



Original Article

Traditional Rangeland Management and Utilization Practices of Nuer Pastoralists in Gambella, Ethiopia

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ABSTRACT

The study was conducted in Nuer pastoral area of Gambella, with the objectives of assessing the traditional rangeland management and utilization practices. The assessment was done using a structured questionnaire, group discussions and visual observations. In the study districts, the pastoral production system included sedentary (26.3%), transhumance (52.6%) and pastoralism (21.1%). For Nuer pastoralists' livestock were the mainstay of life. The purpose of keeping livestock was primarily to get social values and cultural benefits. The most accepted and widely applied traditional methods of rangeland management and utilization practices in the community were communal grazing, grassland burning and seasonal migration. The majority of the respondents (91.2%) reported that flooding escalates their mobility during the rainy season and it has been a threat in their livelihood. In the past 10 to 15 years, the grasslands coverage might be sparse according to the perception of 63% of the respondents. Based on the traditional rangeland condition assessment criteria, half of the respondents stated that the current condition of the grassland being 'poor'. The Nuer pastoralists expressed their concern about the deterioration of their rangelands and they pointed out and prioritized the potential causes as: over grazing, recurrent drought, increased livestock and human population, erratic and low rainfall and restricted seasonal mobility. This situation has been a threat for the livelihood of the pastoral community in the districts and should be reverted through employing proper grazing systems, rehabilitation and conservation.

Keywords: deterioration, Gambella, livelihood, livestock, Nuer, rangeland

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INTRODUCTION

The lowlands of Ethiopia are predominantly pastoral with most people largely depending on livestock rearing for their livelihood (Coppock, 1994). They are home for 10% of human population (PADS, 2004) and constitute about 12 to 15% of the livestock population of the country (Coppock, 1994; BLPDP, 2004). The pastoral production system in these areas is with a major share of its contribution to the country's economy (PFE, 2004), through making about 50% of the agricultural Gross Domestic Product (GDP) (EARO, 2000) and over 90% of the annual live animal legal export earnings (Coppock, 1994; EARO, 2000). The pastoral areas of Ethiopia have a rich resource potential (PFE, 2001) despite the fact that, the country has not yet benefited from these resources. This could be attributed to various constraints (Coppock, 1994). Like other pastoral areas of the Ethiopia, in Gambella Regional State (GRS), extensive pastoral production system is experienced, predominantly in areas where the Nuer Pastoral communities inhabit. According to GRS (2003), the Nuer pastoral communities subsist on the more arid area of the regional state, which is unsuited for crop production. The area consists of wide treeless grassy and seasonally flooded plains of the Itang, Jikawo and Akobo district. The communities are grouped on language and territorial grazing area and move back and forth with the seasonal flooding regime of the rivers.

Various range research and development works were conducted in the Southern and Eastern rangelands of Ethiopia (Coppock, 1993), in Borana by Ayana (1999), Oba (2001), Gemedo (2004); Middle Rift Valley by Russel (1984) and Amsalu (2000); part of the Somali region by Ahmed (2003), Belayenesh (2006) and Amaha (2006). However, in the Gambella Regional State in general and the Nuer pastoral areas in particular, research and development interventions have never been done. Moreover, information on the range resources and their traditional management systems and utilization practices are scanty. It is, therefore, necessary to develop baseline scientific information on the traditional management and utilization practices employed by the Nuer pastoral communities. This would help to suggest ecologically sound and socio-economically feasible development and management interventions towards sufficient and sustainable use of the rangeland resources. To this effect the study aimed at assessing the traditional rangeland management and utilization practices.

MATERIALS AND METHODS

Description of the study area

The study was conducted in the Gambella Regional State which is located in the southwest part of Ethiopia, situated in the lowlands of the Baro-Akobo River Basin between latitudes 6°22' and 8°30' N, and longitudes 33°10' and 35°50' E, and covers a total area of about 34,063 square kilometers (GRS, 2003). The regional state is characterized as mid, lowland and semi-desert agro-ecological zones. Itang and Jikawo districts are located in the semi-desert agro-ecological zone. Forests and woodlands are in existent except for some scattered bushes and shrubs, thus it is logical to defining the grassland as open grassland (GRS, 2003) with an extensive plain topographic feature (PADS, 2004). The annual rainfall and mean annual temperature in the Regional State are 1,247 mm and 34.37 °C, respectively (IAR, 1990). The rainfall regime is unimodal, referred to as the “*Sudan Type*”, occurs in the lowlands along the border with Sudan (Coppock, 1994). Poorly drained *vertisol* is the characteristic soil type of the grassland (GRS, 2003). The highest livestock population in Tropical Livestock Unit (TLU) is found in Jikawo district 156,168.5 (53%), followed by Akobo, 114,390.8 (39.3%). The lowest TLU in Gog, which is, 1,341.6 (0.5%) (PADS, 2004). The major breed is the Nuer (zebu) which is a very good performer in dairying and beef production provided proper management levels (GRS, 2003) and considered to have high tolerance to tse-tse challenges (Alemayehu, 2004).

