



**Original Article**

**Rangeland Degradation and Livelihood Vulnerability of the  
Pastoralists in Erer District of Shinile Zone, Eastern Ethiopia**

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**ABSTRACT**

The research was conducted in Erer district of the Shinile Zone of the Somali Regional State, Ethiopia. This study was undertaken to assess the perceptions of the communities about rangeland degradation and its effect on livelihood and to identify the causes of rangeland degradation. Data were collected through structured questionnaire (80 households), group discussions and visual observations. The average family size per household in the district was 7.27. Regarding their income source, 52.5% of the respondents obtained their income from milk sale, 93.75% from sale of livestock, 37.75% from sale of agricultural products, 5% were employed in government farm land in Erer as daily laborer, 1.3% sale fire wood, 2.5% rent their camels for contraband transportation purpose. All of the pastoralists indicated that the rangeland was degraded and the main causes were drought and overgrazing. Rangeland degradation reduced the income and made the communities vulnerable to even minor climatic shocks. Rangeland is the major feed resource for livestock and livestock is the backbone for the life of pastoralists, but the feed resource available for livestock has declined through time (animals did not get their feed requirement from the degraded rangeland). With the decrease in livestock number and productivity, the pastoralists and agro-pastoralist livelihood is vulnerable to poverty.

**Keywords:** Degradation, Livelihood, Livestock, Overgrazing, Rangeland

**INTRODUCTION**

The rangelands of the world have undergone significant changes over the last centuries and decades. In some regions there are rapid and fundamental changes in the basic socio-

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economic and political institutions following the removal of state controls on rangelands, precipitating rapid and fundamental alterations to the people and management of the rangeland (Howden *et al.*, 2002). Rangeland degradation is a global concern, affecting not only pastoralists who rely on healthy rangelands for their survival but others who suffer from resultant hydrological disturbances, dust storms, commodity scarcity, and social consequences of uprooted people (Harris, 2010).

Livelihoods are affected by natural, policy, social, economic, physical, and human factors. However, the pastoral production system and in particular the food security and livelihood situations are highly threatened because of different human-made and natural risks. Some of the major risks and challenges of the pastoral communities in Ethiopia include: expansion of sedentary agriculture; allocation of vast area of rangeland for non-pastoral use; emergence and expansion of agro-pastoralism; encroachment by invasive plant species; conflicts over rangeland resources use and recurrent droughts (Beruk, 2003). All these factors in single or in combination have resulted in the degradation of the rangeland although the mechanisms could possibly vary depending on the factor considered (Beruk, 2003; Alemayehu, 2004a).

Pastoralists in eastern Ethiopia keep different livestock species for their livelihood (Baars, 2000; Ahmed, 2003; Belaynesh, 2006; Amaha, 2006; Lishan, 2007) and the livestock depend entirely on the natural rangeland for their nutritional requirements. Therefore, proper management and conservation of these natural resources are therefore extremely important, as they form the basis and limit, the economy of the pastoralists (Scoones, 1995; Baars and Said, 2002). But the rangeland has been exploited, without conservation activities undertaken (Baars and Said, 2002). This has resulted in the replacement of high quality forage species with un-desirable and unpalatable species. This change towards un-palatable species has reduced the available feed for livestock resulting with a decline in the productivity and mortality of a large number of animals.

The different coping mechanisms for drought and harsh environment have become weaker and less viable due to severe rangeland degradation and recurrent droughts and lack of support by concerned institutions to minimize the problems in the pastoral areas (Amaha, 2006). Accordingly, a detailed study needs to be undertaken on rangeland degradation, its causes and influence on the livelihood of the pastoralists. It is argued by many scholars (for instance Coppock, 1994; Ayana, 2007) that studies regarding rangeland degradation and livelihood vulnerability should be undertaken in such a way they take into account socio-economic dimensions, that the causes of rangeland degradation are better understood. This information is considered very essential for future pastoral development planning and interventions and for conservation and rehabilitation of rangeland.

Accordingly, the specific objectives were;

- To assess the pastoralists perceptions about rangeland degradation
- To identify the causes of rangeland degradation and their interaction effects
- To assess the effects of rangeland degradation on livelihood vulnerability among pastoral communities

## **MATERIALS AND METHODS**

### ***Description of the Study Area***

The study was conducted in Erer district in Shinile zone of the Somali regional state of [Ethiopia](#). The Shinile zone falls under the hot to warm arid agro-ecological zone, with 60% arid, and 40% semi-arid agro-ecologies. The mean annual temperature varies between 35-40°C. Furthermore, the zone is characterized by low rainfall with high annual and seasonal variability (IPS, 2000). The altitude of the study district ranges between 319 to 2,326 meter above sea level (CSA, 2005). The soil texture for this rangeland varied between 4 - 60% clay,

10- 50% silt and 40- 60% sandy loam, and the predominant sources of water in Shinile zone are intermittent rivers and riverbeds (Tezera, 1998; UNDP, 2004; Lishan, 2007).

