



Full Length Research Paper

Assessment of pastoral perceptions towards range and livestock management practices in Chifra district of Afar regional state, Ethiopia

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ABSTRACT

This study was conducted to assess the perceptions of pastoralists' towards range and livestock management practices in Chifra district located in Afar Region. In the study district, there are 19 pastoral associations and these were stratified into two based on altitude i.e., >550-850 m a.s.l and >850-1,100 m a.s.l. Nine pastoral associations were selected randomly from the two altitudes of the study district. In this regard, five PAs from lower altitude (>550-850 m a.s.l) and four PAs from upper altitude (>850-1100 m a.s.l.) were identified for the study. A total of 90 households were selected using a random sampling method, where 40 households were from the upper altitude (>850-1,100 m a.s.l) and 50 households were from the lower altitude (>550-850 m a.s.l) based on proportional number of households available in the two altitude zones. The socio-economic study revealed that average household size in the study district was 7.87 persons per household with a range of 3 to 15. The main sources of household income for the pastoralists were from the sale of livestock, their products and crop production. The pastoral groups in both altitudes of the study district varied in terms of their livestock ownership. There was a significant difference at 5% of probability between upper and lower altitudes in the mean number of cows, heifers, small ruminants and camels. Rangelands are the major source of livestock feed in both altitudes and most of the pastoralists in both altitudes (94% in lower altitude and 87.5% in upper altitude) of the study district believed that the rangeland vegetation composition dramatically changed within the past two decades particularly for the most important perennial grasses. Most of the respondents in upper altitude (50%) considered the current condition of the rangelands to be fair, while those in the lower altitude (60%) disclosed that the condition of their rangeland is poor. Most of the pastoralists reflected that, the rangelands are constrained in the study district by the occurrence of recurrent droughts, invasion by bushes and other invasive plants, overgrazing, inappropriate range utilization practices, uncontrolled livestock movement and population increment causes rangeland degradation at high rate. Hence, continues awareness creation through training is very important to strengthening the traditional rangeland and natural resource management practices of the pastoralists and also restoration of the grazing areas through establishment of community based enclosures or resting and also over-sowing highly denuded grazing areas is crucial to improve the grazing area of the study district.

Keywords: Pastoral associations, Rangelands, Enclosures

INTRODUCTION

The Afar region is predominating by pastoral communities whose livelihood is entirely dependent on livestock herding. The pastoralists raise mixed species of

primary livestock, usually camels and cattle and keep supplementary herds of goats and sheep (Yayneshet and Kelemework, 2004). Livestock feed utilizes grazing and

browsing of communally owned rainfed rangelands and most of the grass species however, are subjected to continuous threat of genetic erosion due to overgrazing, rangeland degradation, invasion and encroachment by undesirable species (like *Prosopis juliflora*, *Parthenium hysterophorus*, *Calotropis procera*, *Tribulis terrestris*, *Sida ovata*, *Cryptostegia grandiflora* etc.) and weakening of the indigenous rangeland resource management practices of the pastoralists (APARI, 2005).

In the previous time, traditional institutions play a significant role for the continuity of the pastoral lifestyle and traditional natural resource management practices. The indigenous institutions are organized to serve the social, economic, security, development needs of its members and also have the responsibilities of decision-making and enforcement of resource use rules through political authority. However in recent decades, its contribution became shrinking due to modernization and population increment, which resulted in the formation of small towns with large numbers of highland migrant workers, has undermined their culture and traditional institutions (François, 2001). Many young Afar, both men and women are absorbed into the urban-based modern culture. Clan honesty is also beginning to suffer, as the clan is unable to maintain all its members in one place due to the changing nature of pastoral production system (ERCS, 1988). Most serious is the fact that the clan system can no longer maintain its system of redistribution (mutual aid). In the past decades, most of the development projects in rangelands have often ignored the pastoralists needs and goal, leading to many failures (Grandin, 1987) and lacking of the pastoralists perception about range and livestock management practices also contribute its share for the failures of different interventions (Solomon, 2007). Hence detailed understanding of the pastoralists needs is crucial, for successful pastoral development in unlikely to happen without genuine involvement in all cycle of the project.

To this end, the main objectives of this study were to identify the livestock constraints and to assess the perceptions of pastoralists about the range and livestock management practices.

MATERIALS AND METHODS

Study area

The study was undertaken in Chifra district of zone one (Awsa Rasu) of the Afar Regional State. It is located south west of Semera on the main road of Mile to Woldiya, which is about 162 km from the regional capital city (Semera) and bordered on the south by Mille, on the west by Amhara Region, on the north by the Administrative Zone four (Fantena Rasu), and on the East by Dubti (Zone one). The total land area of the district is about 173,374 ha of which the largest area is rangeland

(APARDB, 2006). The average temperature of the area is about 29°C, and the rainfall is bimodal with erratic distribution, with the long rainy season (Kerma) is between Mid-June to Mid-September and the short rainy season (Sugum) that occurs between March and April. The average annual rainfall is recorded to be between 400 and 600 mm (APARDB, 2006). The altitude range of the area is between >550-1,100 m above sea level and most of the rangelands of the study district falls below 850 m.a.s.l. The dominant soil types in these areas are black, sandy, vertisols and deposits of silt and fine sand particles occur in the plain flat areas where cultivation is practiced (APARDB, 2006). The study area consists of 19 pastoral associations of these 13 of the associations are pastoralists, which entirely depend on livestock production. The remaining 6 associations are agro-pastoralists. The district has an estimated total population of 91,078, of which 50,859 are males and 40,219 are females; 9,132 or 10.02% of its population are urban dwellers and the household numbers are 17,744 (CSA, 2007).

Sampling procedures

In the study district, there are 19 pastoral associations and these were stratified into two based on altitude i.e., >550-850 m a.s.l and >850-1,100 m a.s.l taking into account that the mode of life, resource base and others may vary between the altitude zones (Ahmed, 2006). Nine pastoral associations were selected randomly from the two altitudes of the study district. In this regard, five PAs from lower altitude (>550-850 m a.s.l) and four PAs from upper altitude (>850-1100 m a.s.l.) were identified for the study. A total of 90 households were selected using a random sampling method, where 40 households were from the upper altitude (>850-1,100 m a.s.l) and 50 households were from the lower altitude (>550-850 m a.s.l) based on proportional number of households available in the two altitude zones. The households were interviewed independently. A single-visit formal survey method (ILCA, 1990) was followed for data collection.

