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Rangeland Management and Drought Coping Strategies for Livestock Farmers in the Semi-arid Savanna Communal Areas of Zimbabwe

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ABSTRACT Communal rangelands in semi-arid areas of Zimbabwe are heavily stocked, poorly managed and drought prone resulting in high livestock losses during drought years. Resettlement interventions attempting to reduce the impact of drought have had little success. This suggests a lack of understanding of the community's view on rangeland condition, use and its drought coping strategies. This study therefore assesses and documents the perceptions of farmers on rangeland condition and improvement; current rangeland management practices and also identifies factors that explain the failed resettlement interventions. The documented drought coping strategies were assessed in relation to the farmers' socio-economic characteristics through a multinomial logistic regression analysis. A single visit survey method was used to gather data through a structured questionnaire in 34 households. Continuous grazing (100%) and open access (68%) were dominant grazing practices, while herding (97%) and stocking rate control (100%) were not practiced. About 60% of the respondents indicated that the rangelands were good in summer, and were very poor in winter (71%). Drought coping strategies included mobility to relief grazing farms (22%), moving animals to key resource areas (16%) and supplementation (54%). Predictors which were significant in explaining drought coping strategies were household herd size, total household income and access to relief grazing farms in winter. Most respondents (60%) view resettlement intervention as a failure since fences were removed and restrictions to access plus grazing management ceased. There is need for community cooperation in the utilization and maintenance of the common pool resources for efficient livestock production.

INTRODUCTION

The southern region of Zimbabwe is characterized by low and highly variable rainfall pattern, with annual coefficients of variation ranging between 20-35% (Scoones 1992). This region has been classified as Region Five (V) (Vincent and Thomas 1960) and is characterised by less than 450mm mean annual rainfall, 21-25ºC mean annual temperature range and less than 105 day growing period (Mugandani et al. 2012). The main agriculture livelihood strategy is livestock production and production of drought resistant crops. Many farmers, however still prefer planting their source of staple food (maize) instead of the drought resistant small grains crop (Mabhena 2010). Livestock production in this region is more of a rudimentary form of pastoralism characterized by various types of strategic mobility to access water and grazing resources. The region is prone to drought which results in significant loss of livestock and crop failures which expose most families to food insecurity. A significant loss of livestock, the most important household asset, results in an increase in poverty and vulnerability for these households and erosion of their resilience for future shocks. The low rainfall impact is further aggravated by the characteristic high stocking rates found in communal areas of Zimbabwe. These high stocking rates were not eased by the Fast Track Land Reform and Resettlement Programme (FTLRRP) since it concentrated at decongesting communal areas in terms of people rather than moving livestock to farms (Mabhena 2010).

Overstocking results in insufficient forage, especially during the drier years, and that has led to some people practicing a form of transhumance (*ukulagisa)* (Nyathi 2000). This opportunistic management practice involves moving with animals to valleys of major rivers during winter, with herders creating temporary shelter when tending their animals during the winter period. These valley-bottom lands (vleis) are key

grazing resources in the sandy soil savanna areas (Scoones and Cousins 1991).

Severe drought years in this region are characterised by significant livestock loses, especially for those farmers without financial resources for supplementation or access to relief grazing (UNICEF 2013). In the 2012/2013 year Matabeleland South Province lost a total of approximately 5 476 head of cattle (IRIN 2013). Supplementation is a practice of buying commercial livestock feed to cover the shortfall resulting from the poor forage growth in the natural grazing land (Lusby 1990). Government responded to these challenges by embarking on various models of resettlement aimed at availing enough grazing land with an improved rangeland management system. One of these was Model D resettlement scheme, which is a land use approach formally adopted by the government in the 1983-84 period. The scheme was modelled on utilisation of resettlement land for grazing by neighbouring communal area communities on a rotational basis while the land remained state-owned (GOZ 1985). This model was never fully implemented due to political insecurity and violence in Matabeleland linked to the *Gukurahundi* disturbances of the 1980s and lack of local participation (Alexander 1991). It, however, later evolved into what is known as the "Three-tier" resettlement model (Moyo et al. 1992). This new model entailed the reorganization of communal area villages' residential and arable lands (including social services), which constituted the 1st tier in the model. The 2nd tier involved the development of village paddocks (also referred to as the "near grazing area") in the communal areas where all traditional and breeding stock were reared – up to the carrying capacity assessed for the particular locality. The 3rd tier involved the development of the annexed neighbouring farm(s) into a commercial ranch (es); all animals grazing in this tier were not allowed to go back to the communal area but instead leave directly for the market. They were, however, challenges with the 3rd tier version of the model as failure to maintain fences resulted in people without grazing rights on the 3rd tier farms cutting fences and illegally grazing their animals. This and other factors have led to the gradual collapse of this resettlement initiative.