Assessment of traditional rangeland management and utilization practices

In order to gather primary data on traditional management systems, available resources, grazing land utilization practices and the livestock population of the rangeland of the study area, single-visit formal survey method (ILCA, 1990) was used followed by purposive sampling procedure to identify and select the herds' men. Two elders per range site (a total of 46 elders) were selected based on their experience and knowledge about the study area. A well-structured questionnaire was prepared to collect adequate information regarding the rangeland condition and the associated vegetation changes of the study areas. A pre-test of the prepared questionnaire was made before the start of the actual survey in order to facilitate effective convey of the needed information by the selected pastoralists. Furthermore, visual observation and group discussions was held with the DAs, community leaders and zonal officials considering their relevance for this study.

Statistical analysis

Statistical Package for Social Sciences (SPSS, version 12 for window, 2003) was used to summarize the data on the overall pastoral production system. Furthermore, the summarized data were analyzed by the same program using descriptive statistics (i.e., mean, frequency and percentage).

RESULTS AND DISCUSSION

Pastoral production system in the study area

The household survey conducted on the basis of mobility of the pastoralists indicated that the pastoral production system in the study districts included sedentary (26.3%), transhumance (52.6%) and pastoralism (21.1%). About 68.4% of the respondents replied that they practice crop cultivation using zero-tillage. The crops grown in the districts were maize and sorghum.

Livestock population and herd composition

Livestock production is known to be the main stay of the pastoralists in the study area. The livestock species reared in the districts included cattle, sheep, goats and poultry. There were no camels and equines registered in the study districts. According to GRS (2003) the cattle, sheep, goats and poultry population in TLU were estimated to be 9,446.0, 614.5 and 1,102.5 in Itang district and 147,775.0, 4,143.9 and 3,901.1 for Jikawo, respectively. The present survey exhibited that the mean livestock holding per household was 18.05 and 26.81 TLU in Itang and Jikawo, respectively. In the districts, cattle were the dominant species and accounted for 68.14 and 73.48 % of the herd composition of Itang and Jikawo, respectively. The respondents stated that, in the districts there were no improved or cross breed animals, all the livestock species reared were indigenous.

Purpose of keeping livestock species

The respondent pastoralists explained that, the purpose of keeping diversified livestock species was in order to secure their mode of life and this was in line with reports from the other pastoral areas of Ethiopia and East Africa (Coppock, 1994; Ndikumana *et al.*, 2001). In the pastoralists' opinion, composition and diversification of livestock species are primarily in association with the climatic condition and the type and composition of feed resources available in the districts. There was a predominance of cattle over the other kinds of stock. Among the small ruminants, sheep were more abundant than goats. This predominance might be due to the differences in the feeding habits of the species. In accordance with the studies of Scoones (1995) and Nigatu *et al.* (2004), mixed stocking with two or more species having different feeding habits would enable better use of resources and has often been more

profitable. Furthermore, livestock flock pattern and herd size depend on the availability of water and feed resources (Coppock, 1994). In areas where grazing resources are available abundantly, cattle and sheep are predominant, whereas areas of browsing potential are highly preferred by camel and goats. Thus, the least herd composition of goats in the districts (about 10%), were due to the dominance of grass and other herbaceous vegetations in the open grassland. In the floristic composition, the browse species were less abundant and localized in distribution around the periphery of the open grassland. This finding concurred with the results reported for modern ranches in East Africa (Le Houreou, 1980).