## **Material and Methods**

### **Data Collection**

Prior to the actual survey, visits were made to the district and secondary information relevant to the study was gathered from all possible sources. The study regarding community perceptions about rangeland degradation and livelihood vulnerability was undertaken using structured questionnaire schedule, participatory methods and non-participant observations (direct observation).

The interview schedule, involving both close ended and open-ended questions, were constructed, pre-tested and administered. The open-ended questions gave the respondents an opportunity for self-expression to share their views, experiences and opinions. The primary data were collected through various data collection methods or techniques as discussed below;

### **Structured interview schedule**

Primary data on community perceptions about rangeland degradation, causes of rangeland degradation and consequences of rangeland degradation on the livelihood of the community, major income sources of the households, livestock number in the past 30 years and species diversification and which species come to dominant were included in the household survey were also gathered.

In the study district, there are 23 PAs. Of these, 6 PAs were randomly selected and a random sampling method used to select the households within the selected pastoral associations with the help of community key informants and district experts. The final sample size was 80 households and they were interviewed independently. Furthermore, in each of the selected PA, community leaders who were familiar with the area were used as facilitator for data collection.

### **Participatory methods**

Participatory method, like focus group discussion, was employed to gather general and specific information related to rangeland degradation and livelihood of pastoralists. These help the researcher to substantiate the data collected from respondents through the interview schedule methods. This method was done with members of the community who are well knowledgeable about the area which included both males and females. The discussion was meant to use their indigenous knowledge acquired through experience as a reference to assess and analyze the nature and magnitude of changes perceived to have occurred in their environment and the negative effect of the rangeland degradation and solution perceived by the society for rehabilitation of the depleted rangeland.

### **Statistical Methods and Data Analysis**

The collected household data were summarized and analyzed using Statistical Package for the Social Sciences, (SPSS, 1996). Descriptive statistics such as mean, percentage and standard deviations were used to present the household survey results.

## **RESULTS AND DISCUSSION**

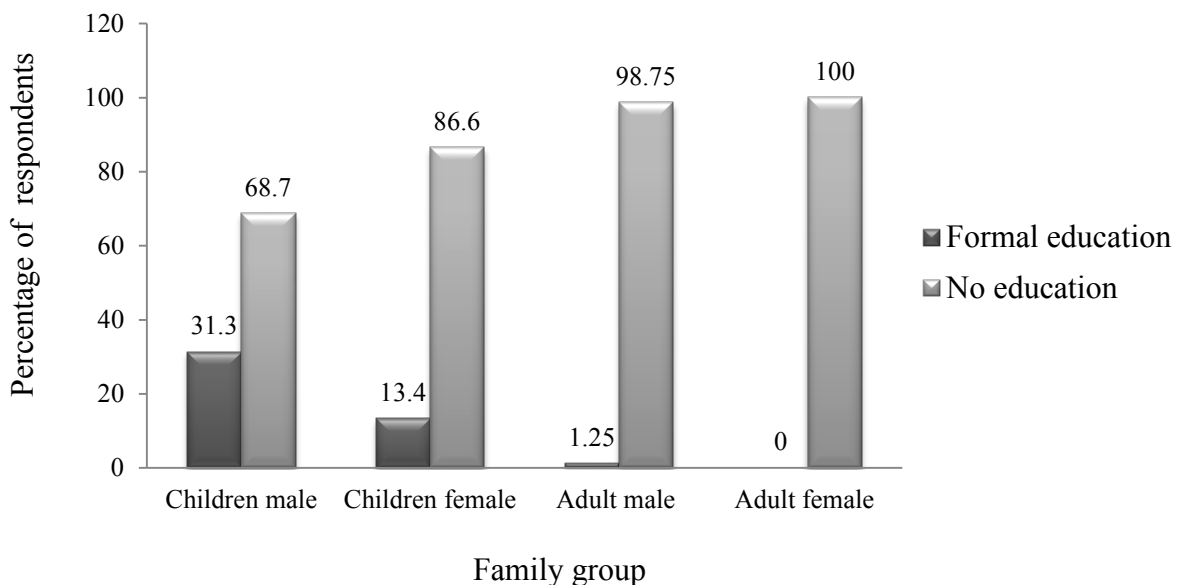
### **Socio-Economic and Demographic characteristic**

All the respondents were males and 95% of the respondent were married and others were single, widowed and divorce. Eighty one percent of the respondents were above the age of 35

and the rest were 25-34 years old. The family size was between 6 and 10 for 56.25% of the respondents. The average family size was  $7.27 \pm 3.68$  (SD). Only 1.25% of the respondents had acquired primary education and the rest were illiterate.

