Household Responses to Drought in Fentale Pastoral Woreda of Oromia Regional State, Ethiopia

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ABSTRACT

Fentale pastoralists have been undertaking a set of responses to mitigate the adverse effects of the present day severe recurrent drought on the livelihood sources of the households. This study was conducted to investigate responses that are undertaken to drought by households in Fentale pastoral Woreda of Oromia Regional State in Ethiopia. A household survey was conducted with 134 households complemented by interviews with informants and with in-depth focus group discussion. The results indicate that households have developed various response mechanisms to deal with the challenges of the severe droughts through pastoral and non pastoral activities. An extent of household responses towards both pastoral and non pastoral activities are varied, in which the household characteristics, specifically, wealth in terms of livestock holding is the decisive factors for the engagement of the household in any one or more of a set of productive activities/response mechanisms. The extent of households' mobility and herd diversification has increased. In addition, households have started to partly practice crop cultivation. Other non-pastoral activities such as agriculture, daily labour, petty trade, fuel wood collection and charcoal selling contributed to about 35% of the total household income.

Keywords: *Climate change, Drought, pastoral, agro-pastoral, Fentale Woreda*

INTRODUCTION

Pastoralism is a rational, adaptable, tried and tested animal production system uniquely suited to the dry lands. Pastoralism occupies a quarter of the world area, which is predominantly arid and semi-arid. Pastoralism developed autonomously across the world's dry lands from some 7000 years ago (Brooks, 2006). It is still widely practised today and remains a dominant feature of rural east Africa in which most households sustain their means of living from keeping domestic livestock (Anderson and Mowjee, 2008). Pastoral and agro-pastoral population are about 60% in Somalia, 33% in Eritrea, 25% in Djibouti, 20% in Sudan and 12 - 15% in Ethiopia (Jahnke, 1982). Pastoralists in these regions keep a significant part of the livestock wealth (Abere, 2010). For example, in Ethiopia 30%-40% of the country's livestock is found in Fentale pastoral Woreda (Abdel Ghaffar *et al.*, 2002). However, Pastoral areas are typified by high levels of uncertainty from one season to the other. Drought is the major serious hazard and incessantly deteriorating pastoral households' livelihood sources in an alarming rate.

In addition to drought, other important risks include uncertain access to grazing and water due to appropriation of dry season grazing lands by external land users, disease, raids, conflict and price of livestock in relation to other commodities. In most cases, in non equilibrium systems, pastoralists spread drought risks through moving herds and flocks to make best use of the heterogeneous landscapes, restock and destock. In addition to the pastoral activities, households have seek economic diversification as a means of response mechanisms to severe drought through undertaking non pastoral activities such as farming, wood cutting and trade, and in extreme cases reduced meal intake per day, and defend complex rights of access to grazing and water resources to support their livelihoods (Abera, 2010). Pastoralists kept a diverse mix of livestock in terms of species and class as well as undertake flexible responses to a diverse resource base to allow further drought risk reduction (Jahnke, 1982; Perrier, 1988; Swallow, 1994). The increasing interaction and integration of livestock with crop activity has major implications for the efficiency of opportunistic pastoralism (Bayer and Water-Bayer, 1991). Pastoralists demonstrate diverse range of adaptations to the risk and uncertainty they face in the daily life.

At the same time, people's adaptations change as conditions alter, so that a snapshot of pastoral life today is in a sequence of moving images, that is, a continual adaptation and change (Scoons, 1996). There is probably an inevitable 'shake - out' of people from the pastoral sector during drought crisis, due to the deterioration of the pastoral households capacity by the recurrent and the severe drought that are resulted in failure of households to make positive response mechanisms. Drought in Ethiopia is not a new phenomenon. Crisis linked to famine and droughts have been traced back as far as 250 BC (Patrick, Joachin and Yishac, 1992). Drought used to recur within 8-10 years in the highland areas and 4-6 years in the pastoral areas of Ethiopia. However, in the drought prone areas drought cycle has changed in the recent time and become more frequent, 2-3 years, giving no time to recover from the effects (Aklilu and Alebachew, 2009; Abera, 2010). This has resulted in economic, environmental, social and cultural losses in the pastoral areas of East Africa (Bayer and Waters-Bayers, 1991). A total of at least 35 periods of food shortage with high human and livestock transience have been recorded. These events have been concentrated partly in the crescent of low lying pastoral and agro-pastoral areas of the country (Gufu, 1998).

Until recently, pastoralists have been employing adaptive mechanisms that varied from mobility to herd diversification and exploiting micro environment. According to Sandford and Habtu (2000), mobile pastoralists that can optimally exploit spatial variation in rainfall and consequent vegetation, those who exploit patches of lands and vegetation suitable for their respective stocks, those who use the community network in times of severe crisis and those who maintain different species of herds have a high degree of sustaining droughts in the pastoral areas. Futterknecht (1997) states that pastoralists living in marginal areas have much better to cope with drought periods than those who live in relatively better environments as the former ones are used to live within little food for longer dry seasons of the year. The pastoral activity responses are divided in to sub categories such as mobility, herd diversification, herd splitting, forced selling, social supports and

reduction of meal per day. Even though, most of these responses are traditionally adapted by pastoralists in order to live in the harsh environment and to overcome the effects of normal drought of arid and semi-arid low land areas. Non pastoral activities include, opportunistic agriculture, collection, burning and selling of firewood and charcoal, petty trading, casual labour and use of wild fruits (Kinyangi, 2008; Aklilu and Alebachew, 2009; Abera 2010). Response can lead to adaptation for groups to be able to protect and increase assets, but can be a vicious spiral towards poverty (destitution) for the poorer through scattered efforts in low-skilled, low-income, and broad-spectrum casual employment (Little, 2001; Homewood, 2008; Homewood and Chevenix-Trench, 2008).