Data collection and analysis

Secondary information pertinent to the study areas were collected from previous studies, organizations and other sources. Furthermore, information was gathered through interviewing individuals, groups, key informants and personal observation. This was undertaken to confirm or complement the information obtained from secondary data sources and to get insights from producers and community members who are directly or indirectly involved in the system. After summarizing all the information obtained through the above techniques, they were used as a basis to design the structured questionnaire which focused on range and livestock

Table 1. Profile of respondents by family size, age and educational level (N = 90) in Chifra district of Afar Region

Categories		Upper altitude	Lower altitude	t-value
		Mean \pm SD	Mean \pm SD	
Family size	Male	3.9 \pm 2.1	4.4 \pm 1.9	-1.17 ^{ns}
	Female	3.6 \pm 2.1	3.7 \pm 1.8	-0.27 ^{ns}
	Total	7.6 \pm 3.4	8.2 \pm 3.1	-0.86 ^{ns}
Age of respondents		46.1 \pm 11.8	43.8 \pm 11.6	0.93 ^{ns}
Educational level (%)				
Formal	Children	28.6	19.4	
	Adult	1.7	0.8	
Informal	Children	12.0	5.0	
	Adult	34.0	25.6	

Note: ns = non-significant at 5% of probability

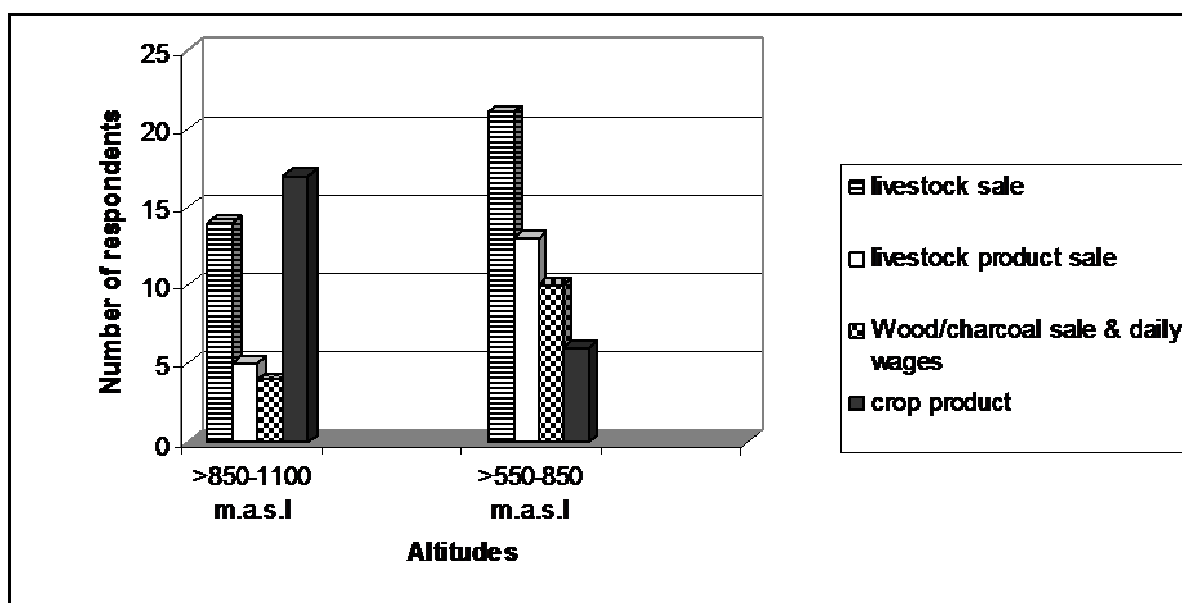


Figure 1. Main sources of income of the respondents in both altitudes of Chifra district in Afar Region (N = 90)

management practices, major constraints of livestock development on the rangeland, range condition of the area, the traditional social institutions and their roles in the management of common property resources, and traditional herd, water and grazing management techniques, the pastoralists view on constraints that affect their livestock, conservation practices and coping mechanisms to feed shortage, and other relevant point. The household was taken as a unit of the study. There were single and multiple response questions in the prepared questionnaire where the percentage of response will be greater than 100% in the latter case. In a single response question, the respondents have a single

reply while in the case of multiple response question, the respondent can have more than one answer to a given question. Before conducting the actual survey, the structured questionnaires were pre-tested by interviewing some households from the community and appropriate modifications and corrections were done to facilitate effective collection of the needed information. Trained enumerators assisted in the collection of the data.

Statistical Package for Social Sciences (SPSS, version 12 for window, 2003) was used to summarize the data on the overall range and livestock management practices. Furthermore, the summarized data was analyzed by the same program using descriptive

Table 2. Mean number of livestock by species owned per household in upper and lower altitudes of Chifra district in Afar Region (N = 90)

Type of animal	Upper altitude (>850-1100 m) (N = 40)	Lower altitude (>550-850 m) (N = 50)	t-value
	Mean \pm SD	Mean \pm SD	
Ox	1.3 \pm 1.0	1.1 \pm 0.9	0.85 ^{ns}
Cow	9.9 \pm 5.7	7.7 \pm 4.5	2.14 ^s
Heifer	2.3 \pm 1.3	1.8 \pm 0.9	2.28 ^s
Steer	1.5 \pm 1.0	1.3 \pm 0.8	0.95 ^{ns}
Calf	3.3 \pm 1.8	2.7 \pm 1.5	1.69 ^{ns}
Sheep	21.7 \pm 6.2	29.1 \pm 8.6	-4.58 ^s
Goat	33.5 \pm 12.3	41.1 \pm 12.5	-2.92 ^s
Camel	6.6 \pm 3.3	9.0 \pm 3.1	-3.51 ^s
Total	80.0 \pm 17.7	93.7 \pm 19.4	-3.47 ^s

Note: ns = non-significant at 5% of probability and s = significant at 5% of probability.

statistics (i.e., mean, frequency, standard deviation and percentage).

RESULTS

Family size and educational background

The average family size in the study district was 7.87 persons/household with a range of 3 to 15. The age of respondents ranged between 22 and 69 years. The average age in both altitude zones was 44.92 years old. There was no significant different at 5% of probability between upper and lower altitudes in the family size. All of the respondents (100%) in the study district were Muslims. Nearly 30% of adult family members of the sampled households had attained informal education (religious).

