Effects of Drought on Pastoral Household in Fentale Woreda of Oromia Regional State, Ethiopia

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ABSTRACT

This study adopted the survey research design to investigate the effect of drought on Pastoral household in Fentale Woreda of Oromia Regional State, Ethiopia. The aim was to give information about drought pattern in the study area, create an understanding of the menace as well as identify appropriate and relevant local level response mechanisms. A household survey was conducted with 134 households and this was complemented by interviews with informants. Meteorological data were also used to map out the time line of drought events in the area. It was observed that severe and recurrent drought of the present time has brought about declining range land resources, poor productivity and declining survival of livestocks. The results indicate that the frequency of drought has been on the increase from year to year. Increased severity of drought has caused huge moisture deficit and has posed multi-dimensional adverse effects on households' livelihood sources. However, households have developed various strategies to deal with the challenges of severe droughts through pastoral and non pastoral activities.

Keywords: *Climate change, Drought cycle, Agro-pastoral, Household responses, Fentale Woreda*

INTRODUCTION

Pastoralism is a rational, adaptable, tried and tested production system uniquely suited to the dry lands. It occupies a quarter of the world area which is predominantly arid and semiarid. This concept 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 livlihood from keeping domestic livestocks (Anderson and Mowjee, 2008). According to Jahnke (1982), pastoral and agro-pastoral population are about 12 - 15% in Ethiopia. Pastoralists in this region keep a significant part of the livestock wealth (Abere, 2010). For example, in Ethiopia 30%-40% of the country's livestock is found in this area (Abdel, Ahmed, Mustafa and Diress, 2002). However, pastoralism is practised under marginal circumstances and high production risk because of different natural and man made factors. Crisis linked to famine and droughts have been traced back as far as 250 BC (Patrick, Joachin and Yishac, 1992). Drought, which occurred in the 9th and 12th centuries resulted in the death of many cattle (Melakou, 2000). After that, many droughts associated with severe famine emerged between the 16th and 18th centuries (1520, 1540, 1559, 1635, 1668

1707, 1752, and 1772). At least, a total of 35 periods of food shortage with high human and livestock transience have been recorded (Gufa, 1998). The 1888-1892 famine was unprecedented in the mass destruction it caused. For example, drought and heavy infestation of pests (army warm, caterpillars, etc) created horror among the population, destroying about 90% of the entire cattle and $^{1}/_{3}$ of the whole population. After this gruesome disaster, many droughts of various magnitudes have occurred, especially in pastoral areas. The worst ones, since that of 1888-92, were those of 1973/74, 1984/85 and 1995-97 (Aklilu and Alebachew, 2009; Gufa, 1998). 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 previous effects (Aklilu and Alebachew, 2009). This has resulted in economic, environmental, social and cultural losses in the pastoral areas of East Africa (Bayer and Waters-Bayers, 1991). These events have been concentrated partly in the crescent of low lying pastoral and agro-pastoral areas of the country (Gufa, 1998).

At present, adverse effects of drought is more aggravated due to lack of the contextual understanding and information about the patterns of drought and lack of well identified, appropriate and relevant local level response mechanisms. Furthermore, no research is done on the effects of drought on the households for pastoral areas of Ethiopia including Fentale Woreda pastoralists. Though the country has been repeatedly hit by severe droughts, yet the extent of effects on households and local level responses are poorly understood. Hence, the objective of this research is to investigate the effects of drought on the pastoral households of Fentale Woreda of Oromia Region in Ethiopia.

DROUGHT IN FENTALE WOREDA OF OROMIA REGIONAL STATE, ETHIOPIA

Drought can be said to occur when rain falls below half the long-term average or when rainfall in two or more successive years falls 75% below average (Pratt, Le Gall and Haan, 1997). In the past, pastoral areas of Ethiopia have experienced severe drought once every 4 to five years. However, the drought cycle has changed in the recent time and become more frequent, 2-3 years, giving no time to recover from the effects (Aklilliu and Alebachew, 2009; Coppock, 1994; Anderson and Mowjee, 2008). Every year, at least some parts of Oromia, Afar, Somali and SNNP arid and semi arid areas have experienced a rainfall deficit in the recent time (FAO, 2008). Drought cycle is shortened and length of drought month in a given year is in an increasing trend from time to time and in some years no rain is sag for successive ten months in the Fentale Woreda. For example, according to the UNDP field report (2002), Fentale district did not receive rain for succesive10 months.