Often, returns are insufficient for the destitute pastoralists and agro-pastoralists to invest in rebuilding household assets (Homewood and Chevenix-Trench, 2008). The combination of natural (increased climatic shocks like drought and others catastrophic) and man made factors (conversion of pastoralists' dry season grazing land to other land uses), and a lack of other viable livelihood options pushes more and more pastoralists out of the system. Loss of livestock assets below a certain threshold translates into poverty in the absence of viable alternative livelihoods. Increased poverty, pressure on settlements and urban areas, displacement and conflict are common results of loss of livelihood without the option of viable alternatives (Little, 2001).

The Kereyu, who have been the indigenous inhabitants of the Metehara plain and Mount Fentale area are Oromo pastoralists. Drought is one of the major hazards frequently challenging the area and it is a natural recurring part of climate of the Fentale Woreda. It has had implications on the predicament of pastoral and agro-pastoral households and their responses (UNDP Report, 2002). However, the extent of responses are not identified. In addition, wealth of the local knowledge is not taken into consideration by external actors, little or no effort is undertaken to encourage responses that are undertaken by pastoralists to drought. Rather blue print planning development intervention, which focus on only sedentary agriculture is taken as the only final option to mitigate the adverse effects of recent severe drought. Even though it is a segments of an opportunity in responses taken to drought, changing the pastoral mode life to sedentary life will require a long evolutionary process, risky and difficulty task under non equilibrium environment with poor technology and capital (Abera, 2010).

According to Anderson and Mowjee (2008), from many land uses in the dry lands pastoralism is the most resilient against climatic variability and change than others. Hence, to improve the resilient capacity of the Fentale pastoral Woreda community, identifying the dimension of households' response mechanism is more fundamental for households and external agencies to employee appropriate response mechanisms in regards of a continuum change of the patterns of drought. The adverse effects of drought are more aggravated due to lack of well identified, appropriate and relevant local level response mechanisms. The objective of this research was to investigate response mechanisms that are undertaken by households of Fentale pastoral Woreda to drought.

PARTICIPANTS AND PROCEDURE

Despite the conventional superiority of probability sampling techniques, non probability

sampling, that is based on purposive sampling techniques were used to select all the research subjects and to make easy the demeanor of the study. Accordingly, Fentale woreda of Oromia region was taken as a case study due to repeatedly exposition of the Woreda to the risk of drought. Out of 20 Kebeles, Dhega Hedu and Gelecha were purposively selected for the exploration of variables under the study. Dhaga Hedu is among the most pure pastoral PA and Gelcha is among the agro-pastoral PAs of the Woreda. The two PAs represent the other pastoral and agro-pastoral kebeles of the woreda with varying degrees in continuous distressing by the adverse effects of the natural and man made factors. Yaya village (YYV) of Dhaga Hedu Keble is predominantly inhabited by a pure pastoral households. The total number of the households residing in the village is estimated at 70.

Households in the village are members of the interconnected clanship family of Bacho, Dullacha and Ittu. They are living surrounding the foot of the mount Fentale to triumph over the effects of heavy scorching sun of the dry period through using the shades of the sparse indigenous tree and the scant pasture on the slant of the mountain. Dire Redie village (DRV) of Gelcha Keble is inhabited by an agro-pastoral households. The total number of the households residing in the village is estimated at 120. The village is residing between the Awash national park and the Metehara sugar cane plantation and they are among the most seriously humiliating village due to the conversion of the traditional rangelands for other land uses by the outsiders and unremitting drought hazards which forced them to engage in the opportunist farming in this non-equilibrium environment as a means of responses to adverse factors for the aim of diversifying their livelihood base. The study is conducted on 75 % of purposely selected households in both villages. The information presented draws on data from 134 households, with 88 purposely selected from YYV and 46 households purposely selected from DRV. Households were interviewed with a base line survey in March 2010 and data were complemented and triangulated with other qualitative data and secondary sources. This was complemented by interviews and discussions carried out with informants and focus group to map out the timeline of drought events in the area. Data were analysed using statistical tools such as frequency distribution table, figures, mean and percentage.