In 2000 to mid-2003 the government also allocated plots to some communal farmers under the fast track land resettlement program. The Villagized Model A settlement provided a 0.5 hectare individual residential plot within a defined village block; a 5 hectare individual arable land holding, and communal grazing land (25 to 60 hectares). This has, however, not decongested the communal areas as most families decided to split, with some family members and part of their cattle moving to the new farms while other members of the family remained at the rural homestead with school-going children (GOZ 2003).

Despite the failure of these government-initiated interventions, communal farmers continue to survive and still sustain their livestock in this drought prone area. This suggests that there might be some effective drought coping strategies employed to reduce the risk associated with these recurrent droughts. Therefore, any attempt of improving rangeland management and hence sustainable livestock production should first incorporate an understanding of the farmers' perceptions and practices on rangeland condition and management and their drought coping strategies. These have to be understood in the context of their socio-economic status, existing community rangeland management practices, institutional policy and frameworks.

Objectives of the Study

The primary objectives of the study are to investigate the perceptions of communal farmers on rangeland condition, farmers' rangeland management practices, and explore their views on how rangeland management can be improved. In addition, the study also examines the drought coping strategies employed by livestock farmers, and identifies the determinant factors for adoption of these strategies. An analysis of the merits and limitations of resettlement models *vis-a-vis* livestock production that has been implemented in this region since the 1980s are also central to the investigation.

RESEARCH SETTING

This study was carried out in September 2011 in Ward 17 (Fig. 1) of Gwanda District in Matebeleland South Province of Zimbabwe (29°E, 21°S). The area falls under natural region V (Vincent and Hack 1960), at an altitude of 600-900m. Annual rainfall ranges from 300 to 500 mm, and average temperatures are 25-34°C in summer and 14-22°C in winter (Anderson et al. 1993). Gener-