PARTICIPANTS AND PROCEDURE

The design of this study is survey. Purposive sampling technique was used to select all the research subjects. Due to the repeatedly exposure of the Woreda to the risk of drought, Oromia region was taken as a case in point.. Out of 20 Kebeles, the most two representative Kebeles such as Dhega Hedu and Gelecha were purposively selected by the researchers 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 (HHs). 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 Baso, Dullacha and Ittu and 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 (HHs).

The total number of the HHs residing in the village is estimated at 120. Similarly, HHs in the village are the members of the interconnected clanship family of Baso, Dullecha and Ittu. 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 systematic selected households in both villages. The information presented are data drawn from 134 HHs, with 88 purposely selected from YYV and 46 HHs purposely selected from DRV. Out of the total respondents 29% (13% from YYV and 14.9% from DRV) were female. Households were interviewed with a base line survey in March and data were complemented and triangulated with other qualitative data. In addition, meteorological data from long period recording stations was used to analyze the patterns of drought and this was complemented by interviews and discussions carried out with informants to map out the timeline of drought events in the area.

RESULTS AND DISCUSSION

Table 1 reveals that the cycle of drought in both DRV and YY villages in the present day is becoming shorter than the past. Also, the length of drought months in a given year in these villages is longer in the present day than the past. This is as the house holds (HHs) in both villages almost equally suffered the same frequency of drought occurrence and length of drought months in a year. In both villages, drought cycle is long in the past and short in the present day; and the length of drought months in a given year is short in the past and long in the present day.

Severity of Drought in the Study Area: Magnitude of Hotness and Wind Speed: In the present day, in the dry land areas people describe living through long periods of heat and burning sun, dry weather which is raining steadily, punctuated, by down pours that accompanied very strong winds, thunder, lightening, and destructive hailstorms (Anderson and Mowjee, 2008). In the present day, Fentale Woreda is characterized by severe drought in which the hotness of the sun is extremely scorching; and human and livestock could not withstand the hotness of the sun scorch and its related adverse effects. Informants explained that the sun is too scorching and both people and livestock could not tolerate the severity of present day drought and its related adverse effects. They said that here before Karrayu

pastoralists' promised in some extent, goats and camels in their capacity to escape and tolerate the recent severe drought but in the present day camels and goats could not tolerate and escape due to the highly increased severity of drought and the length of drought month extremely prolonged. They further explained that when the severity of drought is prolonged, the hotness of the sun and the lack of normal cold water for a long period of time is heavily affecting the head of the goats (lack of ability to keep balance) and resulted in folly and immediate death of the goats (locally they called *jinni*). They said also, the severity of drought caused unknown disease of camel which resulted its death.

In addition, informants confirmed that the speed of the wind in the present day is highly increased. It flows over long distances, carries much amount of dust and other particles, continuously booming the dust above the ground; both people and livestock could not withstand it. Through household survey (Table 2), 94 % of the respondents from YY and 92 % of respondents from DRV confirmed that as the severity of drought is high in their villages in the present day than the past. Regarding the speed of the wind 92% of the respondents from YYV and 88% from DRV confirmed that the wind speed in their villages is high in the present day than the past. This indicates as the local climate is distorted from its past normal situation and caused deterioration on the local livelihood sources. As the temperatures of the area are in an increasing trend from time to time, Aklilu and Alebachew (2009) opine that small increases in temperature can result in measurable impacts on the health of human beings and livestock as well as the availability of water, food, and feed resources. So, one can easily judge the impact of increase in temperature on the livelihood as well as on the health of human beings of the study area.

Increase in temperature resulted in loss of meager moisture obtained through scarce rainfall by evaporation and causes scarcity of water required for the production and normal growth of plants, livestock and human beings. However, the average annual rainfall of the area, in the present day is only 451.3mm. Hence, there is a moisture deficit of 2108.7mm in the area. This indicates a huge gap between the annual amount of precipitation received through rainfall and the amount lost through evaporation. With no doubt, this has posed serious adverse impacts on the pastoralists' livelihood base such as pasture, water and livestock and on the responses that are undertaken by pastoralists of the study area to drought.

Rainfall Characteristics of the Study Area: Informants explained that in 2002, 2006 and 2008 the Woreda did not receive rain for more than 10 subsequent months. They said that even though drought is normal life style that the Kararyu pastoralists' have had tailored to, in the past there was rain and it was plunge in regular pattern in Ganna (long rain season), Furmata (short rainy season) and Arfasa (medium rainy season) season. They said that frequency of severe drought was long (4-6 years) and length of drought month was short in the past, especially, pre - 2002. They said that there was severe drought during the Haile Selassi I regime in 1994, 1953, 1958, 1964, 1969, 1974, and during the Derg regime in 1979 and 1983-85, and in the EPRDF in1994/95.