Table 1: Purpose of keeping livestock species by the pastoralists and their sources of income in the study districts (N=46)

Attributes	Rank	Frequency	Percentage
Purpose of keeping			
Milk production	2	40	86.9
Income generation	3	36	78.3
Social and cultural values	1	42	91.3
Source of income			
Livestock sale		29	63.0
Sale of livestock products		12	26.1
Other sources		5	10.9
Total		46	100.0

N= Number of respondents

The Nuer pastoralists used to keep different livestock species for different purposes. Different livestock species were valued for different purposes and this practice is in agreement with Scoons (1995) and Nigatu *et al.* (2004). The pastoralists depend on milk for food and sale of livestock as a source of cash income. About 86.9% of the respondents kept cattle for milk production (Table 1). In other lowland pastoral areas of the country, pastoralists depend on sale of livestock and livestock products (Abule, 2003; Ahmed, 2003; Belaynesh, 2006). However, sale of cattle and use of livestock species for meat were uncommon among Nuer pastoral communities. Despite their insignificant composition in the herd, small ruminants and poultry might contribute to an important source of income. About 89% of the respondents stated that their food deficits and other miscellaneous expenses were covered mostly through sell of small ruminants (sheep and goats) and poultry as well as products obtained from these livestock types, whereas 10.9% from remittance sent by their relatives from abroad and from other sources (Table 1).

Selling of cattle has not been a tradition for the Nuer pastoralists unless an avoidable drought forced them to destock the cattle population or at times when the said animal might be aging and unproductive. Janke (1982) and Ahmed (2003) reported that in the pastoral production systems, the main livestock product was milk and the main purpose of keeping livestock could be subsistence, though social and cultural functions might be important. However, according to the information obtained from Nuer pastoralists (91.3% of the respondents) (Table 1), cattle are kept to serve for other social benefits and cultural purposes. Livestock in the study districts have been considered as symbols of wealth and prestige. Accordingly, the respondent pastoralists pointed out that they would like to keep as much population of livestock species as long as feed availability and water resources could not be scarce. For the Nuer pastoralists, cattle are the best forms of dowry for marriage because dowry is one of the prime reasons to amass large number of cattle. To resolve conflicts, particularly between clans of the same ethnic groups, cattle have a remarkable contribution as a means of compensation for blood feud. However, the existence of large number of livestock holding by an individual pastoralist might exert a profound pressure on the grassland.

Problems in livestock production system

In the surveyed area, the elder pastoralists confirmed that, the animals they owned were not in good condition in terms of their body weight, conformation and health status. The myriad constraints associated with the livestock production were diseases, followed by shortage of feed (grazing lands), drought and water shortage (Table 2).

Table 2: Major problems of livestock production in the study districts (N=46)

Major problems	Frequency	Percentage
Shortage of grazing land (Feed shortage)	12	26.1
Drought	8	17.3
Water shortage	5	10.9
Disease	21	45.7
Total	46	100.0

N= Number of respondents

The importance of the constraints faced by the Nuer pastoralists, were somehow in concomitant with the situation to other pastoral communities in most arid and semi-arid areas (Beruk *et al.*, 2000; Abule, 2003; Admassu, 2006). As deduced from the informal group discussions made with the local elders, access to veterinary services were absent in their district, though disease was put as the primary challenge for the community. However, to curb the problems, they used traditional way of controlling. For instance, through smoking of dung every morning, the pastoralists had control of the common cattle disease trypanosomiasis, which is transmitted by a vector tsetse fly. Poor market facilities and infrastructure have been the main constraints in the districts. In addition to intervening with the introduction of market-oriented livestock production there must be reorientation of the local communities to change their attitude towards income generation. Cross-border trading has been carried out by the Nuer pastoralists. However, none of them were willing to witness their involvement. In order to revert the constraints and to exploit the potential livestock resources, further, efforts would be expected and should be done by government and concerned bodies.

Livestock feed resources

The majority of the interviewed pastoralists (91.3%) confirmed that natural pasture was the major sources of livestock feed in the area. Throughout the year, the livestock were dependent on the native grassland. According to the information revealed from 6.5% of the pastoralists, although it lasts for the short duration in the dry season, aftermath grazing was used as a feed source to some extent. Use of crop-residues was insignificant (2.2%). This might be due to the fact that crop cultivation was not well practiced, and has been used only for subsistence. Furthermore, in the districts, use of improved fodders and agro-industrial by-products were unknown, largely due to poor and not focused extension service rendered in the area as well as the remoteness to accessible markets.

