IMPACT OF CLIMATE VARIABILITY AND CHANGE ON THE LIVELIHOOD OF THE BARBAIG PASTORAL COMMUNITY IN HANANG DISTRICT, TANZANIA

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Abstract

Climate variability and change has resulted to several impacts on the globe, in this regard, this paper seek to address the impact of climate variability and change on the livelihood of the Barbaig Pastoral community and identify strategies they use to adopt and cope with change effects. The study was conducted in selected villages of Hanang district. A sample size of 110 respondents was subjected to structured and semi-structured interviews. In addition, field observation, focus group discussion and documentary review were used to collect the required data.

Results indicated that, drought being among the major impact resulted from climate variability and change has significantly led to the food insecurity, water shortage and insufficient animal pastures. These have resulted in the migration of pastoralists seeking for greener pastures and water, diversification of economic activities and changing livestock type. This study recommends several strategies such as capacity building to the Barbaig Pastoral Community, integrating climate change problem into development priorities and planning for climate change adoption strategies.

Key words: Climate variability and change, Pastoralists, livelihood, strategies

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1.0 Introduction

According to Hegerl *et al*., (2007), climate change refers to a shift in the state of weather parameter or its variability persisting for an extended period of time (decades or longer), which might be due to natural changes or persistent anthropogenic changes in the composition of the atmosphere or in land use and Climate variability refers to variation in the mean state of climate on a temporal and spatial scale beyond that of individual weather events, such as extended droughts, floods and conditions that result from periodic El Niño and El Niña events.

In Tanzania, climatic change is expected to raise the mean annual temperature by 3-5^{0}C and average daily temperature by 2^{0}C to 4^{0}C by 2075 (Orindi *et al*, 2005). In recent years, several parts of Tanzania have experienced recurring droughts and the most devastating were those of 1983-1984 and 1993-1994 (URT, 2002). Climate variability and change has shown wide-ranging effects on the environment, socio-economic and related sectors; including water resources, agriculture and food security, human health, terrestrial ecosystems and biodiversity, it has a direct impact on livestock production through reduced water and forage (Mwandosya, *et al*, 1998)

Livestock in many areas including Hanang district depend on natural pastures for their diets, and rainfall is the most important factor determining the quantity and quality of pastures and water. Water and pasture shortage for livestock is the main problem facing pastoralists in Hanang as there are no reliable sources of water and those available serve for just short term especially during rainfall season. Therefore this study was conducted to investigate the impact of Climate variability and change to the livelihood of Pastoralist's communities in Hanang district and the strategies used by pastoralists to adopt and cope climate change effects.

2.0 Study area and Methodology

2.1 Description of the study area

This study was conducted in two villages of Dirma and Gisambalang in Hanang district, Manyara region. The district was selected due to the fact that it is potential in carrying out pastoralism as 70% of its people are pastoralists (Lane, 2008). Hanang district is situated in the northern part of Tanzania, in Manyara region. The district has a total land area of 3,436 km^2, of which 80,078 hectors are used for agricultural activities and 224,000 ha (65.2%) are used for grazing. Administratively, the district is divided into 5 divisions, 22 wards and 53 villages. It shares

common borders with Mbulu and Babati Districts to the north, Kondoa and Singida rural districts to the south, Kondoa district to the east and Iramba district to the west. According to National population census of 2002, the district has a total population of 204,640 people where 104,185 are male and 100,455 are females, with the population growth rate of 4.2% per annum (URT, 2002).

2.2 Methodology

This study used cross-sectional design because it involves gathering of information to a representative population sample at single point in time and allow more in-depth study of a small number of sampled population. Both Probability and Non probability sampling procedures were used to select the respondents. Dirma and Gisambalang villages were purposely selected because the majority of its people were pastoralists and the area is claimed to be more affected by climate variability and change. By using the Village registers the list of all the pastoralists of two villages were obtained and stratified sampling and then simple random sampling methods were used to get 50 pastoralists from each village. Purposive sampling was used to select key informants such as village leaders, Agriculture extension officers, WEO and District official staffs for their position and being working close with pastoralists to obtain specific and technical data (Kothari 2004), resulting to representative sample of 100 pastoralists and 10 key informants.