There were human health problems in 95% of the respondents, only 5% of the respondents had access to health service in their area even if it was not highly accessible. Regarding education, there are only primary schools in the study area. Nearly 12.50% of the respondents had access to school service for their children but these schools are not well equipped and established, the class rooms are under the shed of tree. If conditions are fulfilled, the majority of the respondents were voluntary to send to schools their children. The rest were not voluntary, their reasons were children must involve in livestock production, schools were not accessible during mobility and lack of material for education. For the latter group, government and non-government organizations must create awareness about the importance of educating their children and efforts must be made to establish mobile school. Because education is one tool to reduce the human population pressure and indirectly reduce over utilization of rangeland resources means it used to balance the rangeland resources by creating the condition for other forms of employment for the younger generation.

The educational background of the family showed that all adult females were uneducated (Figure 1). The children were better in their education status than the adult female and male; but the percent is low compared to voluntary groups to send school children.



**Figure 1. Educational background of the family**

## Household livelihood

### *Source of income*

As indicated by all respondent's livestock production plays a significant role in their livelihood. Crop production is being practiced in the area but the production was mainly used for household food consumption and insignificant amount brought to the market. This result is in line with the finding of different researchers argued that pastoralists and agropastoralists generate their income mainly from the sale of livestock and livestock products and the economic importance of agricultural crop production remained insignificant (Belaynesh, 2006; Solomon *et al.*, 2007; Asresie and Adugna, 2014). The main occupations of the respondents were 53.75% pastoralists depend only on livestock production and 46.25%

agro-pastoralists depend on livestock production and piece of cultivated private land; they practice opportunistic farming. Livestock product such as milk and animals are sold to buy food and other commodities. In the study district, the majority of the respondents obtain their income from the sale of live animals and their products. A small proportion get their income from sale of agriculture products, employment in government farm land in Erer as daily laborer, sale fire wood, rent their camels for contraband transportation purpose (Figure 2). This result was in agreement with the reports from the different pastoral areas of Ethiopia (Amaha, 2006; Belynes, 2006; Lishan, 2007; Solomon *et al.*, 2007) which indicated that the main source of household revenue for pastoralists was from the sale of live animals and their products.

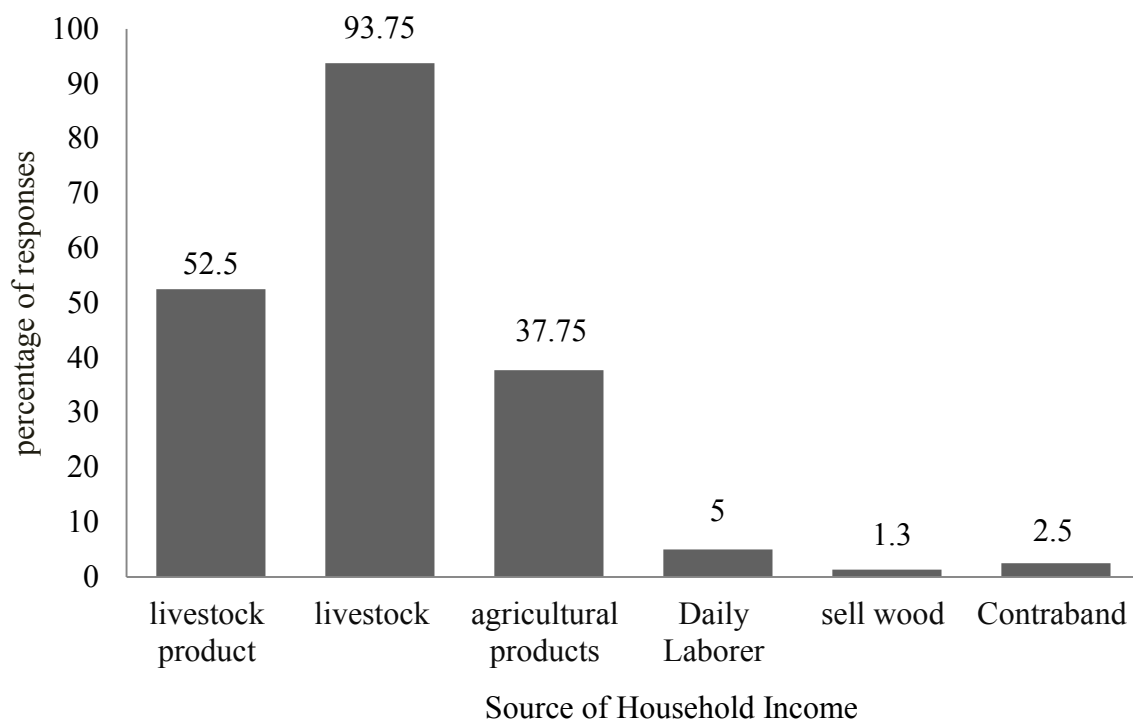


Figure 2. The main sources of household income of the respondents in the study district (N= 80)