RESULTS AND DISCUSSION

Figure 2 shows how the cumulative effects of natural and manmade factors declined the inherent responsive capacity of pastoralists and lead to a depletion of pastoral livelihood system. As the result of differential in capacity of responses to drought, pastoral livelihoods are in a flux (in dynamics). Those who are able to respond positively to drought is perpetuating in the pastoral mode of life and those who are not able to respond positively are on the extent of leaving the system and others are in transition (agro-pastoralists). Transition away from pastoralism can have different outcomes. Under the circumstances of drought that is aggravated by the climate change there is increasing stresses on the system, the rate of destitution is likely to increase unless options which enable responses, adaptation and a choice of livelihoods which allows people to maintain or improve their conditions independent

of livestock-keeping. As it can be seen from Figure 2, which is a conceptual frame work of this study, in the present day, adverse effects of drought is aggravated by both natural and manmade factors on the pastoral households' of livelihood system of the study area.

Natural factors include climatic factors such as scarcity of rainfall, increased temperature, wind pressure; loss of livestock by drought, natural resource/biodiversity/ degradation and disease. Manmade factors mainly include development policy issues such as curtailment of mobility, conversion of traditional dry season grazing lands into other land uses, poor infrastructure development, conflict and household characteristics. As it can be seen from Figure 2, Karrayu pastoralists are found at a varied stage of responses in which wealth of the household coupled with the external responses are the decisive factor to put the pastoralists in any of the stages of the responses. In this case, pastoralists who have undertake appropriate response to drought through pastoral and non pastoral activity responses (PAR and NPAR) are mainly found in the stages I and II of responses. Pastoralists on stages I and II are those who have asset and have capacity to undertake appropriate response mechanisms to mitigate their livelihood from the adverse effects of drought. However, Karrayu pastoralists who have lacked capacity to undertake appropriate response mechanisms to drought through both pastoral and non pastoral activity responses are mainly found on stages III and IV of the responses. Pastoralists on stages III and IV are those in great tension or in pressure because of drought and its related effects. Pastoralistson the stages III are those who reached the asset disposal stage due to loss of livestock by drought and sell for exchange of grain. Mainly household on this stage are those who their livestock holding is below threshold level. Unless appropriate external responses are facilitated for this group, only their responses (internal responses) are not well enough to mitigate them from adverse effects of drought and to rebuild asset. Pastoralists that have reached the stage IV of the responses are the destitute who lost totally their asset due to drought and related effects and those who are out of any viable productive responses. These clearly show as the dimension of the pastoral mode of live of the study area pastoralists are in a continuum fluxes or dynamics due to responses to drought and related adverse effects that is aggravated by the recent climate change (Abera, 2010). Kerreyu households have modified an extent of their responses mechanisms to withstand effects of recent severe drought that is aggravated by climate change. For example, an extent of present day mobility and herd diversification are increased than the past as modified responses to climate change; and selling of livestock, especially, cattle including cow and livestock products are developed as a new response to severe drought that is aggravated due to climate change by households (Abera, 2010). Even though most of these activities were started as response to severe drought of 1980s by the households, extent of this responses is becoming high in this decades as a response to severe drought that is aggravated by the climate change and resulted in loss of the dominant livelihood (Abera, 2010).

Mobility: Mobility allowing pastoralists to respond quickly to fluctuations in resource availability and thereby to maintain their herds and other assets as well as their productivity, enables pastoralists to inhabit areas of harsh and volatile climate and to transform seemingly unproductive wastelands in to assets. It allows tracking changes in the dramatic fluctuations

in feed supply, avoiding areas where forage is insufficient and mopping up surpluses where they are abundant (Sandford, 1983; Behnke, Scoons and Kerven, 1993, Behnke, 1994). Pastoralists are specialists, they respond to and use, even choose and profit from variability. Highly variable, unpredictable and often scarce rainfall dictates where, when, and how much vegetation is available for their livestock to graze (Behnke, 1994). The exchange of services and negotiation of land access between pastoralists and farmers have allowed pastoralists to adapt climatic variability.

Although in the past, an extent of mobility outside of their boundary was low, Karrayu households' had moved more in their boundaries in accordance of spatial and temporal variation of pasture and water availability that were based on the rain fall season such as Ona Ganna, Ona Birra and Ona Arfasa before in appropriation of Kararyu dry season grazing land for other land uses by the external bodies. Households have undertaken this mobility to track fresh pastures, avoid overgrazing and evade disease, conflict and drought condition. When the scarcity of pasture and water was observed in the area of ona Ganna settlement, households moved their livestock with their whole families to the other potential settlement in the Ona Birra and Ona Arfasa. The cycle of mobility was continuous in the past unless during extreme drought. Karrayu households seldom moved to other distant area in search of pasture and water. According to informants, the extent of mobility of households in search of water and pasture to a distance area is high. The increase in frequency and severity of drought left the pasture land barren and drying up water points. These subjected the households to move their camel and cattle to areas such as Hosa'ina (SPNN), Shashamane, Modjo, Adama and Bosat Woreda. During this study period, no lactating cows or any livestock is available around the village. According to Woreda Pastoral Development Office, an extent of mobility is highly increased and even children and elders have not obtained milk due to the reason that all cows are stayed at a far distance outside Woreda more than six month in a years in search of pasture and water. As it is seen on table 1, 90 % of YY and 70 % of DR respondents confirmed that in the present day extent of mobility is higher than in the past.