The data collected from this study were obtained from both primary and secondary sources. Primary data collection methods included interviews, Focus group discussion and observation. Secondary data collection included review of diverse source of professional reports/documents in hard copies and electronic forms. A structured interview was conducted to pastoralists respondents. This enabled the researcher to collect data from large sample at a short period of time by visiting and interviewing them in their respective places of work/residences about the impact of climate variability and change and strategies they use to adopt the effects. Semi-structured interview was used to gather information from key informants, enabled researcher to gather qualitative and quantitative, specific and in-depth information from the respondents.

Focus group discussion was used as it provides a lot of information quickly and explores beliefs, ideas or opinions of a community (Kombo *et al,* 2006). A total of three FGD in each village was conducted from the group of youth, women and men. Observation method was used to collect data

which were relevant to the study, check the validity and make a relevant inference of the data provided by respondents. During observation, the researcher visited the selected villages; paid a direct look to see the real situation of pastoralists as the result of changes of Climate. During observation the researcher used checklist as a tool to guide observations. Secondary data were obtained from the published and unpublished journals, books, internet, broachers and reports. Also documents were obtained from villages and district offices together with data on temperature and rainfall from Tanzania Metrological Agency (TMA)

Data were systematically analyzed using Statistical Package for Social Science (SPSS). This includes measures of central tendency and location, such as frequency, means and percentage. Ranking and scoring was used to understand which are the major impact of climate change in pastoralist community and changes were analyzed by comparing the livelihood variables between present and past. The results for analyzed data were presented by using figures, tables, charts and word text.

3.0 Results and Discussion

3.1 Impact of climate change and variability to Barbaig pastoralists society

3.1.1 Drought

It was discovered that incidences of droughts in the area was increasing as evidenced by the majority (87% and 85%) of the respondents from Gisambalang and Dirma. Respondents mentioned drought of 1964 called *'Gwayda gejed',* followed by that of 1974, called '*Gwayda bulga'* and the worst drought of 2005/6 (*Giyet*) which killed many animals, caused many sufferings and out migration of barbaig pastoralists. This implies that changes in climate are really happening.

3.1.2 Decrease of Livestock number

According to the study findings, decrease of livestock such as cattle, goats, and sheep was mentioned by the majority (66%-70% from Gisambalang and Dirma respectively) and was highly ranked among the important impact of climate change. With these results it can be concluded that climate change has adverse impact to livestock causing death due to prolonged drought and shortage of water.

3.1.3 Decrease of number of trees, grasses, birds and animals

From all the two villages studied, decrease of trees, grasses, birds and animals was another aspect mentioned by more than half (63-75%) of the respondents. During FGD types of trees, grasses/pasture used to grow in the past but are currently no longer growing, significantly decreased or disappeared together with animals and birds due to change in climate were named in their language as:

Type of trees: *Maleshi, Mapumbud* and *Nyweshet*

Type of grasses/pasture: *Nyenga nyatk, Qarosk* and *Sabaled*

Type of birds: *Harachk* (tick eaters), *Madonyak* and *Diyaydesh*

Type of animals: *Habiyed, Ghadid* and *Firayod*

This implies that many areas have remained bare land, natural trees are no longer available for them to live and drought forces animals to move away or vanished from the area.

3.1.4 Decreasing number of water streams

Due to climate variability and change, numbers of water streams dried and disappeared (73%-78% Gisambalang and Dirma respectively). Respondents mentioned a number of streams (*Waranga, Nyasaned, Lilaenda*), ponds (*Misiray, Bassodagwargw*) and wells (*Qanyangeshish, Gidagur, Gisambalang)* dried up due to changes in climate. These results are in line with that obtained by Zebbe *et al*, (2003) '*the most direct impact of change in climate to the pastoralists is the drying of water sources for livestock use'*