According to Akililu and Alebachew (2009), the average annual rainfall in the past four or five decades showed a declining trend in the moisture stressed areas of the southern low lands of the country. High rainfall within a short day and intense down pours caused

that water runs off in floods (Anderson and Mowjee, 2008). The dry area is also characterized by substantial and unpredictable differences in total rainfall between years, within the year and even between areas in one year. The climate of the study area is characterized by scarce absolute rainfall which falls unreliably and within short rainy seasons, and which is often of limited availability for human and livestock use which means low, unpredictable, scattered, variable and erratic.

Informants confirmed that in the present day, intensity of rainfall is increasing and in contrast to this length of rainy month is decreasing and even in some years drought is becoming extended for more than 10 months. Informants have also compared the present day length of the rainy season with the past; they said that in the past Karrayu had rain in *Gannaa*, *Furmata* and *Arfasa* seasons that were sufficient for germination, growth and regeneration of grasses and browse at each of the subsequent seasons. They also explained about the past pattern of Karrayu settlements. In the past, Karrayu had 3 types of settlements that were set apart in spatial and temporal basis in which the availability of rainfall, water and fodder; the suitability of the area for human and livestock health were the main criteria and driving force for the movement of Karrayu pastoralists between these settlements within the Karrayu boundary; but all these are not functional today due to the lack of rains.

In the present day, drought uniformly hit all the settlements simultaneously without any spatial variation unlike in the past and posed adverse effects on the household livelihood sources. The name of the settlement was derived from the respective rainfall seasons in the areas which were called Ona Gannaa, Ona Birra and Ona Arfasa. As it can be seen on Table 3, 70% of DRV and 83 % of YYVs HHs responded that an intensity of rainfall in the present day is high when compared with the pre - 2002. And 96% of HHs from YYV and 85% of HHs from DRVs confirmed that in the present day length of rainy month is shorten than in the past. Several studies by different scholars (Aklilu and Alebachew, 2009; Mortimore and Davies, 2008; Kirkbride and Grahn, 2008;Anderson and Mowjee, 2008; Jennings, 2007) also state the occurring of successive poor rains, increases in drought related shocks and less predictable and more intense rainfall events over the medium term on the East and North of Africa. This phenomenon is the reality that is seriously challenging Fentale pastoralists in the present day through its adverse effects on the livelihood source; prolonged drought resulting in scarcity of pasture and water and increased intensity of rainfall within a short time caused soil erosion and degradation of rangelands in the study area.

Effects of Droughts on Livelihoods of Fantale Pastoralists and Availability of Pasture: Since much of the pastoral household's consumption requirement is derived from livestock or exchange with livestock products, loss of livestock by the drought is a serious risk for the livelihoods and socio-cultural fabrics of the pastoral households (Aklilu and Alebachew, 2009). Livestock reproduction rate, production and productivity is becoming less and less as the study area is experiencing more extreme events which are becoming more and more intense, notably drought. Household herd size has extremely decline from time to time because of the related effect of the drought such as lack of pasture and water, emaciated body condition, susceptiblility to disease, death, low

production, productivity and reproduction rate, and reduced pastoralists' terms of trade. In addition, increased severity and frequency of drought has affected pasture seed bank, reduced germination, growth, sprouting and regeneration capacity of nutritious grasses, bushes and herbaceous pasture in an alarming rate. The relatively slow natural rate of livestock reproduction due to drought and disease also created suitable environment for the colonization of rangelands by unpalatable tree species. According to FAO (2008), in recent years the ASALs of Ethiopia have experienced severe and frequent livestock feed crisis of unprecedented proportion. Informants said that in the past, God provides rain and in turn rains provided pasture for livestock. As it is known, livestock is Karrayus' livelihood base. Karrayu households get their entire basic daily consumption from livestock. Rain (water), pasture, livestock and Karayus' HH life is interconnected; there is no meaning out of this connection but in the present day, drought disconnects this relationship.

The severity of drought has posed serious pasture and water scarcity. They have said that, in the past, when a day or two showers of rainfall dropped, immediately grasses were germinating, sprouting and growing as well as other palatable trees were regenerating within a few days. But in the present day, even if rain falls, it takes a long time before the germination and growth of grass species and regeneration of palatable browse. This indicates that increase in frequency and severity of the drought has declined and exhausted germination, growing and sprouting capacity of grasses and also the regeneration ability of browse. In addition to this, late onset and early cessation of rainfall at the critical stage of grass growing period decreased the reproduction process and seed formation of the pasture and affected germination and availability of grasses. Cumulative occurrences of this process and events for the successive season have resulted in the depletion of grasses biodiversity from rangelands.