Table 1: Percentage of an extent of mobility in response to drought to distant places

Extent of mobility	Yaya		Dirree Redie		Total	
	Past	Present	Past	Present	Past	Present
No						
Low	2		10		6	
Medium	98	10	90	30	94	20
High		90		70		80

Source: Survey, 2010

Herd Diversification: Karrayu pastoralists have been raising different species and breeds of livestock to make optimum use of different ecological niches, particularly in the dry season when resources are scarce. Traditionally, unlike other Oromo pastoralists, Karrayu reared different livestock compositions such as cattle, goats, camel and some equines and also unlike other Oromo pastoralists, Karrayu traditionally consumed milk of cow, camel, sheep and goats. Unconsciously, in the past, Karrayu households reared large amount of

goats and even do not discern their numbers and reckoning only goats which started giving birth and numbers of others are not clearly known. In the past, households investing much on fertile female cows, to build up herd size as an insurance against drought, disease and raiding; and also reluctant to sell reproductive cows. The capacity of Karrayu breeds rapidly to put on weight after the rains (compensatory growth or recovery in short period of time) is admirable, while camels and goats can survive in harsher environments of Karrayu rangelands by browsing leaves, feeding pods and fruits of trees which is too scant in the present day. Households sell small stocks of their product to cover all their basic necessities such as grain, garment, house utensils, health expenditure and for social obligation.

However, they highly recovered from effects of forced selling due to their high birth rate that are undertaken within a short time interval. Hence, households called small stocks Lubbu Dhaqabo. For example, goats give birth in an interval of 5 - 7 month and urgently solve the household cash problem. Not only this, but also small stocks provide milk in the drought period more than large stocks without significant variation from the normal years. Karrayu have given more emphasis to camel since camel tolerate drought for long period of time, move to far places and survive from effects of prolonged drought, produce high amount of milk both during normal time and drought year, use different plant varieties as feed sources, and also used as pack animal in the rural areas.

However, it requires high initial capital and hold mostly by the medium and richer group of the community. According to FGD participants, in the past, when drought was normal households had specified herd structures to maintain an ideal portfolio of livestock and to meet their long and short term objectives in which adult cows were needed to produce milk in the short term and give births to calves that later will grow into adults. Thus, ensuring the future survival of the family, adult steers are needed for sale or major ceremonial purposes, a bull is needed to inseminate cows, heifers are needed to replace cows while young steers to be fattened for future sale. Sufficient supply of small stock (sheep and goats) was also essential to the families for more routine needs without resorting to the sale of the cattle and camel herd, which represent the main resource of the family income while donkeys and camel are critical for providing transport. Even though, Karrayu households used to rear all livestock equally, now an extent of rearing different types of livestock by pastoral households was a response to drought risk reduction has become high. Currently, households inclined more towards small stocks of camel as a modified response mechanisms to minimize adverse effects of climate change and to diversify livelihood source bases. Especially, browsers are unlike grazers they feed on different varieties of natural pasture and bushes found in the rangelands and less affected by drought. For example, according to Fantale pastoral development office a total livestock number of 545,909 of the district share of small stocks is high which is more than 51 % (sheep are 131,829 and goats are 147,535) and the share of camel is 15 % (81,204). Karrayu households have given more emphasis to camel, goats and cattle in decreasing order depending on their drought escaping and drought tolerant capacity; unlike in the past in which wealth was determined by the number of cattle. Table 2 shows that 82% of households confirmed that their extent of herd diversification is becoming high for the purpose of

minimizing drought risks. An extent of herd diversification is high among pastoralists than agro-pastoralists. However, extent of herd diversification of both villages is high.

Table 2: Percentage of households' extent of herd diversification in response to drought

	Yaya		Dirre Redie		Total	
Extent of herd diversification	Past	Present	Past	Present	Past	Present
No	2				1	
Low	10	3	20	6	15	4.5
Medium	78	7	65	20	71.5	13.5
High	10	90	15	74	12.5	82

Source; Household survey, 2010

Selling of Livestock and Livestock Products: Pastoralists sell their livestocks rarely. Since livestock number is socially valued they rather prefer to keep as much livestock as possible (Aklilu and Alebachew, 2009). District livestock experts explained that in the past, Karrayyu households were traditionally reluctant in selling of cattle and livestock products. Karrayu usual used to sell weak cattle and rarely sold reproductive livestock, except during special social ceremony like marriage. Karrayu households sold small stocks (goats) to cover basic household expense such as salt, spice, fuel, garment, etc. Livestocks and livestock products were sufficient for the household consumption and also an extent of livestock selling as response mechanisms to minimize adverse effects of drought is low.

