in the communal areas, while 29.8% thought that there has been no change in plant diversity. Some indicated that some acacia trees are responsible in the disappearance of some grass species. Seely and Wohl (2004) and Mapinduzi *et al*. (2003) stressed that local people often possess detailed knowledge of indigenous plants and comprehensive knowledge of how plants adapt to dry land environment.

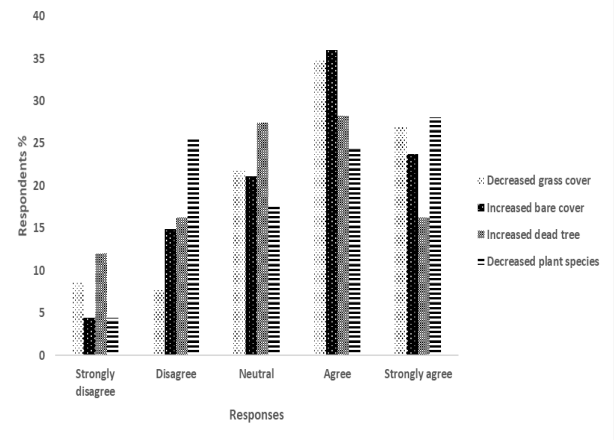

Fig 2. Respondents knowledge on vegetation Indicators (%)

Vegetation indicators like patches of grass cover and death of plants were noticeable in the studied communal areas, especially in Ramatlabama village. The grazing areas in this village are occupied by low quality species such as *Aristida* species, *Melinis repens* and *Tragus berteronianus* grasses. The importance of local farmers in understanding vegetation indicators were emphasized by Angassa *et al.* (2012). It is important that farmers know how to detect and interpret significant changes in indicators of the rangeland as a way of evaluating rangeland condition or health (Ludwing and Bastin, 2008). Angassa *et al.* (2012) concluded that community base knowledge is crucial in strengthening local institutions for sustainable use of natural vegetation.

***Veld restoration strategies*:** In Ramatlabama, 41.7% of respondents were of the view that reducing livestock numbers is not a solution to overcome veld degradation problem, while an equal proportion agreed that it is a viable strategy (Table 7). Livestock play an important role in the reduction of poverty but uncontrolled management practices could have a long-term severe consequences on rangeland health. Communal farmers' resistance to the reduction of livestock numbers as a rangeland management strategy is well documented (Ainslie, 2005). Farmers (41.6%) of Ramatlabama village agreed that creating additional watering points in communal grazing areas could be effective in controlling rangeland degradation. This proportion was much higher in Makgobistad (69.8%) and Loporung, (66.7%) villages. Shortage of water in rural areas poses threat to the livestock and rangeland sustainability (Karl *et al.,* 2010). Holechek *et al.* (1998) stressed that failure to adjust the stocking rate for travel distance to water could result in severe rangeland degradation particularly in hot arid and semi-arid areas. Indeed, overgrazing is severe around watering points as the livestock choose to camp around water sources rather than travel back to areas further from watering points where enough grazing may be available (Howes and McAlpine, 2008). Controlling bush encroachment received the least approval from Ramatlabama farmers with only 25% of farmers agreeing that there is a need to control bush encroachment in communal areas. This proportion was much higher in Makgobistad (71.7%) and Loporung (75%) villages. Bush encroachment in semi-arid areas like northwest province affects many grazing areas. This is because the increase in the number of trees and shrubs tends to overcome grass species. Bush encroachment is considered the most important proximal cause of veld degradation in all the savanna areas of the North West Province (Hoffman

and Todd, 1999). Although bush encroachment is a widespread phenomenon, only few species are perceived as the problematic in the province. However, the small leaved acacia and other leguminous species such as *Tarchonanthus camphorates* and *Acacia erioloba* are treated as endangered species (Msiza and Ravhuhali, 2019). This creates challenges for the communal farmers who may want to control the spread of these tree species in their rangelands. A large proportion of farmers in all villages (85.2% in Ramatlabama; 90.7% in Makgobistad and 95.2% in Loporung) reported that they have not received any training for veld management.

Table 7. Farmers' perception on some veld restoration strategies

Responses	Veld restoration strategies		
	Reduce livestock (%)	Introducing several watering points in communal land (%)	Controlling bush encroach -ment (%)
Ramatlabama			
Strongly disagree	29.2	4.2	33.3
Disagree	12.5	25.0	37.5
Neutral	16.7	29.2	4.2
Agree	25.0	20.8	20.8
Strongly agree	16.7	20.8	4.2
Makgobistad			
Strongly disagree	11.3	1.9	3.8
Disagree	18.9	9.4	11.3
Neutral	32.1	18.9	13.2
Agree	22.6	18.9	43.4
Strongly agree	15.1	50.9	28.3
Loporung			
Strongly disagree	33.3	11.1	2.5
Disagree	10.3	5.6	7.5
Neutral	15.4	16.7	15.0
Agree	15.4	27.8	37.5
Strongly agree	25.6	38.9	37.5

Conclusion

High grazing pressure is a common problem in all the communal areas that were studied. The overstocking in these areas coupled with failure to apply proper management of communal grazing areas are the major reasons for widespread rangeland degradation. Most respondents agreed that reduction of livestock, introducing several watering points and controlling bush encroachment in communal lands are the best was to prevent land degradation. Training in the utilization and management of communal rangelands in order to prevent land degradation should be designed and offered to these farmers. The challenge of over grazing in these areas can be resolved by involving rangeland users in the identification of acceptable, easy-to-apply technologies that can mitigate undesirable effects of grazing

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