In the past, post drought recovery of pasture was in a short period of time, but now recovery of pasture is prolonged. Furthermore, in the present day, before pasture is recovered from the previous hit, other wave of drought occurs - this situation has gradually resulted in extinction of pasture from the rangelands. Informants also said that in the past there were a number of grass varieties that were germinating by few showers of rainfall and used by livestock. Also, there were a number of tree species that regenerated and gave edible fruit for human and livestock, but at present, all these are completely destroyed from the rangelands due to the drought that is aggravated by climate change. Participants explained their fear that the recent severe drought do not only cause the present day scarcity of pasture but it also put under question the sustainability of pasture for future uses.

Effects of Droughts on Availability of Water and Herd Size: Water is the most fundamental physical capital that has shaped pastoral society (Helland, 1997; Cossins and Upton, 1987). In Woreda, rainfall is inadequate and erratic in terms of amount, duration and distribution to meet the physiological requirements of both plants and livestock. This phenomenon is also further aggravated by high temperature, strong and dry winds leading to high evapo-transpiration which in turn resulted in the scarcity of water. Except during the rainy seasons, water is a critical problem during the dry periods for households due to

the encroachment of the route to Permanent River by commercial farms and conservation parks. Hence, major water sources for human and livestock in the study area are shallow wells, boreholes, cisterns and ponds for their water requirements which are highly susceptible to drought, even during the normal drought, these water points are completely dried. The scarcity of water is also aggravated by increasing in severity of drought from time to time. Households (HHs) are highly challenged by poor availability and accessibility of water points for human and livestock. 60% of HHs from both villages confirmed that the availability of water from boreholes, cisterns and wells were moderate in the past. 71% of YYV and 67% of HHs from DRVs confirmed that the scarcity of water in their villages in the present day is high. Households have trekked with their livestock to distant places such as Sheshamne, Modjo, Adama and Boset during drought which is more than 3-5 days during normal and severe drought period. All of the respondents from YYV and DRVs confirmed that they were travelling more than 14km a day for delivering of water for human consumption, small ruminants and weak livestocks, respectively.

An assessment of livestock dynamics of pastoral households of southern lowlands have shown a declining trend or downward spiral and erosion of livestock asset (Solomon, 1999; Aklilu and Alebachew, 2009). Similarly, the livestock population of the study area declines from time to time due to drought. Especially, a number of cattle is decreasing in an alarming rate due to lack of intrinsic capacity to escape and endure severe drought. When compared with the last 20 years, current HHs' livestock holding have declined mainly due to increase severity and frequency of recent drought that is aggravated by the climate change and declined in rangeland resources. Informants confirmed that in the past, severity of drought was low and moderate and it did not result in total livestock loss, but 2002 drought and subsequent ones caused loss of total livestock and it reduced drastically household herd size.

In addition, in the present day, drought does not only cause death of livestock but also declined reproduction of livestock and prolonged recovery period from loss of livestock due to previous drought. To explain the severity of climate change on the Woreda people, the Karrayu informants said that when God was good, Karrayus' cows gave calves in an interval of one and a half years and heifers started provision of calves in 3 years but now heifers could not give calves even in four or five years and cows could not give calves in an interval of 3 years. Furthermore, during the drought period Karrayu pastoralists deliberately killed immature calves to increase the chances of perpetuating and surviving of the reproductive cows from death due to lack of pasture and water. According to the UNDP field report (2002), Karrayu pastoralists' had lost 45 % of their livestock due to 2002 severe drought. Table 4 shows livestock that were dead during the 2002 and 2008 drought from targeted HHs of the YY and DR villages. As it is seen on table 4, a total of 2,110 cattle, 1954 sheep, 1540 goats, and 330 camels died in 2001/2 and 2007/8 when severe drought targeted HHs. Each HH had lost a range of 2-30 cattle, 1-29 sheep, 0-27 goats, 0-7 camels during 2001/2 and 2007/8 drought. Average death of cattle was high on HHs' of DRV than YY village. This was due to the fact that YYV is more mobile and can escape adverse effects of drought than DRV HHs. Average death of goat and camel respectively

were higher in YYV than DRV. This was due to adverse effects of an unknown camel disease and madness of goats that was aggravated by drought and has resulted in deaths of camels and goats which is more in YY village. Average death of sheep was however low in DRv than YYV HHs.