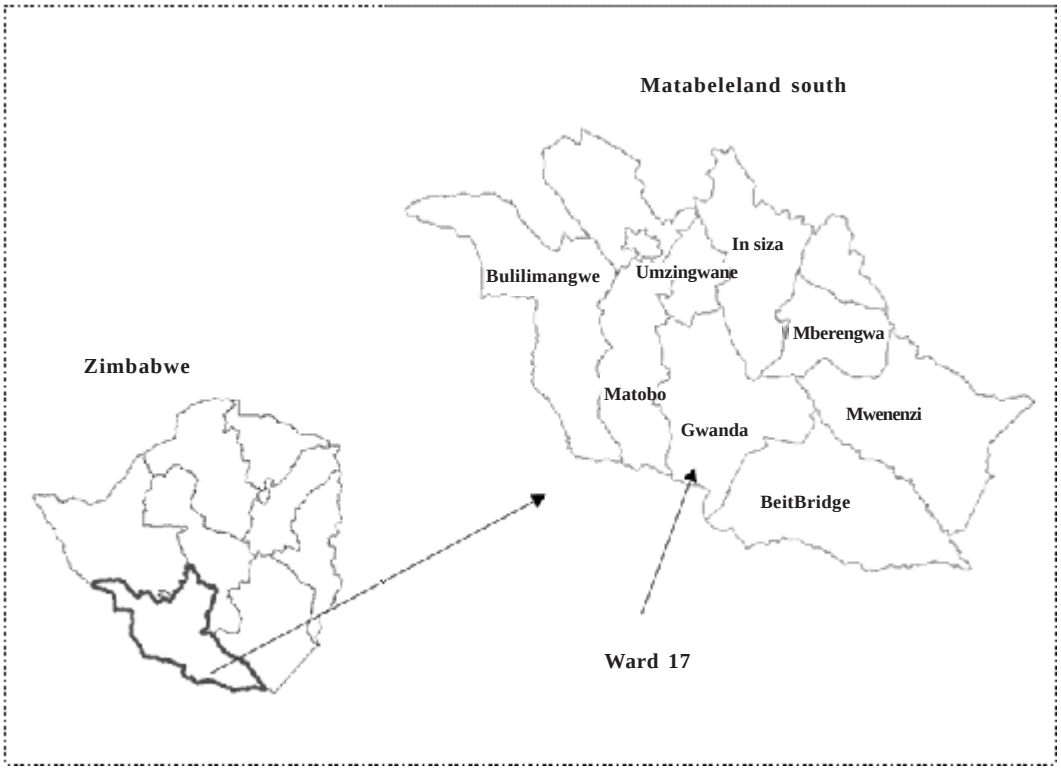

Fig. 1. Location of study area

ally, in this region, the year can be divided into three seasons: a warm wet season from mid-November until mid-April, a cool dry season from end of April to August and a hot dry season from September up to mid-November (Colborne et al. 1981). The area falls under a sweetveld and the vegetation of the area is the Mopane Tree Savanna, dominated by *Colophospermum mopane* on the alkaline soils and *Combretum apiculatum, Kirkia acuminata, Adonsonia digitata* and *Sclerocarya caffra* on dolerite-derived soils. *Acacia, Albizia* and *Grewia* species are found on dark gneiss-derived soils (FAO/ UNESCO 1978). The dominant grasses are annuals, such as *Aristida spp, Panicum* spp, *Eragrostis sp.* and *Cenchrus sp.*(ICRISAT 2007). Typical of most communal areas in drier regions of Zimbabwe, the high population density of around 21 persons / km^2 (Nhira et al. 1998) is supported by a mixed farming system of dryland cropping and livestock production. Other sources of food and income include small amounts of irrigated gardening and remittances from those employed (or in business) in urban areas and the diaspora. The most extensive land use in the area is livestock farming (cattle, goats and sheep), based on a management system where cattle are left to roam grazing areas and kraaled when they are brought for occasional dipping. On the other hand goats and sheep are kraaled every night to avoid theft and predators. This study site was selected because of the foregoing prevailing rangeland management practices as well as the fact that a government-initiated grazing management intervention designed to provide relief grazing sites for farmers has previously been implemented in this Ward 17.

RESEARCH METHODOLOGY AND DESIGN

Thirty- four livestock farmers were interviewed individually in September 2011 on a variety of issues related to livestock farming and

rangeland management practices. Households were selected through stratified random sampling, and two enumerators fluent in the Ndebele language of the interviewees administered the semi-structured questionnaire. This pretested semi-structured questionnaire was populated with questions seeking data on the following: livestock production, grazing management practices, rangeland management and condition, threats to livestock production, success or failure of previous rangeland management interventions, policies on rangeland management and drought management, grazing strategies employed during periods of forage scarcity, suggestions on strategies to improve livestock production and rangeland management. Information on household socio-demographic profiles, income from different livestock species and livestock numbers was also sourced through the questionnaire.

A combination of different methods were used to analyse the data, they included descriptive statistics using the (PROC FREQ) procedures of Statistical Analytical Systems (SAS 2006) and cross-tabulation of ordinal independent and dependent variables. A multinomial logistic regression analysis (Green 2003) was used to estimate factors that influence the adoption of a given coping mechanisms. The dependent variable was drought coping strategies with three levels (migrate to key resource areas along rivers; migrate to rented relief grazing farms; buy supplementary feed). The model compares the probability of two drought coping strategies to the probability of the third (the reference category). The explanatory variables used in the model were the nominal variables which included gender of respondents, their level of education, membership of a farmers' organization, access to relief grazing in winter. The continuous variables were age, total number of people in a household, total number of livestock and total annual income.

RESULTS

Household Characteristics

A total of 34 respondents within the 29 to 87 years age range were interviewed. The majority (68 %) of respondents were males of which 71 % of them were household heads as shown in Table 1. The mean household size was 7 ± 3 people. Half of the respondents reached primary school education level, while 44 % of respondents had secondary education and only 6 % were at a diploma level. Thirty-two percent of all respondents were members of some farmer's organisation.

Table 1: Characteristics of survey respondents

Respondent	*Description*	*Measure*
Age (number)	Range	29-87
	Mean	55 (16.53)
Gender (%)	Men	68
	Women	32
Gender household head (%)	Men	71
	Women	29
Family size (number)	Range	3-15
	Mean	6.7 (2.77)
Education (%)	Primary	50
	Secondary	44
	Diploma	6
Member of a farmers organisation	Yes	32
	No	68

Source of Income

The farmers' main source of income was the sale of animals, which was followed by remittances and off-farm income as indicated in Table 2. Cattle were the major source of income, followed by goats and then donkeys in the livestock sources.