### Livestock Marketing

During the rainy season, the number of their animals increases because the reproduction period mostly fits during this season. From the total respondents 18.8% sell their livestock during the rainy season. In general, during the rainy season there is no serious shortage of feed and the animals gain good body condition and price become higher compared to dry season. From the total respondents 26.1% sale their livestock at drought period because at that time there is a critical shortage of feed and death of livestock may occur. At the time of drought the price of animals is very low and 52% of the respondents sell their livestock at any time to buy different items: crop, clothes, and for other expenses. This practice of the respondents was in line with a study conducted in the Jigiga Zone of the Somali Region (Belaynes, 2006) which indicated that livestock were mostly sold for strong purpose like, purchase of grain (43%), clothes for the family member (25%), restoring stock (16%), during drought period (11%), feast and other religious and cultural ceremonies (5%), Belaynes (2006). Only 2.6% of the respondents did not sell their livestock at all. All respondents agreed that the number of animals sold per household at this time is very small because they

own small number of livestock because of different constraints related with shortage of feed and livestock disease.

According to the results of the group discussions the major market places were Erer, Meiso and Dire Dawa. The market places are not nearby to all the community members to sale their livestock product and livestock. The price with which they sale their animals and products was not reasonably priced, because most of the benefits goes to the trader at the expensive of the community. Pastoral Forum Ethiopia (PFE, 2002) stated that the inefficiency and ineffectiveness of livestock marketing in the pastoral regions have contributed to pastoral food insecurity. In the dry season and drought period, the terms of trade between livestock and cereals becomes intolerable for the pastoral household.

### Food consumption

According to the result of the group discussions, the major food sources for the pastoralists 20-30 years back were livestock products such as; milk, butter and meat and cereals. The current major food sources were mainly cereals (maize, wheat, sorghum). The consumption of meat was much lower than the past 20-30 years. From the total respondents, 67.5% slaughter one animal per year and 10% did not slaughter at all (Table 1).

Table 1. Number of livestock slaughtered per year for household consumption (N=80)

Number of livestock	Frequency	Percent	Remark
One per year	54	67.5	
Two per year	11	13.75	
Three per year	5	6.25	
Four per year	2	2.5	
No	8	10	fear to eat sick livestock
<b>Total</b>	<b>80</b>	<b>100</b>	

There were different reasons to slaughter their animals. The majority of the respondents slaughter their animals for holiday (60%) and when the member of the family has serious health problem (27.5%) (Figure 3). According to the discussions, they mostly slaughter small ruminants than large animals as they have more small ruminants than large ruminant.

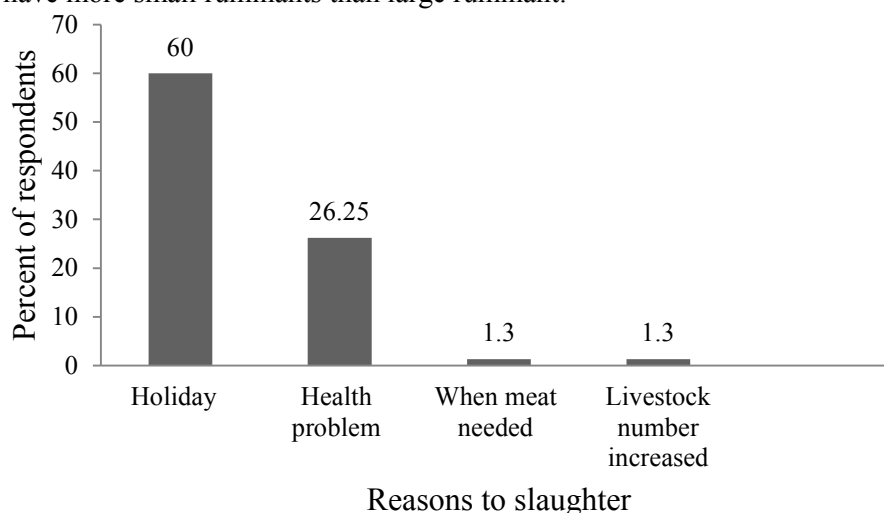


Figure 3. Reasons to slaughter livestock in the study district (N=80)