As it is seen from Figure 1, average livestock size of HHs of DRV has declined from 34.5 cattle, 34.2 sheep, 27.6 goats and 9.1 camel to 9.8 cattle, 9.8 sheep, 11.4 goats and 4.4 camels. And average HH livestock size of YYV has declined from 39.3 cattle, 45.1 sheep, 47.2 goats, and 21.6 camels to 7.7 cattle, 10.3 sheep, 16.3 goats and 6.3 camels. In the last two decades, droughts reduced more than 75% of HHs' herd size. The decline in size of cattle was low in DRV compared to the YYV HHs' due to the double sword effects of drought on YYV HHs. YYV HHs lost their livestock by drought and by selling for exchange with cereals. Since DRV HHs have supplemented their livelihoods from the opportunistic farming than YYV HHS, they were less affected by the double sword effect of droughts. Due to drought, in the present day, per capita livestock holding is below 6.5, and from this, the proportion of goat is more than 50%. This indicates that livestock holdings of the HHs have showed a declining trend when compared with the past 20 years. According to Scoons (1995) to be able to continue in pastoral mode of life, livestock per capita should be more or equal to 7. Data on table 5 represented by 97% of the respondents confirm that both in the past and in the present day, droughts are causing livestock death, reduce herd size and decline reproduction rate. However, 99% of the respondents confirmed that in the present day, severity of drought is higher than in the past.

Effects of Droughts on Livestock Production and Productivity: Extensive livestock rearing is the main livelihood bases for Karayyu HHs. This implies that production and productivity of livestock would have a significant effect on the livelihood of the HHs. Livestock are sources of food, income, prestige, and security in times of hardship. In the present day, HHs raised livestock for a mix of subsistence (particularly milk) and market needs (for example, selling livestock to purchase food and other basic necessities). Informants revealed that in the past, livestock production and productivity was higher than in the present. They said that God was good and pasture was available as a result, livestock productivity was high. In the past, Karayus' routine food was milk, milk products, blood and meat. An elder from Yaya village during the focus group discussion said that Karrayu has had no *suuqi* and Karrayus' *Suqi* is livestock.

Livestocks are sources of everything for Karrayu pastoralists. They drink milk instead of water, eat butter and milk as food. They have said that in the past, there was sufficient pasture (locally called *citaa*). Hence, livestock provides sufficient milk. Traditionally, the Karrayus produce and consume milk of cow, sheep, goats and camels. But now, livestock denied Karrayu HHs, especially during a dry period milk is not expected at all and HHs suffer how to make the livestock survive. Due to lack of pasture, the livestock body condition is emaciated, susceptible to disease, severity of hot weather and variation in daily temperatures have caused break out of external parasite (pest) and has resulted in declining of livestock physical condition. As a result, Karrayus' livestock have low demand for meat on the market.

In addition, they have said that in the past, livestock was recovered in a short period of time from effects of drought and provided milk, but in the present day recovering takes a long period of time due to increasing in frequency and severity of drought. As it is seen on table 6, all respondents confirmed that both in the past and in the present day, drought reduce quantity and quality of milk and meat from livestock, cause breakout of human and livestock disease and pest. However, 99% of the respondents from YY and 97% from DR villages confirmed that severity of drought on the production and productivity of livestock is higher in the present day than the past.

Figure 2 shows past and present day average milk per day per livestock. An average milk production of household of DR village per day per livestock has declined from 3.33 liter per cow, 1.27 liter per sheep, 1.53 liter per goat and 6.08 liter per camel per day, respectively to 1.36 liter per cow, 0.93 liter per sheep, 0.75 liter per goat and 2.62 liter per camel per day, respectively. An average milk production of YY village per livestock has declined from 4.22 liter per cow, 1.65 liter per sheep, 1.04 liter per goat, and 6.09 liter per camel per day, respectively to 1.28 liter per cow, 0.77 liter per sheep, 1.33 liter per goat and 2.59 liter per camel per day, respectively. There is a great difference in milk yield per day per all livestock category between the past and present day except milk from goats. In the last two decades, droughts decreased more than 50 % of HHs' milk production. This indicates that increase in frequency and severity of drought has posed a declining of milk per livestock per day in the present day.