The result obtained from the pastoralists about the availability of feed throughout the year, 84.8% of them indicated that there was a remarkable gap, particularly in the dry season. The opinion of the pastoralists towards the amount and quality of livestock feed available throughout the year now when compared to that of ten years back, 71.7% of them responded that, there was deterioration of the grassland. The reasons for declination in the amount and deterioration of qualities of the feed resources were primarily over grazing, followed by shortage of rainfall and expansion of unwanted species. Based on the information gathered from the selected elders (viewed by 94.7% of the respondents), supplementary feed at the time of feed shortage was inexistent. However, to alleviate the constraint, through their

indigenous knowledge, the pastoralists had taken animal movements (65.2%) followed by sale of animals (23.1%) and to some extent (8.7%) use of browsing species. The problems and their ultimate situations prevailing in the study districts were having similarities to other pastoral areas of the country (Coppock, 1994; Abule, 2003; Oba, 2003).

Traditional rangeland management and utilization practices

In the study area, the modern range management and grazing systems had not been practiced at all. Most of the interviewed pastoralists affirmed that they used traditional grazing management. The most accepted and widely applied traditional methods of rangeland management and utilization were communal grazing, burning and seasonal migration. The corresponding responded ranked orders of these practices were: 97.8, 91.3 and 67.4%, respectively.

Communal grazing

Like the other pastoral areas of Borana (Ayana, 1999; Gemedo, 2004) and Afar (Abule, 2003), in the Nuer pastoral communities, there were communal rangeland management and utilization practices. The grasslands were owned communally. In the districts, blocking access to other clans within the same ethnic groups were a common phenomena. Consequently, inter- and intra- clan conflicts has frequently existed due to resource utilization and ownership rights. Based on the respondents reply, the management responsibility of controlling over the grazing lands were by local elders (56.5%), individual pastoralists (32.6%) and 10.9% of the pastoralists understood as if the government or PA administration had taken the responsibility (Table 3). Though the Nuer pastoralists prefer the communal ownership right, this land tenure by itself has a negative impact on the rangeland condition. Utilization of rangelands through the use of enclosures, hay making and standing hay (*Kalo*) has been impractical in the Nuer pastoralists, unlike those of the Borana pastoralists (Coppock, 1994; Ayana, 1999; Alemayehu, 2004; BLDP, 2004).

With regard to the status of communal grazing lands in the districts, 76% of the respondents stated that it was going in decreasing trend (Table 3). Besides, they noted that the possible reasons for such decline might be increasing in the livestock production and reduced productivity of the grasslands. Overstocking in the districts in turn led the grassland to overgrazing, land degradation associated with sever soil erosion and lose of biodiversity and land productivity. The view of the pastoralists was in harmony with the studies conducted in Borana rangelands by Coppock (1994) and Ayana (1999); Somalia regional state by Ahmed (2003). Accordingly, there must be an attempt to employ appropriate management systems along with monitoring of the grassland condition, productivity, carrying capacity and stocking rate in sustainable basis.

Grassland burning

Burning grassland has been a widely accepted practice in the areas where the pastoralists predominantly inhabited. Almost all the surveyed households (91.3%) replied that they employed burning in their grazing land. However, there were disparities in the purposes for the application of fire in the grasslands among the respondents. The majority of the respondents (69%) use fire to get good animal feed. Few of the respondents (19.1%) use grassland burning for the ride of livestock diseases whereas the rest of the respondents (12.0%) employed fire for the purpose of ease herds' mobility. From the range management point of view, this is a desirable technique of bush encroachment control and this view is supported by the authors Bidwell and Woods (2000) and Snyman (2002). The overall purposes of grassland burning practiced by the communities have similarities with Borena

pastoralists as reported by Ayana (1999) and BLDP (2004). The vegetation would recover very fast by natural regeneration and might be available for grazing animals within short period of time after burning has caused damage. About 65.5% of the respondents revealed that one week is enough to get the vegetations ready for grazing. As far as preference of the regenerated plants by livestock species was concerned, the pastoralists indicated that they are highly preferred.