An average livestock holding per capita is becoming below threshold level due to loss that is caused by recurrent drought. Lack of water and pasture caused by rangeland degradation, conversion of dry season pasture lands to other land uses, invasion of pasture lands by unpalatable exotic and indigenous shrubs and bushes, eradication and depletion of palatable herbaceous, grasses and bushes by severe drought (degradation of pasture biodiversity and genetic deterioration due to both natural and manmade factors which requires independent study in the future) resulted in declining of household herd size. This in turn has resulted in reduction of production and productivity from livestock, forcing pastoral households to undertake forced selling for the purpose of purchasing grain. Since 1984 devastating and debilitating drought, households have started unusually selling of livestock including cows and livestock products as a modified response mechanisms to minimize loss/death of livestock by drought and also for exchange of grain. According to information obtained from informants, monthly, in average households' sale is 5 small stocks; and yearly 6 cattle and 1 camel in a normal year for exchange of grain, other basic household necessities and for social and economic obligation. Karrayu was also reluctant to sell livestock products such as milk and butter, but in the present day they have selling meager available milk and milk products as a newly developed response mechanisms to drought and as a means of diversifying a source of income. The study also revealed that 77% of households confirmed that extent of selling of both livestock and livestock products was low. And 85% of the households have confirmed that selling of their livestocks and livestock products is a response mechanism to drought. In the past, extent of selling livestock and livestock products was low in YYV than DRV but now it is higher in YYV than DRV.

Social support: According to informants, traditional Karrayu Oromo system encourages

and supports sharing of resources and mutual assistance mechanisms that serve as risk spreading tools among households, and communities. Pastoralists who are victims of calamities have the right to seek support in kind and in cash. In the past, there was no destitute in the community; when somebody lost livestock due to natural or manmade factors, the relatives donate lactating cows for the handicapped for a defined period of time. This was undertaken not only for the purpose of overcoming short term problem but also in expectation of rebuilding the asset for the future; at the end, the owners left the calf and return the cows. In a range of 1-2 years a person become fully recovered his herd. In addition, in Karrayu tradition there is a type of loaning animals "surplus" to subsistence requirements to family and friends to help them rebuild their herds and develop social relations as a form of social capital as hedge against drought and other risks which allows Karrayu families to maintain a functional balance between herd and family size.

Furthermore, in a Karrayu culture partiality was not known and every one's resources were considered one another's resources. Because of this extended and bonded traditional background Karrrayu households strongly believe one another and share their herds among different relatives to overcome the scarcity of pasture and water in certain locality and also to reduce over grazing, but consultation and agreement of household members are undertaken prior to make gifts, transfers, and loans of any type of livestock including small ruminants. However, the extent of social support is gradually declined due to the depletion of asset by recurrent drought and is resulted in increasing of destitute pastoralists. FGD participants reflected that in the past Karrayu supported one another, holding asset is only for the sake of social value and those who had no livestock were equally used without any partiality from their neighbours. But this situation is not expected today, almost all are equal, the numbers of destitute are increasing from time to time due to increase in the occurrence of severe drought. Through household survey, all respondents from both villages also confirmed that the extent of social support is low in the present day when compared with the past.

Natural Resources Management: Pastoralists employ a number of highly specialized risks spreading strategies to safeguard their herds in the face of unpredictable and some time extreme climatic events, disease outbreaks, and social unrest. These strategies are the rational use of the natural resource base on which the herds depend and also build strong social network (Hesse and MacGregore, 2006). Grazing management can contribute to biodiversity and promote biomass production. Dry land ecosystem health is better were mobile pastoralism continues to be practised effectively (Rodriguez, 2008).

Majority of the pastoralists opined that the dry lands belong to no one in particular, and that communal land means free-for all grazing where pastoralists try to outdo one another in terms of herd size to ensure that individual persons or groups benefit the most from this assumed 'open access' resource. Such open access is expected to eventually lead to exhausted and degraded pasture (Tragedy of the commons' thinking) (Behnke, 1994), but dry lands under communal land tenure are not 'open access'. They are divided up between groups, and rights to the use of these areas are defined and redefined through negotiations, communications and dialogue. Strict rules are put in place to maintain these rights (Behnke

1994; Little, 2001). In this way, pastoralists ensure that pastures can sustain them and allowed them to replenish. Traditionally, Karrayu households manage their pasture lands through different techniques. For example, mobility, identifying dry and wet season grazing location, burned the rangelands to facilitate the regeneration of grasses at the onset of rain fall. Karrayu households also burned the rangelands for controlling the effects of pests such as ticks and for facilitating balanced germination, regeneration and growth of grasses, bushes, shrubs, trees and herbaceous pasture in the rangeland ecosystem. And also each Karrayu clans have their own rangelands in which the right to use the pasture was restricted (only the clan members have free right to access to the pasture) to reduce the pressure on rangelands. However, during uncertainties through negotiation they could allow other clan members for a defined time period. Mobility directly benefits rangeland management in a number of ways. It removes dead biomass and paves the way for fresh grass to sprout at the onset of the rains, prevents the liter plant (risk of colonization by unpalatable tree), disperses plant seeds, facilitates the germination of certain herd species that require physical dispersal, break-up hard soil crusts (facilitates infiltration and seed burial). According to the Woreda Rangeland expert, Karrayu have undertaking natural resource management activities such as terracing, resting of the rangelands, afforestation, reseeding of grasses, water harvesting as response mechanisms to mitigate the effects of drought, while 60% of the households say that they were undertaking reseeding of grasses, afforestation and terracing on their private closure areas, and 51% undertaking cut and carry system of grasses and agro-forestry practices, and 67% of households were undertaking water harvesting, management of water points and controlled grazing systems on their farmlands, private closure area and communal grazing lands and water points. In general, when we compare the present and past natural resource management practice of the households, more households are undertaking natural resource management practice in the present day than in the past as a response to minimize adverse effects of climate change. Management of water points and controlled grazing system are undertaken more by pure pastoralist households (Yaya Village). Cut and carry system of grasses, agro forestry practice, afforestation and reseeding of grasses are undertaken more by DRV households than YYV households. It is found that rangeland burning is not practised at all by both villages. The shortage of grasses by recurrent drought and degradation of the land deter the households from undertaking the rangeland burning as a means of conserving a meager available shrub, bushes, grasses and herbaceous pasture. According to the Woreda Pastoral Development Office (2001) Annual Report, more than 500,000 different types of forest seedling was planted by the pastoral community on their farmland, communal grazing land and on the private closure areas.