Since cattle of the YYV HHs moved to distant places than the DRV HHs the chance of exhaustively using milk from cattle in the present day is very low. In addition, DRV HHs have minimized scarcity of pasture by crop residue than YYV HHs. Shortage in camel's milk is almost equal in both villages. This is due to unknown present day camel disease and increasing mobility of camels to distant places. In the present day, milk from goat is not showing variation when compared with the past. This is due to the fact that in the past, HHs had not exhaustively used milk from goat since milk from cattle was abundant. In addition, small stocks unlike large stocks such as camel cannot move to distant places during the drought, as s result, small stocks including goats are more accessible for consumption to majority of the household members in the present day, than the other livestocks moved to distant places. Hence, this does not indicate the increment in milk yield from goat in the present day, but it indicates the under utilization of milk from goats in the past day due to the availability of milk from cattle and camels.

Effects of Droughts on Pastoralists' Terms of Trade: Toulmin (1995) has presented a three stage model of the drought cycle which indicates stages of severity of drought within a given time frame. According to his model in stage I, failure of rains (drought) declined availability and quality of forage and resulted in death of large number of livestock with a moderate decrease of prices of livestock and increase in price of grain (a situation of price scissors effect occurs at this stage). In stage II, drought reaches its climax accompanied by continuous increase of livestock off-take either through death, sale or slaughter despite the relative improvement of rainfall and water. Grain price continues to escalate. In stage III, availability of rain fall improves pasture conditions, which means

pasture recovers from the effects of the previous drought and becomes ready to support more livestock and livestock prices started to rise.

According to the findings of this study, Toulmin's model is only functional when cycle of drought is long; and its practicability is completely under question, especially, in the present day, when drought cycle is shortened and do not allow recovery of pasture in a given time frame due to increasing severity and frequency of drought. In addition, the higher the frequency of drought years giving no time to recover from the previous hit, the lower the recovery from the effects of the drought. This is the reality that is observed in the present day in the study area. This also puts functionality of the model under question. As it is seen from this study, increase in frequency of drought and extent of the severity of drought on the Karrayu pastoralists' livelihood is greatly prolonged recovery time. Even in some cases, there is no recovery at all due to the occurrence of other wave of drought before recovering from the previous hit. Pastoralists' receive poor price during the drought, especially if the condition of the animal is poor due to weight loss and stress caused either by drought, a long trek over difficult terrain, or both (Scott-villiers, 2006).

Informants raised that both in the past and in the present, droughts have caused scarcity of pasture and have been resulting in declining of livestock body condition and this in turn has resulted in fall of livestock price and rise of grain price in the market. In the past, cycle of severe drought was long and households were easily recovered from the effects within a short period of time and terms of trade were improved as pastoralists started to get sufficient milk and other livestock products. However, in the present day, every year is drought, cycles of drought is too shortened and it does not give time to recover from the effects and caused continuous fall of livestock price and rise of grain price (negative terms of trade). They also confirmed that during drought, especially, during severe drought in fear of death of livestock, HHs are subjected to gather their livestock to the market but demand is very low due to declining livestock body condition.

In Ethiopia, the impacts of drought are increasing grain retail prices and sales of livestock. The ability to buy food or not depends on the amount of the livestock assets and their value in purchasing the food required to sustain the livelihood of the pastoralists. However, price of livestock during drought is so low that pastoralists can no longer buy goods to sustain themselves. Thus, combination of price and number of holdings of livestock provide the extent of pastoralists to purchase goods and services (Cuttler, 1985). Similarly, an elderly person from DRV said that price of livestock is decreasing but in contrast, price of grain is increasing, especially, during 2002 and subsequent droughts. This situation is seriously challenging HHs livelihoods. The household survey result on table 7 reveals that 90 % of HHs from YYV and 68 % from DRV confirmed that the severity of negative terms of trade is high in the present day than in the past. The severity is high both in the past and in the present day on YYV HHs than DRV due to double swords of drought effects which is more on the pastoralists than agro-pastoralists.

Table 1: The patterns of drought (%)

	Yaya		Dire Redie		Total	
Patterns of drought	**Before 10yrs**	**Now**	**Before 10yrs**	**Now**	**Before 10yrs**	**Now**
Length of cycle of drought year						

- Short		77		74	75.5		
-Medium				3	23	7	
26		5	24.5				
- Long		97		93		95	
Duration of drought month in a year							
-Short		70		83			76.5
-Medium		30	1	17	11	23.5	6
-Long		99			89		94

Source: *Household survey, 2010*

Table 2: The severity of drought or hotness of the sun and wind speed (%)