Table 2: Average annual income from various sources

Income source	*Rands/Annum*
Cattle	5592.7 ± 1182.16
Remittance	2166.5 ± 684.50
Goats	1770.3 ± 511.11
Off-farm	1629.4 ± 996.87
Donkeys	664.4 ± 398.18
Chicken	347.2 ± 130.41
Sheep	201.8 ± 71.22
Crop	72.1 ± 72.06
Eggs	41.2 ± 41.18

Rangeland Management and Condition

All the respondents indicated that communal rangelands were not fenced and were grazed continuously. They also noted that traditional leaders had no control over rangeland use. The following rangeland management practices were not being implemented in the community: prescribed burning (100%), stocking rate control measures (100%), herding (97%), monitoring of veld condition (50%), and exclusive use of the rangeland resource by the legitimate communi-

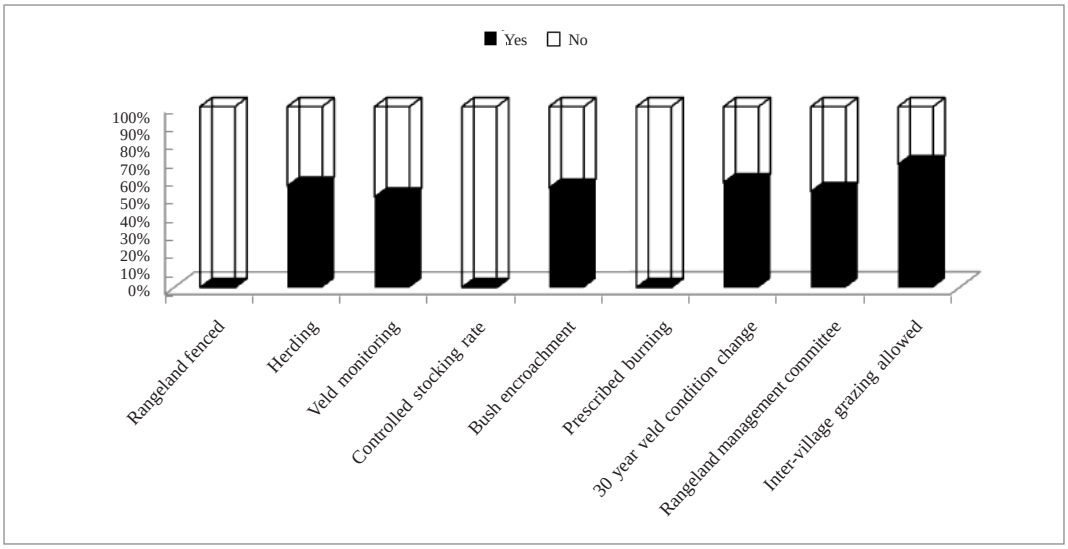

Fig. 2. Household responses on rangeland management and condition

ty (32%). Respondents indicated that there was a rangeland management committee (53%), and collective decisions (63%) were taken in relation to rangeland use (Fig. 2).

There were differing opinions on the general condition of the rangeland with 10% of respondents classifying it as excellent, 40% indicating that the rangeland was good and had plenty of grass, while 10% perceived their rangeland to be very poor with little grass. The rangeland was classified as good with plenty of grass in summer by 59% of the respondents while 70% indicated that it was poor with very little grass in winter (Fig. 3). More than half (55%) of the respondents considered the rangelands to be encroached by bushes and blamed drought (54%), overgrazing (31%) and the year 2000 Cyclone Eline induced floods (15%) for the observed bush encroachment. About 58% of the respondents indicated that they observed a disappearance of certain grass species and an increase in *Colophospermum mopane, Commiphora africana* and *Acacia karroo*. Sixty percent of the respondents indicated that bush encroachment occurred everywhere, while the rest stressed that it's prevalent along river banks. The other challenge in these rangelands is deforestation (43%) which is considered to be very high (47 %), and is a result of farmers using woody plants for fencing (58%), and firewood for cooking (18%) and burning bricks (5%). Forty one percent of the respondents considered the level of erosion to be very high and attributed it to mainly overgrazing (49%) and deforestation (43%).

Drought Coping Strategies

Drought coping strategies included mobility to relief grazing farms (implemented by 22% of the farmers), moving animals to key resource areas (implemented by 16% of the farmers) and supplementation (implemented by 54% of the farmers) (Fig. 4). The results from the multinomial regression model for drought coping strategies show that a few explanatory variables significantly ($p < 0.05$) influence the coping strategies, and these are household herd size, household total income and household access to relief grazing farms. Exceptions are age of the household head, household size, gender and education level of household head, and whether the household belongs to any farmer organisation.