Reduction of Consumption and use of Wild foods: Reduction of consumption and changing of composition of diet is also undertaken by Karrayu pastoralists as a last resort or response to drought. According to Coppock (1994) during the drought pastoralists take more cereals than milk and reduce their food intake. FGD participants revealed that in the past an extent of reducing consumption as a response to conventional drought was low but in the present day consumption is reduced even during the normal period to only

one time per day. The effects of drought are multidimensional in the study area. It also eradicates many bush products that pastoralists used in the past during critical time such as grasses, berries and roots. They also explained that drought eradicates wild plants that are used by human and livestock during drought - this also highly reduced food intake rate of pastoral households during drought. According to informants, in drought period not only quantity of food is decreased but also the quality is dropped due to lack of milk, especially, for children and elders; its related health effect is dangerous. 63% of the respondents confirmed that there was no meal reduction as a response mechanism to conventional drought, but 85% of the households confirmed their extent of meal reduction as a modified response mechanism to recent severe drought.

Non Pastoral Activity Responses: More pastoralists are desperately looking for additional sources of income including non pastoral subsidiary activities which generate additional revenue during normal years and spread risks at times of insecurity. Such activities range from opportunistic farming, casual labour in urban areas, and commercial farms to selling of charcoal, firewood and wild fruits collection (Aklilu and Alebachew, 2009). Prior to the 1980s severe drought, extent of responses to non pastoral activity was almost nil by the Karayu households and they were devoted extremely on the pastoral activities. Livestocks and livestock products were sufficient for household consumption requirements, but due to loss of livestock by drought, pastoralists in the study areas have engaged in agriculture, collection and selling of fuel wood and charcoal, casual labour and trading as response mechanisms to drought (Abera, 2010).

Crop cultivation: With change in the climate condition and uncertainties surrounding livestock production more pastoralists are shifting towards agro-pastoralist. As a response to drought events and food insecurity, Karrayu engaged in crop cultivation. Cultivation was considered as an activity of distressed, poor pastoralists when they have been ejected from pastoral systems, they engaged in farming because of livestock loss to drought or disease. Informants indicate that Karrayu have started rain fed agriculture during the Derg regime after the 1977 severe drought, but the extent and coverage is increased after 2002 as a modified responses to drought that is aggravated due to climate change. Out of 134 targeted sample households 109 of them have started (engaged in) agriculture as a response to drought. It was found that the objective of crop production is varying across wealth group. Informants indicate that the wealthy appeared to cultivate for avoiding of livestock liquidation to purchase grain, where as the poor cultivated to deal with food security. The land cultivated and the rate at which it expands may not pose serious problems to Karrayu pastoralism in comparison to the quality of land it encroaches. According to OPADC (2008), from the total area of the Woreda (133,963.6 hectares) the total cultivated area in 2008/2009 under rain fed agriculture was 2021 hectares and under irrigation agriculture was 202.25 hectares which is less than 2% of the total area of the Woreda, but after the completion of the Fantale large scale irrigation project, the area cultivated through irrigation may rise up to 18,000 hectares. Although it is on a progress the construction of the irrigation canal was not installed up to the villages on which this study was undertaken for the time

being. Karrayu pastoralists' eagerly waiting the completion of irrigation canal and expecting, as it will resolve their current food security problem through undertaking both crop and forage production. It was identified that in the last season 45 %, 52 % and 5 % of households from YYV cultivated 0.5, 0.6-1, 1.1-2 hectares of maize, respectively, under rain fed agriculture where as 20%, 54% and 26% of households from DRV cultivated 0.5, 0.6-1, 1.1-2 hectares of maize under rain fed agriculture. Regarding the yield 40%, 56% and 4% of the YYV households produced <3, 4-6 and 7-9 quintal, respectively. And 36%, 55% and 9% of households from DRV produced <3, 4-8, and 9-12 quintal, respectively, in the last season. Average farm size holding and engagement in agriculture is high in the agro-pastoral village than pure pastoral village. Experts of Woreda crop production explained that in both villages cultivation of other crop type was not practised due to the soil type and duration of the rainfall in the area. In addition, pastoralists claimed that full sedentary agriculture is difficulty in the area. For example, on a certain plot of land, crop is not growing for more than a season without resting due to salt deposition. This indicates that crop farming is not the sole solution as a response to drought. Instead it is an opportunity and help pastoral households as a means of supplementation to pastoral activity income.