	Yaya		Dire Redie		Total	
	Before 10yrs	**Now**	**Before 10yrs**	**Now**	**Before 10yrs**	**Now**
Severity of drought or hotness of the sun						
- low	4		6		5	3
- moderate	96	6	94		8 95	7
- High		94			92	93
Magnitude of wind speed						
- low	84		76		80	
- moderate	16	8	24		12 20	10
- high		92			88	90

Source: Household survey, 2010

Table 3: Households' responses on the intensity and length of rainfall month in the study Area (%)

	Yaya		Dire Redie		Average	
	Past	**Present**	**Past**	**Present**	**Past**	**Present**
Intensity of rainfall						
- low	65		71		68	
- moderate	35	17	29	30	32	23.5
- high		83		70		76.5
Length of rainy month						
- short		98		94		96
- medium	70	2	65	6	67.5	4
- long	30		35		32.5	

Source: *Household Survey, 2010*

Table 4: Death of livestock by drought in Yaya and Dirre Redie village (2001/2 and 2007/8 drought)

Village		**NCD**	**NSD**	**NGD**	**NCID**	**Total**
Yaya	Sum	684	746	836	218	2484
	Mean	14.87	16.22	18.17	4.74	
	Std. Dev	11.295	14.12	16.909	5.972	
Dire Redei	Sum	1426	1208	704	112	3450
	Mean	16.2	13.73	8.19	1.27	
	Std. Dev	15.205	14.285	8.892	2.495	
Total	Sum	2110	1954	1540	330	5934
	Mean	15.75	14.58	11.67	2.46	
	Std. Dev	13.957	14.225	13.128	4.344	

Source: Household survey, 2010. NCD = No of Cattle; NSD = No of Sheep; NGD = No of goat; NClD = No of Camel

Table 5: Adverse effects of drought on the household herd size (HHs responses in %)

	Yaya		Dire Redie		Total	
Effects of drought	**Past**	**Present**	**Past**	**Present**	**Past**	**Present**
Increased livestock death?						
Reduced reproduction rate?						
Yes	95	99	99	95	97	97
No	5	1	1	5	3	1
Severity of the effects						
Low	3		10		6.5	
Moderate	77	1	73	15	75	8
High	20	99	17	85	18.5	92
Recovery period from the effects						
Short	4		7		5.5	
Medium	69	4	83	8	76	6
Long	27	83	10	83	18.5	83
No recovery at all		13		9		11

Source: Household survey, 2010

Table 6: Percentage of Severity and Effects of Drought on Livestock Production and Productivity

Adverse effects of drought	**Yaya**		**Dire Redie**		**Total**	
	Past	**Present**	**Past**	**Present**	**Past**	**Present**

Declined milk and other livestock products?						
Yes	100	100	100	100	100	100
No						
Severity of the effects						
Low						
Moderate	97	1	96	3	96.5	2
High	3	99	4	97	3.5	98
Recovery period from the effects						
Short	93		89		91	
Medium	7	3	11	7	9	
Long		87		83		85
No recovery at all		13		9		11

Source: *Household survey, 2010*

Table 7: Percentage of household responses on adverse effects of drought on pastoralists' Terms of Trade

Adverse effects of drought	**Yaya**		**Dire**	**Redie**	**Total**	
	Past	**Present**	**Past**	**Present**	**Past**	**Present**
Decline price of livestock?						
Rise grain price?						
Yes	97	99	96	99	96.5	99
No	3	1		4	1	3.5 1
Severity of effects						
Low	3		10		3.5	
Moderate	97	10	90		8	96.5
High		90		68		91
Recovery period						
Short	97		96		96.5	
Medium						
Long		91		91		91
No recovery at all		9		9		9