Source of income

The main sources of income of the sampled households in the lower altitude (>550-850 m) was from the sale of livestock and their products while in upper altitude crop production and livestock sale are the major income source of the household.(Figure 1).

Livestock ownership and herd composition

The pastoral groups in both altitudes of the study district varied in terms of their livestock ownership. There was a significant different at 5% of probability between upper and lower altitudes in the mean number of cows, heifers, small ruminants and camels (Table 2). According to the opinion of the pastoralists in the group discussions, keeping diverse species of livestock would give an advantage for the communities in order to mitigate the

harsh climatic condition, feed and water shortages. The pastoralists also explained that composition and diversity of livestock primarily depend up on the climate and types of feed. The type and quantity of the existing feed (proportion of browse to grass), availability of water and the sensitivity of animals to drought and diseases mostly decide the type of livestock reared in the area. This strategy of maintaining herd diversity has been common practice in most arid areas of East Africa (Herlocker, 1999; Ndikumana *et al.*, 2001; Nigatu *et al.*, 2004).

Livestock production constraints

In both altitudes of the study district, recurrent drought was indicated as the primary problem for livestock production which was followed by shortage of animal feed, water shortage on rangelands and lack of awareness about better livestock management/handling which were more or less similar to the constraints mentioned by different pastoral areas in Ethiopia (Beruk, 2003).

Pastoralists perceptions towards vegetation composition

Most of the pastoralists in both altitudes (94% in lower altitude and 87.5% in upper altitude) of the study district believed that the rangeland vegetation composition dramatically changed within the past two decades particularly for the most important perennial grasses. These were replaced by less palatable annual grass and unpalatable woody vegetation. The most important perennial grasses like *Cenchrus ciliaris*, *Cynodon dactylon*, *Panicum coloratum* and *Chrysopogon plumulosus* were mentioned to be in threat of extinction from most of the communal and riversides grazing areas.

Figure 2. The major livestock production constraints as perceived by the respondents in upper and lower altitudes of Chifra district in Afar Region (N = 90)

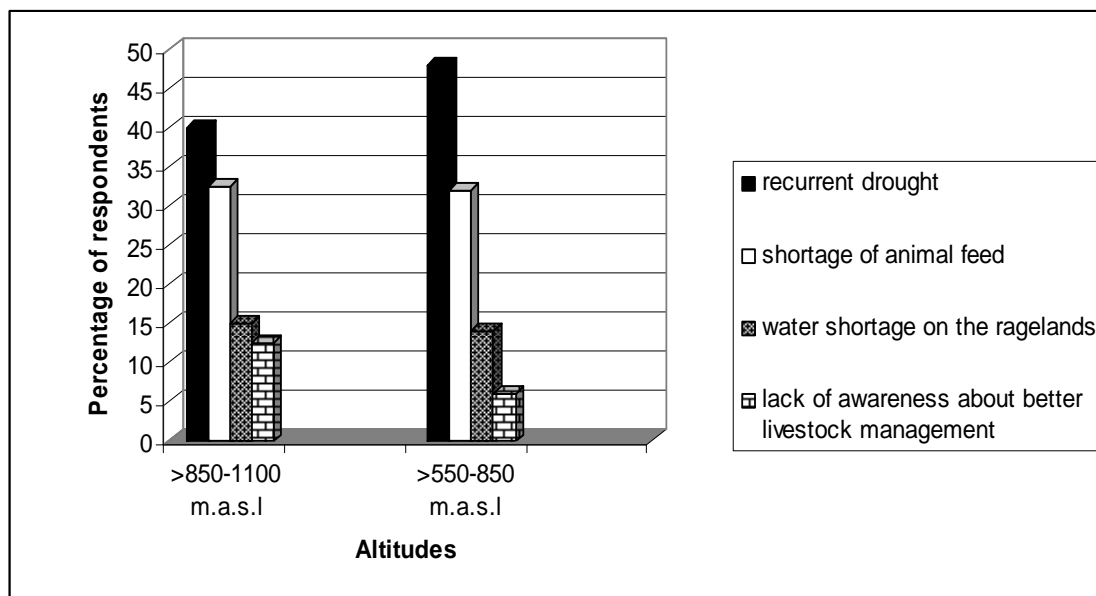


Table 3. Pastoral perceptions about vegetation composition in percentage in upper and lower altitude of Chifra district in Afar Region (N = 90)

Status of vegetation composition	Plant species	Altitudes			
		Upper altitude (>850-1100m);(N = 40)		Lower altitude (>550-850m);(N = 50)	
		Frequency	Percent	Frequency	Percent
Increasing	Perennial grasses	2	5	0	0
	Annual grasses	40	100	50	100
	Herbaceous legumes	6	15	5	10
	Woody vegetation	40	100	50	100
Decreasing	Perennial grasses	32	80	50	100
	Annual grasses	4	10	10	20
	Herbaceous legumes	35	87.5	45	90
	Woody vegetation	10	25	0	0
Same	Perennial grasses	6	15	0	0
	Annual grasses	8	20	5	10
	Herbaceous legumes	0	0	25	50
	Woody vegetation	0	0	12	24

Pastoral perception towards rangeland condition

Periodic assessment of the condition of the rangeland is part of the traditional natural resource management practices of the pastoralists but now due to civilization and modernization the traditional rangeland management systems of the society became weak (Sidahmed, 2000). As described by the pastoralists, 40 % (N = 16) of the upper altitude (>850-1100 m) and 44 % (N = 22) of the lower altitude (>550-850 m) replied that they make periodic assessments on the condition of their rangeland.