Table 3 shows multinomial logit results of two coping strategies relative to buying supplementary feed. The likelihood of migrating to key resource areas along rivers during a drought relative to buying supplementary feed, significantly ($p < 0.1$) diminishes by 1.8% (0.982 odds–ratio) with a unit increase in the herd size, while non-access to relief grazing farms is more likely

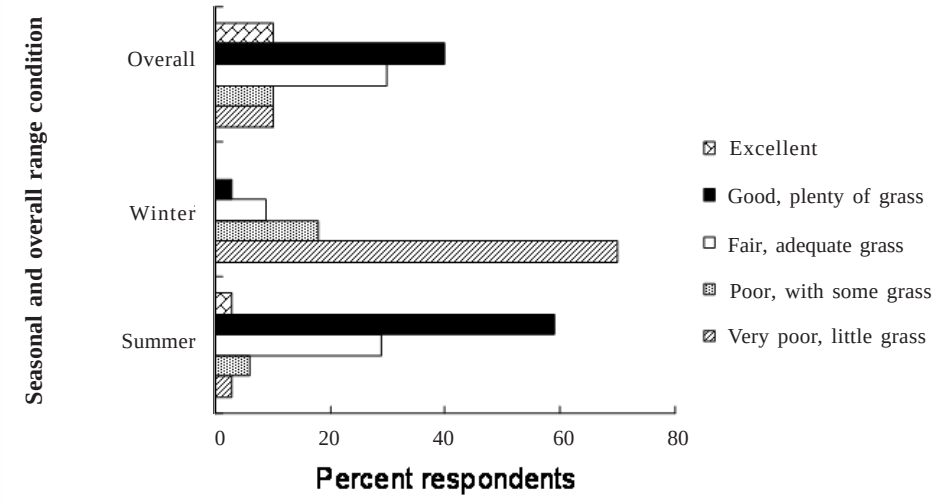

Fig. 3. Perceptions of overall, summer and winter rangeland condition

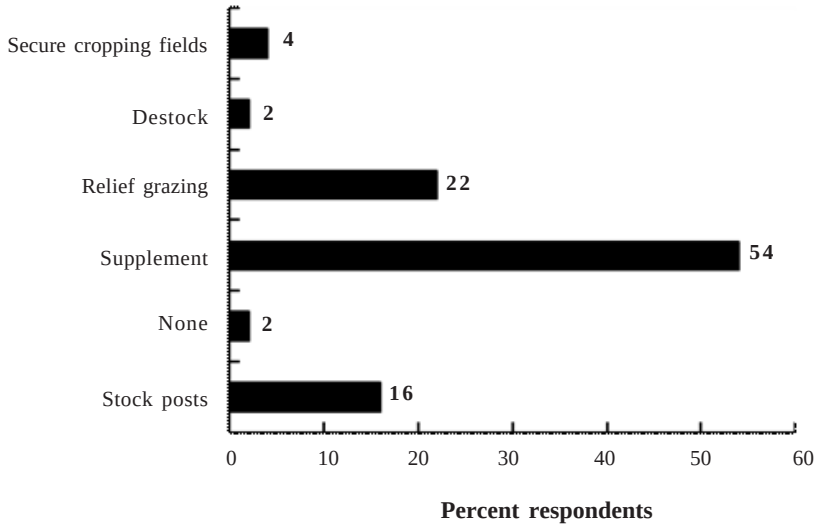

Fig. 4. Drought coping strategies practised by farmers

($p < 0.001$) to cause a 5.2% (4.221 odds-ratio) increase in respondents who migrate to key resource areas as compared to those buying supplementary feed. The likelihood of migrating to rented relief grazing farms during a drought significantly increases by 2% (1.015 odds-ratio) with a unit increase in the herd size ($p < 0.1$) and total household income ($p < 0.05$; 1 odds-ratio) compared to buying supplementary feed.

Development Interventions and Policies

Three quarters of the respondents agreed that there were interventions by government

Table 3: Multinomial logit results for determinants of drought coping strategies

	Migrate to Key resource areas			*Migrate to rented relief grazing farms*		
Variables	*B coeff*	*Std err*	*Odds-ratio*	*B coeff*	*Std err*	*Odds-ratio*
Gender	-0.724	0.621	0.485	-0.009	0.526	0.991
Age	0.015	0.014	1.015	0.003	0.015	1.003
Education level	-0.293	0.561	0.746	-0.196	0.578	0.822
Household size	0.021	0.095	1.022	0.045	0.078	1.046
Livestock number	-0.018*	0.010	0.982	0.015*	0.009	1.015
Total annual Income	0.000	0.000	1.000	0.000**	0.000	1.000
Member of a farmers organisation	-0.406	0.472	0.666	-0.293	0.404	0.746
Access to relief grazing in winter	1.440***	0.446	4.221	0.245	0.445	1.278

The reference category is: Buying supplementary feed; Number of observations 34; (-2 Log likelihood): 236.279; $\div^2$ = 27.929; degrees of freedom = 16; significance level = 0.032
Note: *, **, *** indicate significance levels at 10, 5, and 1 % respectively.