However, respondents claimed that since 2006 there was no harvest from rain fed agriculture because of late initiation, and early cessation of rainfall, lack of soil fertility, pest outbreak and effects of salt deposition. For example Ganna crop was completely devastated in 2008 by the army worm, ball worm, cutworm and stock borer breakout that were caused by variation in daily temperature and by the late initiation and the early cessation of Ganna rainfall. Even though the irrigation is an opportunity for the Karrayu households in production of supplementary feed for the livestock and crop, it is too difficult to entirely depend on it because of the soil characteristics of the area (deposition of salt in arid and semi-arid lands stunting plant growth on the second season of production) and climatic condition of the area. 78% of the households confirmed that they did not use agriculture as a usual response to drought in the past and 22% of them responded that their extent towards agriculture as a response mechanism to drought was low in the past, but 63% of the households responded that their extent towards agriculture as a newly developed response mechanism to drought is becoming high.

Collection and selling of fuelwood and charcoal: The disposal of livelihood assets due to drought and related shocks forced pastoral households to collection and selling of fuelwood and charcoal. Both key informant interview and focus group discussion participants revealed that Karrayu were proud for the nature; nobody was cutting tree from the base (it is prohibited by the Gada system), but depletion of asset by recurrent and prolonged drought (climate change) and lack of alternative livelihood option has led Karrayu pastoralists' to destruction of meager indigenous trees, collection and selling of fuelwood and charcoal. They explained their fear that an extent of households towards this activity is high. The deforestation for this purpose may lead to severe degradation of natural resources. The respondents confirmed that in the past none of them had participated in selling of fuelwood and charcoal, but in the present day 57%, 19%, 7% and 17% of respondents

from YYV confirmed that as their extent of selling of fuel wood and charcoal as a modified responses (forced response to drought) to drought is no, low, medium and high, respectively. An average of 25% of the respondents from DRV confirmed that their extent of selling of fuelwood and charcoal high. An extent of selling of charcoal and fuel wood is high in DRV than YYV. This indicates the increasing in severity of drought. According to informants from Woreda Finance and Economic Development Office, all wealthy groups of the Woreda are involved in making of charcoal and collection of fuelwood for sale. Especially, female headed households are entirely depending on this activity for their daily income due to disposal of asset by drought and lack of other alternative income for exchange of cereals.

Casual Labour: Traditionally, Karrayu gave priority, emphasis and proud to their pastoral activities, manage their livestock and when uncertainties happen to any of their members Karrayu help one another, but at present, drought has reduced herd size, deteriorated social support; made all equal and led households to destitute and forced them to engage in casual labour. According to informants, slashing of the railway side, temporary daily labour in sugar cane plantation, compilation and loading of sands were among labour activities that were undertaken as means of income generation by Karayu pastoralists due to loss of livestock and lack of other alternative viable livelihood options. Every respondent confirms that none of them used casual labour as response to a conventional drought in the past, but now 27% of the respondents from YYV confirmed that their extent towards casual labour is high in the present day. And 40% of the respondents from DRV confirmed that their extent towards casual labour is high due to the complete disposal of livelihood assets (livestocks). Comparatively, an extent towards casual labour is high in agro-pastoral village than pastoral village.

Trading: As Sandford and Habtu (2000) argued, pastoralists in Ethiopia in general have low level of earning income from non pastoral activities like petty trading. Similarly, Karrayyu give less attention to non pastoral activities and their participation in trading is also low. According to the FGD participants, until today no Karrayyu has had any small, medium and big business centre from the Woreda town in Matahara. However, as a response to drought households have started petty business and livestock trading in the village (buying and retailing within the village or in the Woreda town) and women have started selling of butter and milk when available to purchase household utensils. 65% of the households from DRV and 43% from YYV confirmed that their extents towards trading are high. However, they did not have interest towards trading in the past.

Assets disposal: Livestock represented wealth and to a large extent considered as insurance of food security (livelihood) and description of social value among Karrayu pastoralists'. But nowadays due to increased climatic shocks (severe drought), some pastoralists reached the stage of destitution because of complete assets disposal (loss of livestock by drought). According to Little et al. (2008), loss of livestock (assets) below a certain threshold translates pastoralists into poverty in the absence of viable alternative livelihoods. According to the Woreda Food Security Office, 13% of the Woreda population is identified as destitute and treated through direct support of safety net programme due to complete loss of physical capital (livestock) by drought and related shocks. 17% of the households confirmed that they did not lost their asset because of drought, but now they have completely

loss their entire asset and become destitute through undertaking responses to drought.

Table 3: A simple model of an extent of households' response mechanisms to drought in Yaya and Dire Redie villages of Fentale Pastoral woreda in the past and in present day.