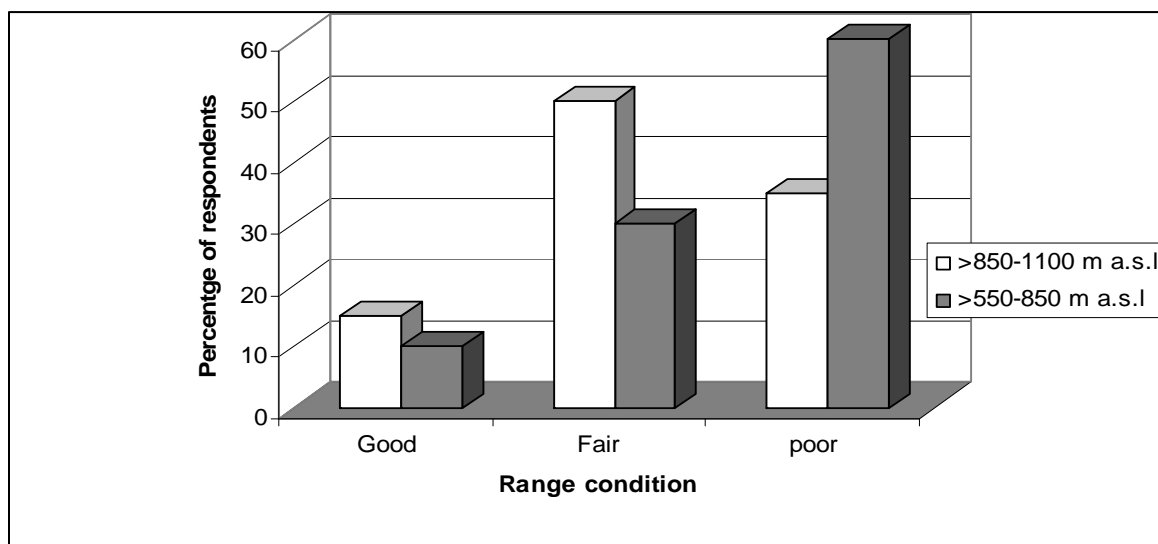
Major rangeland constraints

Most of the pastoralists reflected that the rangelands are constrained in both altitudes of the study district by the occurrence of recurrent droughts, which resulted in loss of soil seed bank, poor germination of the available seeds and favoring unpalatable and drought tolerant thorny bushes.

In addition, invasion by bushes and other invasive plants; overgrazing, inappropriate range utilization practices, uncontrolled livestock movement and

Table 4. Criteria used in rating rangeland condition by pastoral groups in upper and lower altitudes of Chifra district in Afar Region (N = 90)

Condition	Criteria
Poor	Most of the grazing areas covered by annual grasses Large area invaded by encroachers Absence of permanent water source Far from vicinity High incidence of diseases for human and livestock
Fair	Moderate amount of palatable perennial grasses are available The area is moderately invaded by encroachers Water is also available A little bite far from vicinity Incidence of diseases for human and livestock
Good	Most of the grazing areas covered by important legumes and promising perennial grasses Availability of important browsing species Water is available though out the year Near to their vicinity Less incidence of diseases for human and livestock

**Figure 3.** The range condition classification as perceived by pastoralists in upper and lower altitude of Chifra district in Afar Region (respondents; N = 40 in upper altitude; N = 50 in lower altitude).

population increment causes rangeland degradation at high rate and the allocation of area of rangeland for non-pastoral use also contribute to increased grazing pressure in the remaining grazing lands. The constraints raised by the pastoralists in the both altitudes of the study district are similar to those reported from other pastoral areas (Zhang, 1995; Beruk and Tafesse, 2000; Abule, 2003).

Feed resources in the study district

The major feed resources in both altitudes of the study

district are communal grazing areas composed of indigenous species of grasses, legumes and browse. This holds true for the pastoral production system in Ethiopia where extensive grazing has been the only way for livestock production. In both altitude zones, natural grazing areas, crop residues, standing hay (enclosure) and improved forages (*Panicum*, *Buffle*, *Cowpea* and *Lablab*) are the feed resources available for livestock but they vary in terms of the extent of availability.

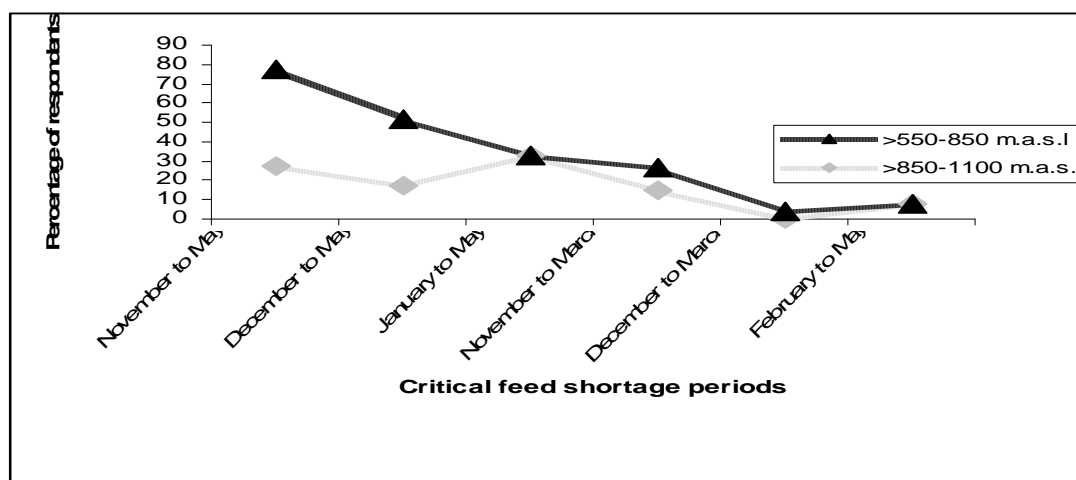
The communal grazing area is available to animals only for about four months, starting from June to September (main rainy season) (Table 7). Pastoralists found in lower altitude (>550-850m) used irrigation for

Table 5. Major rangeland constraints as perceived by pastoralists in upper and lower altitudes of Chifra district in Afar Region (N = 90)

Rangeland constraints	Altitudes			
	>850-1100 m.a.s.l		>550-850 m.a.s.l	
	Frequency	Percent	Frequency	Percent
Recurrent droughts	35	87.5	43	86
Overgrazing	24	60	38	76
Invasion by bushes and other invasive plants	18	45	32	64
Inappropriate range utilization practices	10	25	16	32
Uncontrolled livestock movement	10	25	13	26
Population increment	8	20	10	20
Allocation of area of rangeland for non-pastoral use	5	12.5	3	6

Table 6. Major sources of livestock feed in upper and lower altitudes of Chifra district in Afar Region (N = 90)

Source of feed	Upper altitude (>850-1100m);(N = 40)		Lower altitude (>550-850m);(N = 50)	
	Frequency	Percent	Frequency	Percent
Natural grazing area	20	50	35	70
Standing hay (enclosure)	8	20	5	10
Crop residues	7	17.5	7	14
Improved forages	5	12.5	3	6
Total	40	100	50	100