after independence to relieve grazing pressure in communal rangelands by allocating fenced relief grazing in nearby farms under Model D and the three tier resettlement scheme. More than 60% of the respondents however view this intervention as a failure since fences surrounding these farms were damaged and removed over time thus exposing the relief grazing farms to perpetual grazing. This lack of grazing restrictions on the relief grazing farms is driving these sites towards degradation similar to that in surrounding communal areas. According to the farmers, a number of factors partly explain the failure of this government intervention: Lack of effective and relevant institutional support was thought to be the cause by 73% of the respondents while 68% blamed non-supportive government policies. In addition, failure by the government to consult the targeted communities before implementation of the interventions was mentioned as one of the likely causes of their failure.

DISCUSSION

Household sizes, age range and average age range of the sample is almost similar to those observed among pastoralists of Ethiopia (Abule et al. 2005), but however lower than those of pastoralists in Namibia (Katjiua and Ward 2007) and those reported by Barrett (1992) in other communal areas of Zimbabwe. The small household sizes might be related to high levels of emigration to neighbouring countries as a result of the deterioration of the economic situation after year 2000 (Kiwanuka and Monson 2009; IOM 2010). The average age of 55 is in the range observed by Mapiye et al. (2006) and Ndebele et al. (2007) in other communal areas of Zimbabwe. In terms of education, the majority of respondents (50%) had primary level of education. People with this level of education were defined as 'literate' by Zimbabwe's 2002 national census (CSO 2004). The education levels of respondents in this study thus qualify them to be called literate. This level of education is considered satisfactory since livestock production, rangeland management intervention and any type of rangeland technology transfer can be easily comprehended.

In general, rural people's livelihoods are predominantly dependent on on-farm and off-farm agricultural activities, such as brick moulding, selling firewood, building and being engaged in some casual work (Shackleton et al. 1999) as observed in this study. Agriculture is thus the main source of rural income compared to other supplementary livelihood strategies. Amongst other agricultural activities, livestock production remains the most popular among both middle aged and old rural denizens. In many rural economies, livelihood strategies for men are dominated by large livestock production (Chawatama et al. 1998; Ndebele et al. 2007) compared to poultry production by women (Muchadeyi et al. 2004). This explains the dominance of male respondents in this study as it concentrated on livestock farmers. The dominance of male headed households observed in this study is a characteristic of communal areas of Zimbabwe (Francis and Sibanda 2001; Mapiye et al. 2006).

The Zimbabwean case under discussion here is similar to other communal rangelands in

Southern Africa (Ward et al. 2000; Moyo et al. 2008; Lesoli 2012) wherein traditional leadership institutions have no control in rangeland management issues such as access and period of use, instead everyone does as they wish. In South Africa and Namibia, communal rangelands are continuously grazed because of the absence of rangeland management fences. Farmers in these countries have user rights while ownership remains with the state (Verlinden and Kruger 2007; Moyo et al. 2008; Lesoli 2012). This grazing system is also the traditional land-use management system in Ethiopia (Kassahun et al. 2008). This scenario has been associated with overgrazing based on the theory of the 'tragedy of commons' (Banks 2001). Thus, the rangeland in this area is in danger of confirming and conforming to the 'tragedy of commons' theory. Sustainable management embodies the ability to establish collective rules and authority to solve conflicts, and hence lack of rules will adversely affect rangeland utilisation, condition and livestock production. The existence of collective norms, in which rules are not written, but are agreed by communal livestock keepers was observed by Allsopp et al. (2007). The author observed norms on the establishment of stockposts, times in which crop fields can be used for grazing and access to use of rangelands. This arrangement was found to be sustainable and effective, and the collective decision making by farmers shows that there is a need to consider such norms and incorporate them in any rangeland management intervention.

The absence of herding in this study is similar to communal areas of South Africa (Moyo et al. 2008). In contrast, pastoralists in Ethiopia, Namibia and Mongolia (Fernandez-Gimenez 2000) herd their animals searching for areas with enough forage to meet the physiological requirements of their animals throughout the year. The absence of herding suggests that there is no structured utilisation of pasture throughout the year. For example, there is no attempt to refrain from grazing key resource areas in summer so that they can be used during the harsh non-growing season. This lack of structured utilisation of pasture worsens the plight of these farmers during drought years. Furthermore, even though the respondents indicated the presence of a rangeland management committee in their community, it does not seem to be functional. Consequently, rangeland management practices such as stocking rate control, veld condition assessments, and exclusion of those without user rights were not practised.