## Livestock production

### Livestock ownership

In the study area, all members of a family participate in livestock production except children (1-5 years old) and very old persons. The mean number of livestock owned per household was the highest for goats (41±54) followed by sheep (26±31). In the study district, small ruminants dominated the livestock population and this finding was in agreement with that reported by Amaha (2006). This could be due to the shrinkage of the grasslands and the changes in the vegetation composition. Accordingly, there is a shift in the original species composition of livestock in favor of small ruminants. The number of camels and cattle owned per household was the same but the standard deviation is larger for camels than cattle which imply that there is a wider variation in camel ownership per household than cattle. The results showed for donkey one per household with one standard deviation (Figure 4).

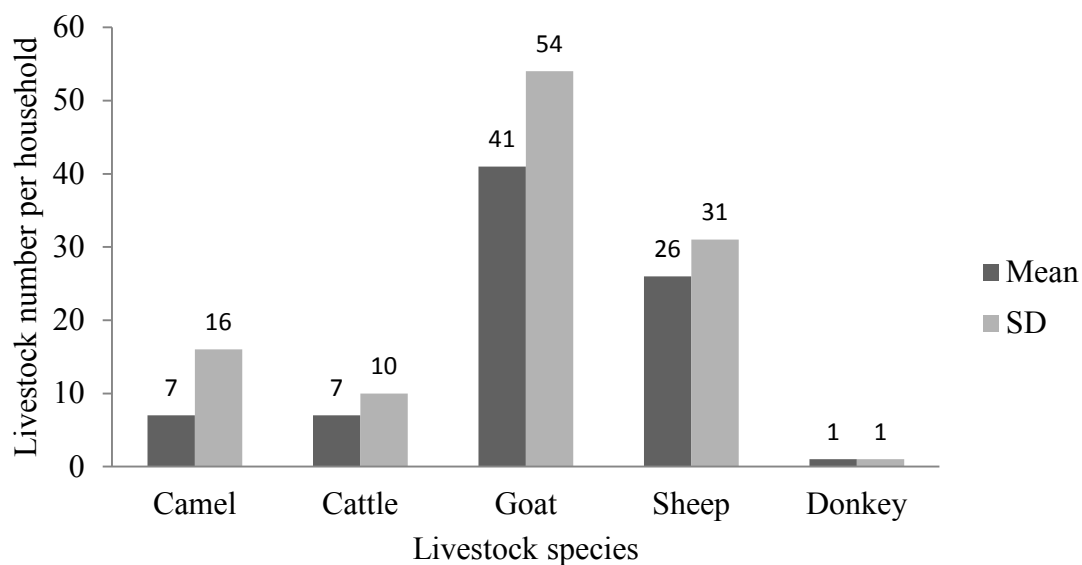


Figure 4. Livestock ownership per household (Mean ± SD) in the study district (N = 80)

According to the information obtained during group discussions with knowledgeable members of the community regarding wealth ranking of the study community, it was based on the number of livestock owned (Table 2). The average livestock ownership per household indicated in Figure 5 showed that below medium wealth category. In the Somali region, rangeland degradation has influenced the vegetation ecology, which is the major feed source with obvious changes in livestock species patterns and livestock holdings of households over time (Lishan, 2007).

Table 2. Wealth ranking criteria according to knowledge members of the community

Criteria	Rich	Medium	Poor
Camel	250-200	50-100	0
Cattle	50-100	10	1
Small ruminant	300-200	50-100	10-20

All respondents agreed that rangeland degradation has affected their income and rangeland degradation reduced the availability of the rangeland resources. In the study area, the rangeland is the main source of livestock feed. Accordingly, the reduction in the amount of

feed affected the number of animals owned and the products that they produced. From the respondents, 98.75% replied that poverty is increased through time, because their livestock number is reduced. All the respondents agreed that there is a reduction of livestock ownership per household while the total number of livestock owned has increased because there is an increase in the total human population. The rangeland is not in good condition in the view of the respondents and cannot support all livestock in the study areas.

### Causes of rangeland resources degradation

All the sampled households were of the opinion that there was a reduction of natural resources in the rangeland in the past 30 years. The respondents put different causes for the degradation of the rangeland resources; low amount of rainfall and drought (100%), settlement (3.8%), overgrazing (high livestock population) (11.4%), high human population (5%), insects destroy grasses (2.5%), flood (2.5%) cutting valuable trees (2.6%) and shortage of grazing land (3.9%) (Figure 5). A study conducted in the Afar region revealed that the causes of reduction of the abundance of grasses and legumes as a decline in the amount of rainfall and drought, population pressure, increase in livestock numbers, expansion of farming, pests, pressure from weeds, bush encroachment and in the case of the Afar the change in the channel (direction) of the rivers (Abule *et al.*, 2005). The high dependence of the local people on the rangeland accompanied by the absence of diversified livelihood options and lack of technical knowledge to manage the rangeland resources have contributed to the degradation of the rangeland.