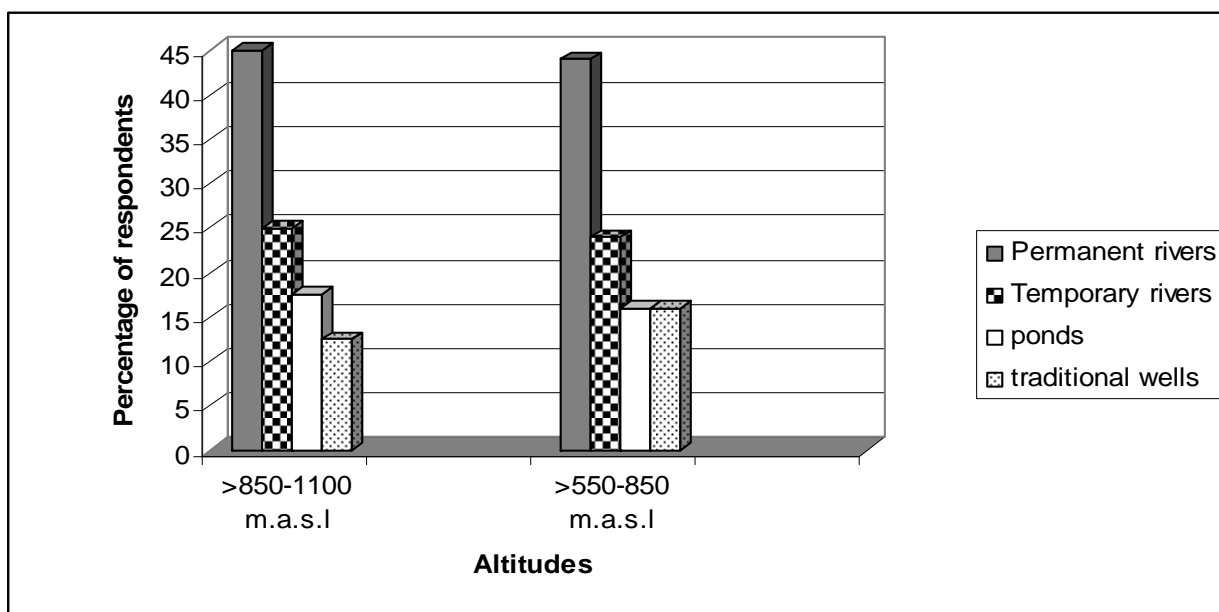
**Figure 4.** Critical feed shortage periods in upper and lower altitude of Chifra district in Afar Region (N = 90)

crop production due to this crop residues are important feed resource for animals. The crop residue used as animal feed is maize stover, they are available for supplementing feed for a few weeks during the

harvesting season and some pastoralists (35% in upper altitude and 22% in lower altitude) practiced feed conservation for dry season feeding.

Table 7. Strategies used during critical feed shortage period in upper and lower altitude of Chifra district in Afar Region (N = 90)

Strategies used	Upper altitude (>850-1100 m); (N = 40)		Lower altitude (>550-850 m); (N = 50)	
	Frequency	Percent	Frequency	Percent
Migration and sale of dry animals	3	7.5	22	44
Migration	2	5	10	20
Sale of dry animals	2	5	8	16
Use reserve feed (enclosure; crop residues)	9	22.5	6	12
Supplementing cultivated improved forages	6	15	2	4
Supplementing cultivated improved forages and use reserve feed (enclosure; crop residues)	18	45	2	4
Total	40	100	50	100

**Figure 5.** Different water sources for livestock in upper and lower altitude of Chifra district in Afar Region (respondents: Upper altitude = 40 and Lower altitude = 50)

Water sources

The major sources of water for livestock are permanent rivers, temporary rivers, ponds and traditional wells (Figure 5). In the study district, the source of water for animals and human beings are the same. This implies that the water is not clean and there is critical water shortage during the dry season (April and June). The coping mechanisms mostly mentioned by the pastoralists were minimizing watering frequencies and long distance migration to get water for their animals. In the study district, the watering frequency of animals depends on

season like the case with the Borana pastoralists (Coppock, 1994). In the dry season, those herders, particularly owning cattle and small ruminants graze their animals for two consecutive days and move their animals on the third day to the watering points. In the wet season, because of availability of water here and there animals drink water depending on their need. The present results revealed that on average the pastoralists travel a distance of 2.1 Km and 2.4 Km in upper altitude and lower altitude, respectively, to water livestock in the wet season. Similarly, in the dry period at an average, they travel 8 Km in upper altitude and 10.2 Km in lower

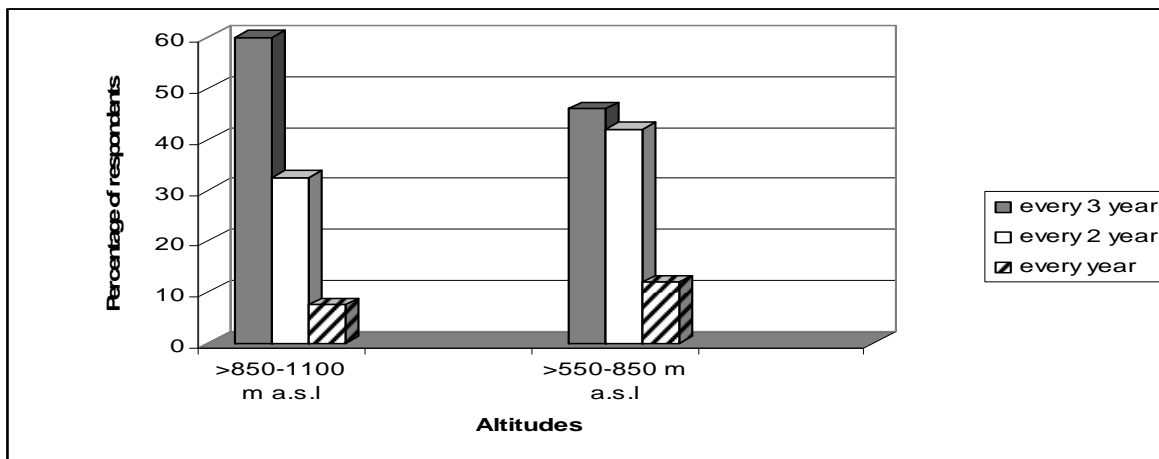


Figure 6. Frequency of drought occurrence based on the response of pastoralists in upper and lower altitude of Chifra district in Afar region (N = 90).