The general condition of the rangelands in this study was considered to be good by the respondents. According to Azadi et al. (2009), pastoralists (through experience) can estimate the annual trends of their rangelands. They know the species and their fluctuations in different years. This contrasts the perceptions of most (64%) of the farmers in a humid subtropical communal rangeland in South Africa who perceived theirs to be poor (Lesoli 2012). Poor rangeland condition was also observed by pastoralists in Ethiopia (Abule et al. 2005) and Northern China (Ho and Azadi 2010). The lack of strongly shared ecological perception by farmers on the current condition of the rangeland may impede them from building strong regulatory institutions to manage their rangelands. Bush encroachment has been reported in semi-arid areas of Namibia (Katjiua and Ward 2007) and Ethiopia (Abate et al. 2010; Gil-Romea et al. 2010). There have been various assertions on the cause of bush encroachment, which include drought (Ringrose et al. 1990), wet cycles or floods (Ward 2005), heavy grazing (Andrew 1988), absence of fire (Westoby et al. 1989) and loss of large trees (Smit 2004). Drought has been reported to contribute to bush encroachment since it causes a reduction in the herbaceous layer and promotes survival of deep rooted shrubs (Ringrose et al. 1990). Inadequate herbaceous biomass to raise enough fuel load and to provide forage for animals has discouraged prescribed burning in this area, hence encouraging bush encroachment (Dougill et al. 1999). Floods have been reported to increase *Acacia* tree density in the vicinity of rivers due to mass recruitment (Ward and Rohner 1997). The seeds of the encroaching trees might have been dispersed by flooding (Abule et al. 2005) since they float and drift to river banks and then germinate. The knowledge of farmers on disappearance of certain grass species and an increase in woody plants has been proven to corroborate scientific vegetation assessments as observed by Oba and Kaitira (2006) when comparing herder's perceptions of changes in forage species to their assessments in northern Tanzania. Similarly, Verlinden and Kruger (2007) also found that indigenous technical knowledge on vegetation condition in evaluating rangeland condition was consistent with the scientific ap-

proaches for assessing vegetation condition. This suggests that even in the Zimbabwean case under discussion, it is important to use this local indigenous knowledge when planning and developing local rangeland management policies.

Livestock farmers in this drought prone region (like other livestock keepers in other semiarid areas) have developed adaptation strategies to mitigate the risk associated with drought. Migration in search of forage is one adaptation strategy adopted by 38% of the farmers in this study in an attempt to secure their livelihoods. This mobility in search of adequate forage, has previously been observed in Zimbabwe (Scoones 1995), Botswana (Reed et al. 2007), Ethiopia (Solomon et al. 2007; Kassahun et al. 2008; Abate et al. 2010), and South Africa (Allsopp et al. 2007). The low percentages of farmers resorting to mobility in this study in comparison with 80% in Somalia (Amaha Kassahun 2003) might be related to the size and geographic structure of grazing lands which are of a smaller radius. There are also private farms and villages between these grazing areas as compared to the geographically extensive rangelands in East Africa. This figure is comparable to the 12% observed in Botswana by Reed et al. (2007).

Supplementation was also one of the observed adaptation strategies. The prevalence of supplementation might have been promoted by the fact that the majority of the farmers were practising mixed farming. Buying supplementary feeds is usually practiced in countries with better economies and in contexts where farmers have diversified livelihoods. For example, the Botswana Government subsidises supplementary feed (Reed et al. 2007). Supplementary feeding with hay, grass and maize stover plus salt was also reported in Ethiopia by Solomon et al. (2007) because commercial feeds were expensive or unavailable. Proponents of equilibrium ecological theory discourage supplementary feeding because it prevents destocking and ultimately results in overstocking and land degradation (Horn et al. 2002). Destocking was an insignificant adaptation strategy in this study. This strategy is usually recommended by researchers (Illius et al. 1998; Campbell et al. 2000) and policy makers in governments who are not considerate of the primary farming objectives of livestock keepers. It was also observed that very few farmers (4%) in the study used fenced off parts of their fields for fodder reserves during drought. In addition, the old practice of taking animals to relatives or acquaintances (*ukusisa*) in areas less affected by drought for use in ploughing and obtaining milk as a strategy of reducing risk is no longer practiced in the study area. This is contrary to the prevalence of this practice as observed by Reed et al. (2007) in the South Kgalagadi District of Botswana.