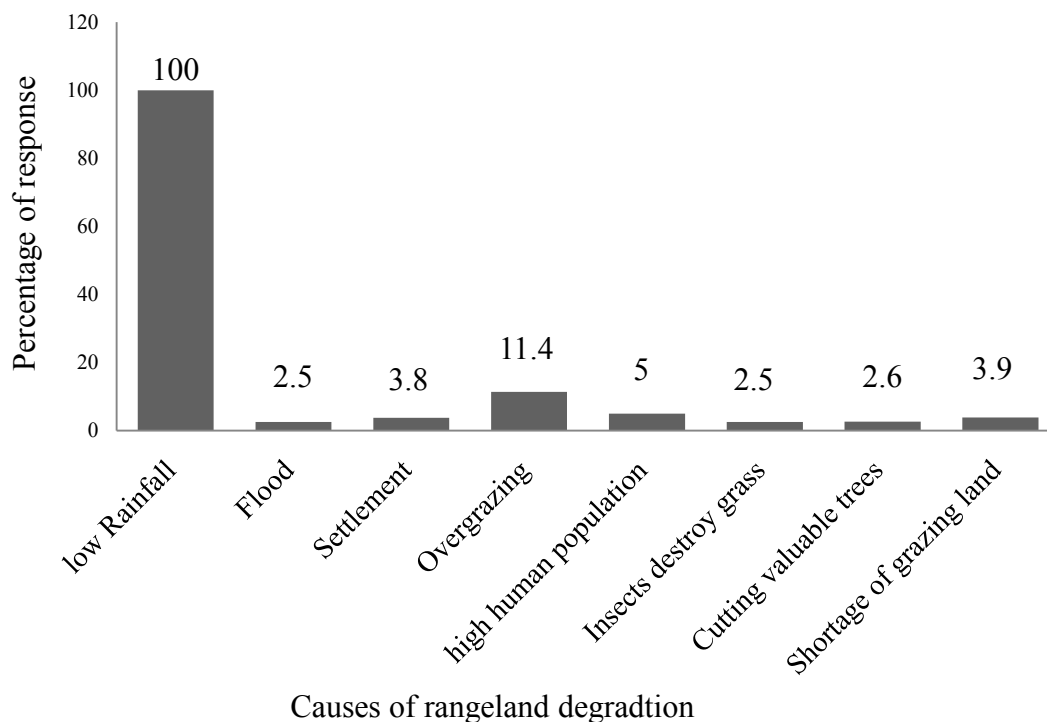


Figure 5. Causes of rangeland degradation according to the perception of the respondents (N = 80)

In general, from the total respondents, 77.4% put nature disaster (drought and shortage of rainfall) as the only cause of rangeland depletion while 6.9% of the respondents put human interference as cause of rangeland resource depletion and nature as minor cause and 15.7% of the respondents put human interference as a minor cause of rangeland resources depletion.



Drought has been a common phenomenon in the study area. According to the result of the group discussions, it frequently occurs within 2-3 years gap. All respondents replied that drought reduced the vegetation cover of the rangeland and it has led to over utilization of the rangeland resources so it had a negative impact on the rangeland resources and reduced animal productivity in terms of milk production and reduced reproduction efficiency of the animal's and increased livestock disease outbreak (Figure 7). The opinion of the pastoralists was also in line with the report of a study conducted in Borana; drought led to loss of grasses, and hence reduced availability of feed to animals and induced ecological degradation. The consequences of the drought were therefore a loss of livestock, migration, poverty because of overall degradation in the rangeland (Belaynesh, 2006; Getachew, 2006; Lishan, 2007).

Respondents perceived that humans are affected directly by drought situations and this is presented in Figure 6. It was also confirmed by pastoralist forum Ethiopia few years ago (PFE, 2002), drought was a natural phenomenon that happened once in a long period; however, in recent past in the pastoralist areas it occurs more frequently. Although the degree and impact of the drought varies across the pastoral groups, drought remains a major cause of asset losses and resource degradation leading to poverty. Drought also increases vulnerability of livestock to death and equally threatens the pastoralist livelihoods (PFE, 2002). Different reports also indicated that drought can, by of the depletion of livestock herds, force poor pastoralists into temporary or part-time crop farming as a result of reduced milk production and increased mortality of milking cows and their replacements (Coppock, 1994; Solomon *et al.*, 2007). Drought affected negatively the living condition of the pastoralist and UNOCHA (2006) reported that there is no significant improvement in the drought situation in Somali Region. Pre-famine conditions prevail, including increasing malnutrition rates; serious water shortages; and intensified cattle and small ruminant mortality. High rates of abortion of cattle; street begging; and distress sale of productive basic assets also have continued.