Table 8. Effects of drought as perceived by pastoralists in upper and lower altitude of Chifra district in Afar Region (N = 90).

Effects of drought	Upper altitude (>850-1100m); (%)	Lower altitude (>550-850m); (%)
Death of livestock	22.5	24.5
Migration	35	36
Death of livestock	22.5	20
Poor grass growth	19	18
Death of human being	1.0	1.5
Total	100	100

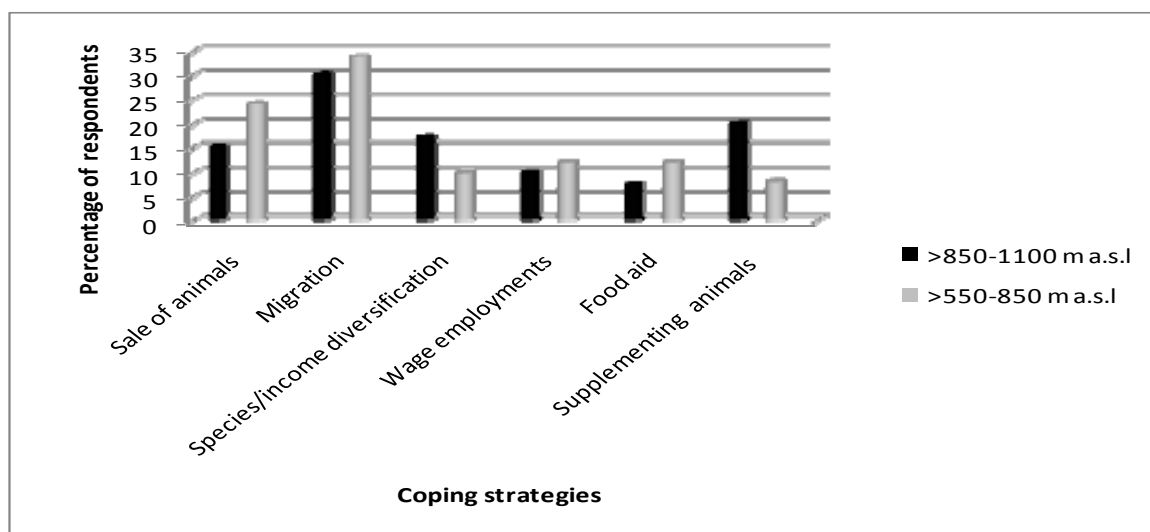


Figure 7. Major drought coping strategies as mentioned by the respondents in upper and lower altitude of Chifra district in Afar Region (N = 90).

altitude of the study district.

Drought and coping mechanisms

The unrealistic nature of rainfall and the occurrence of

drought are accepted features of arid and semi-arid areas in general and the pastoral areas of Ethiopia in particular. Definition of drought according to the United Nations Convention to Combat Desertification (UNCCD) was the naturally-occurring phenomenon that exists when precipitation has been significantly below normal

recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems (FAO, 2002).

The majority of the pastoralists in the study district replied that the frequency occurrence of drought was once every three years (Figure 6). The latest drought occurred in both altitudes of the study district in year 2007 and resulted in the sale and death of animals, migration and poor grass growth. The major coping mechanisms of the pastoral groups in both altitudes of the study district were almost similar but the only difference is the extent of each activities. Migration and sale of dry animals were the major drought coping strategies in lower altitude (>550-850 m) but in upper altitude (>850-1100 m) they undertake migration and supplementing animals (lactating cows, kids and lambs) with improved grasses and legumes as well as with different types of conserved animal feeds (Figure 7). The majority of the respondents in both altitudes of the study district reflected that migration was the major drought coping mechanism of the community and this concurs with that reported by Yayneshet and Kelemework (2004).

DISCUSSION

Family size, educational background and source of income

The level of education in the sampled households of the study district was very low. Less than 2% of adults had attained formal education. This represents a serious limitation to the transfer of new technology so improving the educational status of the community through establishing schools in different areas are very important in order to get more literate pastoralists.

In the lower altitude the main source of household income is from livestock and their products. This result was in agreement with the report of Tadesse and Yonas (2007) who argued that there is a heavy dependence on livestock and around 91% of the Afar people in Ethiopia are estimated to be herders. In the upper altitude (>850-1100 m), the main sources of household income was from crop production and sale of livestock. The communities during the group discussions in the lower altitude (>550-850 m) indicated that camels and goats are the dominant milk source and little comes from cattle. The low level of milk production from cattle is due to the poor grazing areas as result of drought, over grazing and degradation of rangelands. Hence, most of the pastoralists shifted their stock to small ruminants and this finding was in agreement with reports by Coppock (1994); Solomon (2000); Abule *et al.* (2005) and Amaha (2006).

Livestock ownership and herd composition

altitude (>850-1100 m) owned more number of cattle

(cows and the pastoralists in the upper heifers) per household than the pastoralists in the lower altitude. The reason might be associated with climatic condition where it is relatively favorable for rearing of cattle while in the lower altitude (>550-850 m) the pastoralists owned more number of small ruminants and camels. In areas of abundant grazing resource, cattle (cows) are the predominant livestock species while camels and goats are preferred in area of browsing potential. Small ruminants, especially goats are adaptable in their feeding habits and they utilize a wide range of plants and plant parts. Apart from foliage, goats feed on flowering plants and twigs and the pods of Acacia. When feed is scarce, they feed on barks, roots and even climb short trees in search of browse (Angello *et al.*, 1996). This result is also in agreement with the reports made in modern ranches in east Africa (Le Houerou, 1980). Earlier findings also supported that livestock flock pattern and size depends on the availability of water and feed (Coppock, 1994). Studies have shown that mixed stocking with two or more species of different feeding habits make more effective use of vegetation and are often more profitable. Moreover, different livestock species are valued for different reasons (Scoones, 1995). The herd composition in the study district revealed that, the proportion of goats were higher than that of cattle and sheep in lower altitude (>550-850m) and female cattle dominate in both altitudes of the study district. The pastoralists have the tendency of maximizing females while keeping males at the minimum number in herd structure to ensure effective breeding and food security through market exchange of livestock (especially small ruminants) (Yayneshet and Kelemework, 2004).