Stage of responses	Type of livelihood	Type of household activities (modified household activities)	Before 10 years an extent responses to drought	Now-an extent modified responses to drought
1	Pastoral activity	Mobility	Medium	High
		Herd diversification	Low	High
		responses selling of large stocks and livestock products	No	Medium
		Herd splitting	High	Low
		Selling of small stocks	Medium	High
		Assistance from the relatives and communities(Social supports)	High	Low
		Collection of wild foods and meal reduction	Low	High
2	Non pastoral activities	Agriculture	Low	High
		Collection and selling of fuel wood and charcoal	No	High
		Petty trade	No	High
3	Asset disposal	Loss of asset (selling of whole livestock and household tools)	No	medium
4	Destitution	Casual labour, migration and employment on non secured activities and lack of moral	No	High

Source: Extracted and summarized from household survey responses, key informant interview and FGD Participants (Abera, 2010)

As it can be seen on table 3, almost all wealth groups of the Karayu pastoralists' households have been undertaking both pastoral and non pastoral activities in a varied extent as a response mechanisms to drought. The responses of the households' are categorized at different stages and individual households have engaged in different types of activities. Individual households of the study areas are found at different stages of responses. Very few old pastoralists have limited themselves to the first stage and modifying their extent of response mechanisms through undertaking pastoral activities such as increasing an extent of mobility, increasing an extent of herd diversification, etc. But majority of the pastoralists have engaged simultaneously in the pastoral and non pastoral activities as a means of response mechanisms to drought risk reduction. The third stage of response is asset disposal. The pastoralists who reach this stage are those who lost their livestock by both drought and selling for exchange of grains and/or those who could not respond to drought due to the fact that their livestock holding is below threshold level. And those who disposed their asset and could not get other productive livelihood option, is now employed in non secure activities and some are lose moral and out of any dimension of pastoral activities and addicted to chewing khat. Extents of responses of households to a set of pastoral and non pastoral activities are varied. For example, an extent of mobility and herd diversification is higher in the present day than in the past. Herd splitting and social support was high,but now they are low. An extent of households towards agriculture, collection and selling of fuel wood and trade is high in the present day than the past.

Household Annual Income: Table 4 shows the household average annual income and

its respective sources. It is found that more than 65 % (10,000 birr) of the average annual income of the households of both villages were generated from the pastoral activities through the sale of livestock and livestock products. This indicate that livelihood of the study area is highly dependent on the pastoral activities. The share of non pastoral activities income to households of both village annual incomes were large which was 34.6% (5924.2091birr) and is modified and developed as a response mechanism against severe drought that is aggravated by climate change.

Table 4: Household annual income

	Yaya	Dire Redie	Total
Average pastoral activity income	5854	4146.0	10,000.0
Average non-Pastoral activity income	2226.9091	3697.3	5924. 2091
Average income from Food aid	548.4783	657.2	1205.6
Total income (average)	8414.3478	8485.3	17,129.7

Source: Household survey, 2010

CONCLUSION AND RECOMMENDATIONS

Though the Fentale pastoral Woreda households have been undertaking a set of responses to mitigate their livelihood sources from the adverse effects of severe and recurrent drought, extent of household responses are poorly understood. Responses of the households' are categorized at four different stages of livelihood activities and individual households are occupied in different stages of the responses such as pastoral activities, non pastoral activities, and asset disposal and destitution stages. In general, in the present day, an extent of responses towards mobility and herd diversification is higher by households. In addition, households have started to partly practice crop cultivation. Other non-pastoral activities such as agriculture, daily labour, petty trade, fuel wood collection and charcoal selling contributed to about 35% of the total households' income in the study area. The recurrence of severe drought is a cause of human suffering and a major blockage to pastoral and agro pastoral systems in Fentale pastoral woreda. Hence, identifying more viable and productive pastoral and non pastoral activities that are well suited to the agro-ecological condition of the area is the decisive factors to reduce vulnerability of the households to the increasing rate of recurrent drought. Mobility and herd diversifications are among the pastoral activities that require due attention to minimize adverse effects of drought on pastoral households. In addition, perseverance have to be made to make use of unexplored local wealth potentials of non pastoral activities such as agriculture (irrigation and rain fed agriculture) trade, micro enterprise, tourism as a development strategies in responses that are undertaken to drought. In this case, identification and characterization of the distribution and composition of the livestock resources among the wealth group is mandatory to design appropriate and plausible intervention that is based on the household wealth characteristics. Traditional rangeland management and drought risk spreading strategies should strengthened, and go along with scientific rangeland and the drought cycle management. It is best to think about increasing the level of community participation in relation to each of the main components of drought management. Identification of the potential and degraded rangelands, species composition, productivity status and type of management intervention to be embarked on

is advisable. Since the indigenous pasture on the rangelands is the primary feed source for livestocks of the pastoralists, attention is needed for its improvement by applying rehabilitation intervention. Dry season reserve areas should be better protected. Unwanted plant species should be better controlled and the management and utilization of the feed source should be improved. Furthermore, natural and social science research institution should give due attention and priority to find drought tolerant and drought escaping forage, livestock and crop variety to strengthen pastoralists' adaptation to recent severe drought that is aggravated by climate change. Continuum of emergency intervention and livelihood development is required from pastoralists and external agencies instead of only focusing on life saving at the onset of drought; to improve the resilient of pastoralists in sustainable basis. In general, it is better to promote holistic development approach that comprises both pastoral, non pastoral activities and improvement of social and economic infrastructure to undertake sustainable responses to drought instead of only giving blue print development approach (sedentary agriculture) as a final option to mitigate the adverse effects of drought.

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