There are contrasting reports on the strategies farmers with varying herd sizes engage in response to external stressors such as drought. Næss and Bårdsen (2010) concluded that large herd size maximises long term viability of farmers since such farmers were found to have a significant increase in their herd after each year relative to ones with smaller herd size. This explains why large herd size households were buying supplementary feeds during drought because they could sell some animals and save others. This also explains why households with large herd size in this study would rather supplement than migrate to key resource areas along rivers. On the other hand, if such households had to choose between migrating to rented relief grazing farms or supplementing, they would prefer the former. This might be due to the fact that renting for cattle in relief grazing farms is cheaper than buying commercial feed as observed by Murungweni et al. (2011) in southeastern Zimbabwe. Households with higher income also tended to prefer migrating to rented relief grazing farms than buying supplementary feed which shows that respondents settled for the cost effective strategy. Access to these relief grazing farms is limited to farmers from specific wards, and therefore farmers without access to these farms tended to migrate to key resource areas along rivers.

Farmers in this study also indicated that overgrazing can be prevented through the government providing more land for grazing, than resettling people in the acquired farms. The need for more land for grazing was justified because of the decreased size of grazing land due to increased population and hence more cropping fields for new households. Prevention of overgrazing by providing more land than destocking seems to be the main emphasis of farmers; hence it means they would not tolerate any destocking intervention. Farmers also expressed a desire for paddocking than destocking. This desire for paddocking of grazing lands might have been

motivated by the positive benefits of rotational grazing observed in commercial farms or some knowledge on the advantages of rotational grazing. Another motivating factor for paddocking could have been the belief that fencing would help in easily accessing the animals as compared to the current communal open grazing practice where some animals can go astray or be stolen as they are not herded. However, these desires and preferences by the livestock farmers ignore that communal grazing areas are a common property and their utilisation should conform to the dictates of global commons. If paddocking fences were to be installed, they will block the preferred movement paths of other community members who do not have livestock but derive other resources from the rangelands.

The sale of animals as a last resort was not observed in this study. This is contrary to observations by Hoffman et al. (2007). It is possible that farmers are not selling livestock because they know it is expensive to restock, since breeding animals would have to be bought at a higher price (Alexander 1991). In addition selling cattle deprives the farming system important inputs such as manure and draught power (Scoones and Wilson 1988). Farmers' reluctance to sell livestock might also be due to their knowledge that the government of Zimbabwe does not have a specific drought management policy targeted at livestock production or a post-drought stocking policy. Given these circumstances, the farmers thus have to devise their own drought mitigation strategies which do not deplete their livestock levels.

Excluding other users from a resource seen as common property has always led to lack of cooperation in managing such a resource as observed by Banks (2001) in China. Excluded groups will tend to cut fences as observed at Hollins Block Resettlement Scheme where resettled people tried to exclude communal area cattle resulting in fences being cut and communal area cattle driven in to graze at the scheme (Alexander 1991). Indigenous or community knowledge on communal resource use objectives and patterns is important when planning interventions for the communities (Huntington 1998; Oba and Kotile 2001; Allsopp et al. 2007). Alexander (1991) reports that most of the communal farmers wanted the resettlement farms to be used for relief grazing rather than subdividing the farm to allocate residential plots, hence the failure of the initial resettlement attempt (Model A) before switching to Model D schemes. The importance of the relief farms is supported by Müller et al.'s (2007) model that showed that inter-annual heterogeneity of resource use by granting of reserves for use during drought was a crucial component of the traditional rangeland management strategy for sustainable herbage production in Namibia. The gradual change towards degradation reported in this study is similar to observation by White (1993) in which ranches being leased to communal farmers were found to be severely degraded within a few years post-leasing at Ncojane in the Ghanzi district. The main suggestions for improving rangeland management was a need for assistance from government for paddocking of grazing lands (40%), controlling deforestation (45%) and preventing overgrazing (10%).

CONCLUSION

The observed failure of the resettlement initiative is a result of the multiple interactions of socio-economic, ecological and institutional factors at play in this drought prone region. There is need for community cooperation in the utilization and maintenance of the common pool resources for efficient livestock production and successful risk management. Lack of and poor institutional arrangements and networking within livestock keepers and also with other resource user groups led to challenges in enforcing decisions among multiple resource users in the communal and resettlement farms. Farmers identified retrogressive change in their rangeland over time and the possible causes, this suggest that it is possible to build on their knowledge to mitigate the undesirable change. Shortage of land and unequal access to relief grazing farms is still a major challenge for the farmers in this area, and therefore any intervention should aim at providing more grazing land for communal farmers. The study suggest that every household in villages surrounding the relief grazing farms has to be granted user rights in those farms, so as to alleviate grazing pressure and mitigate effects of drought in communal areas. There has to be, however, strong institutions governed by rules collectively developed by every village entitled to use the farms. Rangeland management would be effective if government could support indigenous rangeland management knowledge

through recognising and empowering the local management institutions by including them in development planning.

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