Table 3: Pastoralists' perception towards the control over and status of the communal grazing lands in the study districts of Nuer zone (N=46)

Attributes	Frequency	Percentage
Responsible for control over the land		
Local elders	26	56.5
Individual pastoralists	15	32.6
Government/PA administration	5	10.9
Status of the communal grazing land		
Increasing	3	6.5
Decreasing	35	76.1
Stable	8	17.4

N= Number of respondents

Seasonal mobility

Pastoralism is based on mobility, which is a primary strategy of pastoral production units, changing according to ecological, social, economic and political conditions (Scoones, 1995) and to make better use of the scattered resources (Sabine *et al.*, 2004). Similarly, the Nuer pastoralists have employed mobility as a key and well arranged strategy to manage and utilize their grazing resources. The Nuer pastoralists ranked the major problems constraining their mobility as flood (91.2%), security (73.5%), poisonous insects (insect bites) (32.4%) and dense forests (5.9%). As far as seasonal mobility is concerned, flooding poses a great problem in the districts. Of the 91.2% of the respondents who reported that flooding escalates their mobility during the rainy season, 67.7% of them stated that flooding might be induced primarily by the over flowing of River Baro while 25.8% of the respondents stated as it could be due to the combined effects of high rainfall and the over flow of the river. Duration of the flood inundation over the entire grasslands was noted for about four months, as 54.8% of the interviewed pastoralists responded. In the report of 35.5% of the pastoralists, the rangeland stays flooded even for more than the stated months. From the group discussion made with the local elders, officials and experts, it was learned that water borne diseases outbreak coincide with the flood, and became more problematic to the local communities.

In the districts, about 76.5 and 55.9% of the interviewed elders emphasized that, there were a decrease in the trend of free access grazing across wet and dry seasons, respectively. Seasonal allocation of grazing lands is a common practice in the districts similar to those of Borana pastoralists as reported by different authors (Coppock, 1994; Alemayehu, 2004; Sabine and Rischkowsky, 2004). Accordingly, the dry season grazing areas serve for the Nuer pastoralists, during the long dry months (November to April). When the rainy season begins, they would be forced to move to the relatively flood-free summer camps so as to gain a time gap for the recovery of the degraded grazing land during the long-dry months of the year. On the other hand, this situation cause stress on wet season grazing areas, and holds true with the finding by Gulliver (1972) in which restricted movement of the pastoral nomads has brought

environmental stress on limited rangeland resources. Moreover, in the dry season mobility of the pastoralists to exploit resources out of the clan territories in most cases leads to conflicts. This is in line with the findings of Abule *et al.* (2003), Nigatu *et al.* (2004) and Alemayehu (2005) whereby the extent and direction of pastoralists' mobility was affected by such factor as availability of rainfall, water and feed resources and security.

Pastoralists' perception towards the current status of the rangeland

In the study districts, 76.1% of the respondents stated that the current pasture availability in the rangelands was inadequate. According to the perception of 63% of the surveyed households, in the past 10 to 15 years the grasslands had densely covered. As the pastoralists compared the present tree and shrub coverage to that of the specified years, 52.2 and 32.6% of them indicated that there were 'greater' and 'similar' levels of coverage, respectively. During the informal discussion made with the local elders, it was understood that, due to over grazing, recurrent drought and low and erratic rainfall in the district the most palatable and valuable grass species had declined and eventually given way to unwanted invasive species. Based on the report by 65.2% of the interviewed households, the grass species composition was by far less than it used to have been previously. Some desirable grass species which were available in the grazing lands previously (as expressed by 78.3 % of the elders) have now disappeared. They also emphasized that species that tend to increase in the proportion of the herbaceous vegetation were annuals rather than perennials. Moreover, most of the respondents believed that the overall negative effects to be exerted on the most valuable and palatable grass species. The local elders further commented that, the amount of regrowth of grass species following rain has been declining from year to year.

The pastoralists were convinced that the cumulative effects of changes in the vegetation structure and composition were reduced carrying capacity of the grassland with a consequent feed scarcity. Furthermore, the existing high grazing pressure could finally put the rangeland in a precarious condition. The present study is in agreement with the reports of other authors (Amsalu and Baars, 2002; Ahmed, 2003; Belaynesh, 2006), whereby an increase grazing pressure in the rangelands was associated with increased coverage of non-native species at the expense of palatable local species. The woody vegetation coverage in the open grassland was observed to be scanty with scattered distribution along the periphery. Recently, their relative abundance has diminished. The most likely reason as pointed out by the community elders, for reduced woody vegetation coverage, were continued destruction and clearing for construction, charcoal making and rain fed shifting cultivation practiced by smallholders residing around the river banks and sedentary centers.