From the information obtained in the group discussions and sampled households, it was possible to understand that human and livestock population have increased at the same time and this has caused over utilization of the rangeland resources. The livestock population is not proportion to the size of rangeland according to 11.4% of the respondents and 5% of them indicated human population was increased in the past 20-30 years and were the cause perceived for overgrazing. Overgrazing could lead to degradation of rangeland because the resources are used excessively and important species disappear in the rangeland. Different reports are also in line with the respondents view that range degradation and vegetation change has been associated with overgrazing (Alemayehu, 2004b; Belaynesh, 2006; Lishan, 2007).

From the sampled households, 3.8% put settlement as cause of rangeland degradation and members in the group discussion agreed that movement is restricted because the zone is stratified into districts and then into *kebele* and the community also became sedentary. It was reported that seasonal grazing, which provides pasture the chance to regenerate is considered environmentally friendly. This practice is, however, on the verge of disappearing principally as the result of rapid socio-economic changes in the pastoral areas. The seasonal grazing patterns are also challenged by the misleading policy of the Regional Somali government plans to settle (sedentarize) pastoralists (Belay *et al.*, 2005).

According to informants in the group discussions, the production system in the study area has changed through the past 30 years from livestock production into opportunistic farming system because the rangeland is depleting. Three point nine percent of the respondents also indicated that rangeland size was reduced. Cultivation of the rangeland reduced the size and increased the grazing pressure on the rangeland. This is also in line with the report of Coppock (1994) that indicated settlement and cultivation have created strong competition for grazing land, and pushed pastoralists into increasingly arid zones.

Different studies revealed that livestock production was insufficient due to change in vegetation cover and this has resulted in the decline of the productivity of the rangeland, resulting in low carrying capacity and poor vegetation composition. As a result, livestock production system may not cover the family's needs. Due to this fact, the pastoralists were forced to follow agro-pastoralism or opportunistic type of farming that led to cultivate small plots of farm for growing crops on fragile environments. This practice may result in the removal of forest that remained in the area and aggravate the rangeland degradation further with removal of top soil and facilitating wind erosion (Ahmed, 2003; Belaynesh, 2006).