During group discussion the pastoralists have agreed that, the present grass species, which were found in the grazing lands, were not similar to the endangered grass species in quality and quantity. They compared the present and the past species in terms of livestock products and body condition. In the past, grass species had a high yield and nutritive quality that increases milk production and live weight gain (fattening) and also used as other purpose like house making. Due to this fact, milk, butter and meat availability were very high and the livestock sale was also good. But, the existing plant species of the rangeland have less influence on the milk and meat production as well as animal body performance. Most of the grass species in grazing areas are light in weight and easily diminished within a short period of time after growing. The herbaceous layer cover has declined besides, the disappearing of most important species and this change in vegetation proportion is in line with the reports of others (Coppock, 1994; Philipott *et al.*, 2005).

The pastoralists mentioned that grasses in the past grew fast and after short rain shower, the land was green but in recent years the grass species did not grow as in the previous years. Following this, forage scarcity

increased and the possible reasons indicated by the pastoralists for the change in vegetation composition were drought, overgrazing, weakening of the tradition rangeland management system and also expansion of agricultural activity (crop production), which created grazing pressure on the remaining grazing areas.

Pastoralists perceptions towards vegetation composition and range condition

The pastoralists in lower altitude (>550-850 m) of the study district (72%) replied that most of the communal and riversides grazing areas were invaded by unpalatable and less palatable plant species, which were responsible for a decline in rangeland condition. Drought and heavy grazing, either singly or in combination, could result in the death of perennial grasses in the grazing areas (Mclvo, 2001). The reasons indicated here are similar to those reported in other studies (Schaller and Gu, 1994; Miller, 1996; Wang *et al.*, 2002). Most of the pastoralists (64%) in the lower altitude (>550-850m) keep small ruminants and camels to mitigate the lack of herbaceous species (shortage of grass) problem faced in the area.

The majority of the pastoralists in the study district believed that annual grasses and woody vegetation increased but perennial grasses decreased in the grazing areas. This might be due to the recurrent drought and overgrazing which resulted in the loss of the soil seed bank, poor germination of the available seeds and the grazing areas were replaced by annual grasses which favored the growth of unpalatable and drought tolerant thorny bushes.

The range condition assessment is based on the availability and quality of fodder (grass, legume & browse species) and water for different livestock species as well as the suitability to the different livestock species. This assessment is mainly carried out by team selected by the community and the criteria for selection of the team include the following main points; gentle, calm, physically strong, capable of walking long distance, married and have livestock assets, and well respected by the members. The criteria used by the pastoralists in the study district are similar to those reported by Yayneshet and Kelemework (2004). In general, the Afar pastoralists convey the message of rangeland, about water, rainfall, rangeland condition and welfare of their animals through *Dagu* systems (peoples were setting and exchanged information).

The majority of the respondents in the upper altitude (>850-1100m) replied that the condition of their rangeland is fair while those in the lower altitude (>550-850m) replied that the condition of their rangeland is poor. The major reasons indicated by the pastoralists for these fair and poor states of the rangelands were recurrent drought, overgrazing, invasion by bushes, increment of

human population and the allocation of area of rangeland for non-pastoral use. The decline in the condition of the rangeland as perceived by the pastoralists was in agreement with the reports of Abule (2003) and Beruk (2003). As described by the pastoralists, the degradation of the rangeland could be aggravated due to poor grazing land management system. In most cases, livestock graze the first lush of grasses, before seed setting. This may result in poor regeneration capacity of the rangeland either from existing vegetation propagates or soil seed banks. The pastoralists in the study district have clearly understand about the ability of rangeland to replenish itself from soil seed bank reserves and they used to exercise careful timing of grazing to safeguard plants during seed production. However, due to aggravated pressures in the rangeland like, overgrazing only small percentage of the pastoralists (20% in upper altitude and 14% in lower altitude) reported to have tried to rehabilitate the rangeland by establishing enclosure in the denuded grazing areas.

Drought and coping mechanisms

The main coping mechanisms to feed shortage during the dry season were different between the two altitudes. Most of the respondents in lower altitude (>550-850 m) replied that migration and selling of dry animals are main coping mechanisms but in upper altitude (>850-1100 m) migration and supplementing lactating cows, kids and lambs with improved grasses and legumes as well as different sources of conserved animal feed resources was commonly practiced. The critical feed shortage and the majors taken to solve the problem are in line with the general situations prevailing across the rangelands of Ethiopia (Admasu, 2006; Belaynesh, 2006; Lisan, 2007). Most of the respondents in the upper altitude (>850-1100 m) of the studied district replied that the critical feed shortages occurred between January to May while in the lower altitude (>550-850 m) the respondents indicated that the critical feed shortage occurred between November to May. During this period, the pastoralists tried to overcome the problem using different alternative options like migration, selling dry animals and supplementing with different improved forages and conserved feeds. Among the respondents, 82.5% of the upper altitude (>850-1100 m) and 20% of the lower altitude (>550-850 m) supplement their animals with conserved animal feeds and different types of cultivated improved forages.

CONCLUSION

The perceptions of the pastoral community clearly showed that the range condition of the study areas deteriorated due to recurrent drought, overgrazing,

expansion of crop cultivation and population pressure.

The herbaceous as well as the woody vegetation were affected much by over-utilization and frequent and prolonged droughts as perceived by the pastoralists in the study area. As a result of these factors, the rangelands in the study district are dominated by less palatable and undesirable drought tolerant species, which in turn might affect the sustainable production of livestock in the area.

From this finding, it can be concluded based on the pastoral attitudes in the study district, that the range vegetation of the study area, is subjected to continuous threat of genetic erosion and extinction due to overgrazing and rangeland degradation and also the grazing areas were suffering from lack of attention to control the expansion of woody and other invasive plants. The level of degradation in lower altitude (>550-850 m) of the study district was higher than that of the upper altitude (>850-1100 m).

The study revealed that the pastoralists in the study areas have different indigenous knowledge about their livestock and rangeland management practices, of which nothing was documented until now. In the past decades, the pastoralists in the study district were lived friendly with their environment by using indigenous management systems but in recent time the traditional management systems became shrink due to modernization, population increment and drought.

Therefore, continues awareness creation through training and workshop is very important to enhance the indigenous knowledge of the pastoralists and also in the future, development agent and government organizations should work more friendly/closely with the communities and empower them in decision making processes.