Source: *Survey, 2010*

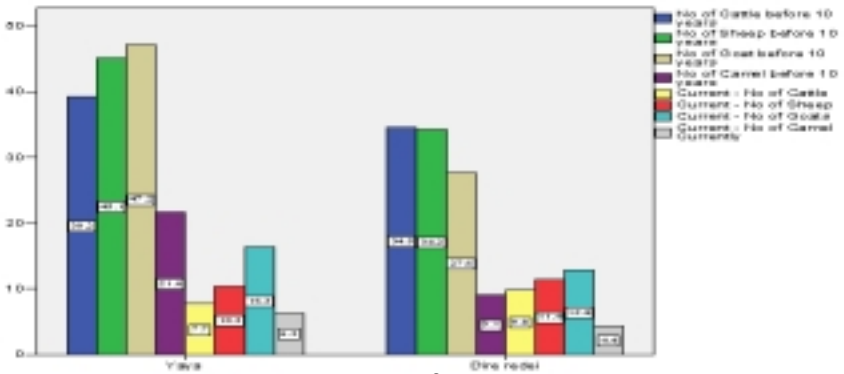
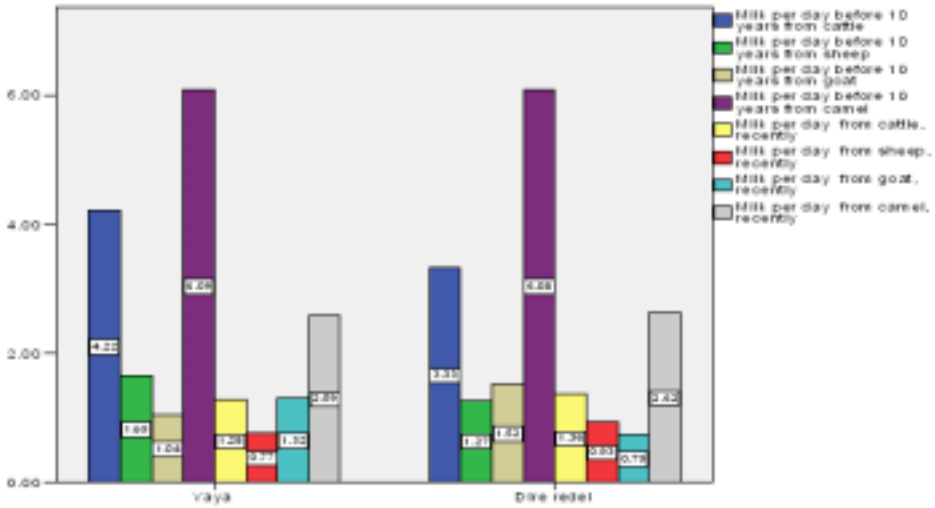


Figure 1: Past and present day herd size of YY and DR Villages HHs'

Source: *Household survey, 2010*

Figure 2: Past and present day amount of milk per livestock per day in YYand DR Villages



Source: *Household Survey, 2010*

CONCLUSION AND RECOMMENDATIONS

Findings indicated that Karrayu pastoral HHs have been victims of drought and related adverse effects. Especially, in the present day, drought cycle is shortened and the severity of drought on lives and livelihoods of pastoral HHs' is extremely increased bizarrely due to Global climate change. Hence, contextual understanding of the patterns of drought and identifying of various response mechanisms relevant in mitigating droughts, simultaneously working towards the betterment of pastoralists are the fundamental tasks that are required from concerned stakeholders to take into consideration. In veiw of this, the following are believed to be the decisive factors in spreading drought risks. Contextual understanding of the patterns of recent severe drought is the prerequisite task for any development intervention that is designed in promoting livelihoods of the area. Since monitoring of rainfall pattern is a useful indicator of early warning of drought, continuous forecasting and monitoring of climatic conditions are the prior issues that need attention through using both indigenous knowledge and scientific methods; and disseminating of timely information to reduce the adverse effects of drought on the households.

In this case, climate foresight must be integrated in planning for pastoralists' development as an early warning system and as a means of perceiving timely stress and to design early appropriate intervention. In line with this, better awareness of how to access and use climate projections is required at different levels of planning and implementation to mitigate the HHs livelihood from the adverse effects of the recent severe drought and to develop local level adaptation. 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 drought. Mobility and herd diversifications are among the pastoral activities that requires due attention to minimize adverse effects of drought on pastoral households. In addition, perseverance have to be

made to make use of unexploited local wealth potentials of non pastoral activities such as agriculture (irrigation and rain fed) trade, micro enterprise, tourism as development strategies in responses that are undertaken to drought. Furthermore, due attention and priority is required from natural and social science research institution to find drought tolerant and drought escaping forage, livestock and crop variety to strengthen pastoralists' adaptation to recent severe drought/climate change/. In general, it is better to promote holistic development approach that comprise both pastoral and non pastoral activities to undertake sustainable responses to drought instead of only giving blue print development approach (sedentary agriculture) (MOARD, 2008) as a final option to adverse effects of drought.

In the present day, the basic social and economic service provision and infrastructure development such as education, health, roads, market, water, credit services are poorly developed in the Dhega Hedu and Gelcha kebeles of the Fentale Woreda. Therefore, it is imperative to pay much attention on the expansion of basic social and economic infrastructure development and provision of service with the aim to connect marginalized pastoral households to the regional and national socio-economic development opportunities, to endorse pastoralists to take on appropriate response mechanisms to severe drought and to build pastoralists asset base that constitute natural, physical, financial, human and social capital.

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