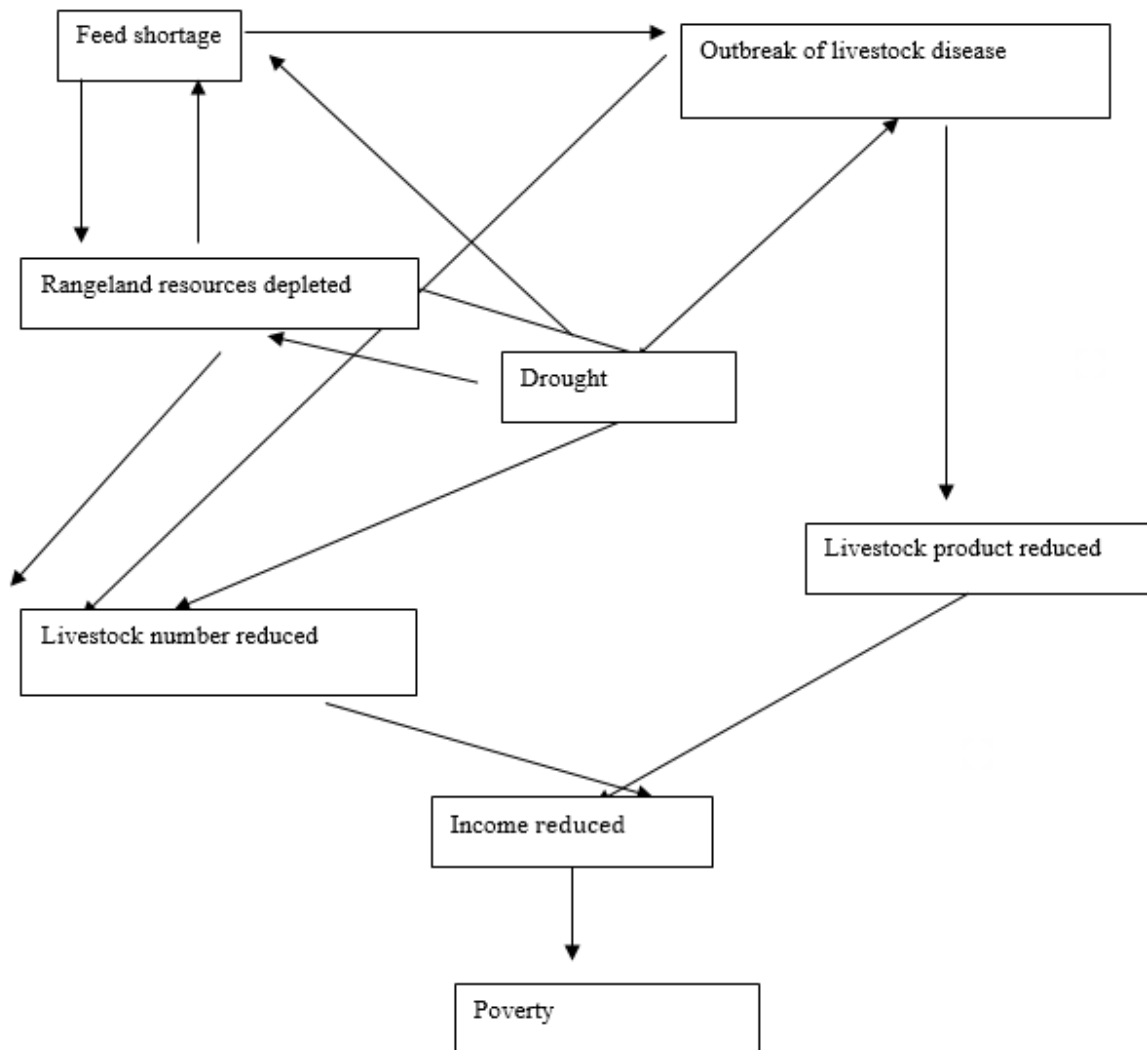


Figure 6. Drought and its negative impact on rangeland and human beings in the study district

### Indicators of rangeland degradation

Several indicators of rangeland degradation were identified by the respondents. These indicators were; low production of herbaceous plants (100%), disappearance of palatable grasses (71.25%), increased unpalatable species (40%), soil instability (28.75%), soil erosion (33.75%), no percolation of water in the rangeland after rain; flood (10%) and the growth of palatable herbaceous species was not like the past time even after enough amount of rain fall (15%). As reported by different authors (Baars and Said, 2002; Belaynesh, 2006), this could be due to the low level of soil seed bank of palatable species in the grazing lands and low

level of soil nutrients. In most cases, livestock graze the first flash of grasses, before seed setting; this may result in poor regeneration capacity of the rangeland. The growth and regeneration rate of forage following rainfall has also declined due to decreased soil fertility because of soil erosion, quick and continuous grazing of plants; which do not get enough time to produce seeds, invasion of drought-resistance and unpalatable species and increased runoff of rain water.

Respondents indicated that rangeland became less abundant in palatable herbaceous species and deplete more quickly in their vegetation cover than the past years. All respondents agreed that the disappearance of palatable grasses and herbs and emergency of unpalatable species was the main indicator of rangeland degradation. The reduction of palatable species and emergency of unpalatable species is a risk of life for pastoralists and agro-pastoralists. All respondents agreed that all part of the rangeland are degraded. Grass, herb (palatable), forbs and valuable trees are disappearing from the rangeland in the past 30 years. These results were also in line with a study conducted with the community of middle Awash valley by Abule *et al.*, (2005) and Gembella Tilahun *et al.* (2015) in Ethiopia indicated that the abundance of grasses and legumes were decreased from time to time.

### **Conflict**

From the respondents, 27.50% agreed that there are conflicts between different ethnic groups because of shortage of feed resources and reduced mobility of the pastoral communities. The increased number of human and livestock populations have caused shortage of grazing land. This forced the people to graze their livestock in other regions, Oromia and Afar. This result also related with other pastoral community; conflict is raised as one of the problems of Ethiopian pastoralists and it is also reported in Somali region (Belaynesh 2006; Lishan, 2007). The major cause of this conflict was competition over grazing land and watering points that remained under dispute for many years.

### **CONCLUSION**

The results of the perception of the community suggested that the rangeland of the study district have been degraded and the pastoralist livelihood was vulnerable even to minor climatic shocks due to reduction in livestock number and production. In general, declining grass cover and its substitution with unpalatable vegetation was the outcomes of recurrent droughts, overgrazing, the recent settlements and expanding cultivation. Areas exposed to soil erosion have increased due to the removal of the herbaceous cover. Therefore, future development interventions better incorporate both the indigenous and technical knowledge as deemed necessary. Therefore, to plan effective management interventions, it is important to assess the current rangeland degradation level by the use of aerial photographs, satellite images and geographical information system.

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