Traditional range condition assessment

By using traditional indicators, the Nuer pastoral communities have been exercising periodic range condition assessment. The major criteria employed by the communities in their prioritized orders were: plant growth, current grazing pressure, forage availability, accessibility to water, soil condition, absence of ticks and biting flies, security, and topographic suitability (Table 4). Most of these criteria used by the Nuer communities have similarities to those of the Borena pastoralists (Ayana, 1999; DLPDP, 2004). Based on the traditional rangeland condition assessment criteria, half of the respondents stated that, the current condition of the grassland as being 'poor' and 32.6% reported as to be 'fair'. The perception of Nuer pastoralist concerning about the deterioration of their rangelands as revealed by present study conforms to the findings of a number of authors based on similar studies conducted in other rangelands pastoral communities (Ayana and Fekadu, 2003; Abule *et al.*, 2003; Gemedo, 2004).

Table 4: Ranks of major traditional indicators of assessing rangeland conditions from the perspectives of the Nuer pastoralists (N=38)

Indicators	Rank	Frequency	Percentage
Plant growth	1	44	95.7
Current grazing pressure	2	41	89.1
Availability of forage	3	32	69.6
Accessibility to water	4	28	60.9
Soil condition	5	21	45.7
Absence of ticks and biting flies	6	18	39.1
Security	7	17	37.0
Topographic suitability	8	2	4.3

N= Number of respondents

Regarding the presence of and magnitude of rangeland degradation, most of the interviewed pastoralists (82.6%), perceived the presence of degradation in the districts. Of these, 68.4% stated that, the extent of range degradation on the livestock production has been much severed. The pastoralists pointed out and prioritized the potential causes of degradation in their rangelands. The most likely reasons for the degradation in the districts as perceived by the pastoralists were: over grazing, recurrent drought, increased livestock and human population, erratic and low rainfall and their restricted seasonal mobility (Table 5).

Table 5: Potential causes of rangeland degradation as prioritized by the respondents in the Nuer pastoral communities (N=38)

Causes	Rank	Frequency	Percentage
Overgrazing	1	36	94.7
Recurrent drought	2	33	86.8
Overstocking	3	26	68.4
Shortage and erratic rainfall	4	21	55.3
Restricted seasonal mobility	5	18	47.4
Increases human population	6	15	39.5
Soil erosion	7	8	21.1
Settlement	8	6	15.8
Lack of good rangeland management	9	3	7.9

N= Number of respondents

Rainfall pattern and water resources

Most of the interviewed pastoralists indicated that besides its uni-modal pattern, the rainfall in their districts was erratic with uneven distribution. As the pastoralists pointed out, the rainfall begins late and with extreme intensity lasts for long period of the wet season. The rainfall intensity has a significant part in contributing to the entire plains (open grasslands) to become over flooded. Seasonal flood has been a common threat in the communities' livelihood. In the grasslands, according to the views of 63% of the respondents, the availability of water was inadequate. As witnessed by 71.7% of the elders there was insufficient as well as impure water for human consumption. The existing sources of water for the pastoralists include: rivers, wells, ponds, lakes and swamps as well as rain water. According to 69.6% of the respondents, permanent rivers including the *Baro*, *Akulla*, *Adura*, *Aluero*, *Burra*, *Jikawo* and *Makwe* were the major sources of water for the pastoralist particularly during the long dry season. Like the other pastoral communities of Ethiopia, particularly the Borena (Ayana, 1999; BLDP, 2004), the Nuer pastoralists have also a well-developed traditional water resource management and utilization practices. For dry season use, they developed wells and permanent ponds. Control over of these water points existed

through clan leader ship. As indicated by the elders, lakes like *Bol*, *Gar*, *Mangok* and *Ngatan* are used as dry season water sources. During the wet season when the flood is inundating the rangelands adjacent to the river banks, water from rain, marshes and seasonal ponds provides an alternative solution to water scarcity.

CONCLUSION

It is therefore, possible to conclude that use of proper grazing systems and establishment of community based drought period grazing reserves in some key range sites might be essential to sustain the pastoral production system. Moreover, to improve the pasture quality there is a need to employ prescribed fire as a management tool to control bush encroachment. The pastoralists' traditional rangeland resources management and utilization practices should be supported by modern ecological methods in order to protect the range resources and biodiversity. To revert the pastoral production constraints and to exploit the potential livestock resources, further, efforts would be expected and should be done by government and concerned bodies through intervening with the introduction of market-oriented livestock production. There should due attention to infrastructure facilities that link the pastoralists to external society and create their awareness to efficient management of the resources around their environment.

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