REFERENCES

- Abule E(2003). Rangeland evaluation in relation to pastoralists perceptions in the Middle Awash Valley of Ethiopia. A PhD dissertation Presented to the University of the Free State, Bloemfontein, South Africa. 297p.
- Abule E, HA Snyman, GN Smit (2005). Comparisons of pastoralists' perceptions about rangeland resource utilization in the Middle Awash Valley of Ethiopia. *Journal of Environmental Management*, 75: 21-35.
- Admasu T(2006). Pastoralists Perceptions on Range-Livestock Management Practices and Rangeland Assessment in Hamer and Benna-Tsemay Districts of South Omo Zone. An MSc Thesis Presented to the School of Graduate Studies of Haramaya University, Ethiopia.
- Afar Pastoral, Agricultural and Development Beuro (APADB), 2006. Baseline survey made on the Potential, Constraints, and Opportunity on the Production System of 29 woredas of Afar National Regional State.
- Afar Pastoral and Agro-pastoral Research Institute (APARI), 2005. Rangeland management strategic plane.
- Ahmed Hassen(2006). Assessment and evaluation of utilization practices of natural pastures and other forages in Basona Worana wereda of North Shoa Zone. An MSc. Thesis Presented to the School of Graduate Studies of Alemaya University, Ethiopia. 174p.
- Amaha K (2006). Characterization of Rangeland resources and dynamics of the pastoral production systems in the Somali region of Eastern Ethiopia. A PhD thesis Presented to the University of the Free State, Bloemfontein, South Africa. 232p.
- Angello JM, NKR Musimba, RS Kidunda(1996). Traditional rangeland resource utilization in selected pastoral communities of Tanzania. pp. 11-23. The African Pastoral Forum (APF). Working paper, Nairobi, Kenya.
- Belaynesh D(2006). Floristic composition and diversity of the vegetation, soil seed bank flora and condition of the rangelands of the jijiga zone, Somali Regional State, Ethiopia. An MSc Thesis Presented to the School of Graduate Studies of Alemaya University.
- Beruk Y, Tafesse M(2000). Pastoralism and agro-pastoralism: Past and present. pp. 54-65. Proceeding of the 8th Annual Conference of Ethiopia Society of Animal production Addis Ababa, Ethiopia, 24-26 August 2000.
- Beruk Y(2003). The declining pastoral environment and variability status and adaptation strategies. Pp. 155-164. Proceedings of the Challenges and Opportunities of Livestock Marketing. The 10th annual conference of Ethiopia Society of Animal Production, Addis Ababa, Ethiopia, 22-24 August 2003.
- Central Statistical Authority (CSA), 2007. Ethiopian Statistical Abstract, Central Statistical Authority, Addis Ababa Ethiopia.
- Coppock D, Layne(1994). The Borena Plateau of Southern Ethiopia. Synthesis of Pastoral Research, Development and Change, 1980-91, ILCA, Addis Ababa, Ethiopia.
- François Piguet(2001). Even after good rains, Afar Pastoralists remain vulnerable. Multi-Agency Assessments Missions, UN-Emergencies Unit for Ethiopia.
- Herlocker D(1999). Rangeland Resources in Eastern Africa: Their Ecology and Development. GTZ, German Technical Cooperation, Nairobi.
- ILCA (International Livestock Center for Africa), 1990. Livestock system research manual. No.12, section 1. Working document used in range management. ILCA, Addis Ababa, Ethiopia. Society of range management, Denver, Colorado, USA.
- Philipott J, Asnake A, Kassaye H(2005). Livelihoods/Emergency Assessment in Afar Region.
- Le Houerou H, 1980. The Rangelands of the Sahel. *J. Range Management* 33:41-45.
- Lisan T(2007). Woody and Herbaceous species composition and the condition of the rangelands in Shinile zone of Somali regional state, Ethiopia. An MSc Thesis Presented to the School of Graduate Studies of Alemaya University.
- Ndikumana J, JW Stuth, R Kamadi, S Ossiya, R Marambii, P Hamlett (2001). Coping mechanisms and their efficacy in disaster-prone pastoral systems of the greater horn of Africa: Effects of the 1995-97 drought and the 1997-98 El Nino and the responses of pastoralists and livestock. 106p.
- Nigatu A, Getachew G, Adam D (2004). Mobility, Herd dynamics and species composition of pastoralists; indigenous innovations towards coping mechanism during crisis. Participatory innovation and research; lessons for livestock development. pp. 77-86. Proceedings the 12th Annual Conference of Ethiopia Society of Animal production. Addis Ababa, Ethiopia, 12-14 August 2004.
- Schaller GB, B Gu(1994). Comparative ecology of ungulates in the Aru Basin of Northwest Tibet. *National Geographic Research and Exploration* 10: 266-293.
- Scoones I(1995). New directions in pastoral development in Africa. pp. 271-280. In: I. Scoones (ed.). Living with uncertainty: new directions in pastoral development in Africa. London: IIED.
- Sidahmed AE (2000). The rangeland of arid and semi-arid areas: Challenges and hopes.
- Solomon D(2000). Pastoralism and Natural resource management: the case of the pastoral Borana in Southern Ethiopia. pp. 17-27. Proceeding of the 8th annual Conference of the Ethiopian society of animal production (ESAP), 24-26 Aug 2000, Addis Ababa, Ethiopia.
- Solomon T, HA Snyman, GN Smit (2006). Rangeland dynamics in southern Ethiopia: Assessment of rangeland condition in relation to land-use and distance from water in semi-arid Borana rangelands. Statistical Analysis System (SAS) Institute Inc., 2003. Applied statistics and the SAS programming language 2nd edition Cary, North

Carolina.

Statistical Packages for the Social Sciences (SPSS), 2003. Cary, North Carolina.

Tadesse B, Yonas A(2007). Afar; The impact of local conflict on regional stability (pp 16); Pretoria. Institute for security studies.

Wang Y, M. Shiyomi M, Tsuiji XYu, R Yi(2002). Spatial heterogeneity Heilongjiang Steppe of China. Agriculture, Ecosystems and Environment: 90:217-229.

Yayneshet T, Kelemework T(2004). Indigenous Rangeland resources and Conflict Management by the North Afar Pastoral Groups in Ethiopia.

Zhang Z(1995). The effect and causes of grassland degradation (in Chinese). Pratacultural Science: 12(6):1-5.