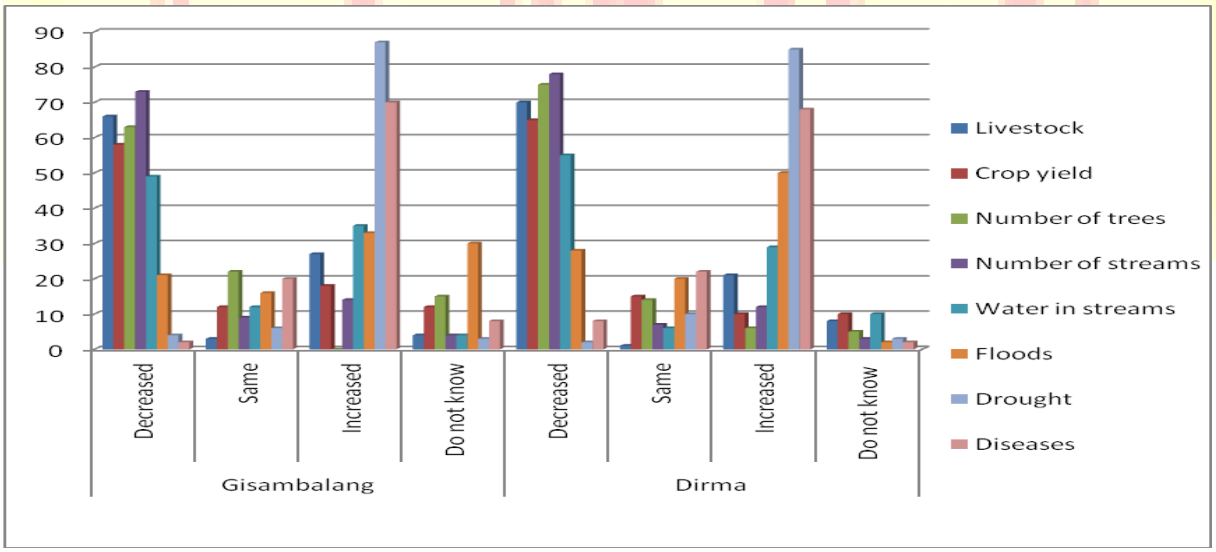

Figure 1: Impact of climate change and variability

3.1.5 Incidence of diseases

It was also found out that disease cases have been increasing as 70% of respondents mentioned this incidence. For human malaria was mentioned and for animals; Trypanosomiasis '*kareti'* caused by tsetse; Babesiosis '*kidafojanda'* and East Coast Fever '*gidong'hoshika*', caused by ticks and Rift Valley Fever of 2007 were described. Only an average of 5% of respondents said disease cases have been decreasing, the reason might be they are not well aware of these diseases. The implication obtained is that, changes of climate go hand in hand with spread of different human and animal diseases.

3.1.6 Crop yield decrease

From this study it was revealed that changes in climate results to decrease of crop yields hence food insecurity. This was indicated by 58%-68% of respondents from Gisambalang and Dirma respectively. These results were supported by official who said that *"the trend of harvesting crops has been declining in recent years*". Few of the respondents 12-15% claimed that crop yields remained unchanged. This implies that not all are engaged in agriculture, so they are not aware of the situation of yield.

3.1.7 Decreasing amount of water in streams

Apart from number of water streams decreasing, amount of water in available streams were decreasing this was evidenced by more than half (49% Gisambalang and 55% Dirma) of respondents, this proves the adverse impact of climate change.

3.1.8 Incidence of floods

Furthermore, it was discovered that incidences of floods in Barbaig community area was increasing as evidenced by 33-50% of respondents. It was noted that in past years floods were rarely happening compared to recent years. The most recent flood incident mentioned during FGD is that of 1998 called *Gwayda roptaw* which destroyed farms, roads, houses and took the lives of animals and people.

However, 22% and 28% from Gisambalang and Dirma respectively explained that flooding is decreasing. The implication is that, it is not raining much in an area to cause flooding.

3.2 Impact of climate change and variability to Barbaig livelihood

3.2.1 Food insecurity

One of the major impacts of changes in climate to the Barbaig livelihood was problem of food security. Majority of the respondents 84% and 79% from Gisambalang and Dirma, said food insecurity has been increasing dramatically due to prolonged drought and shortage of rainfall resulting to poor health and starvation to many people in the community. This is supported by Ahmed *et al* (2011) who reported that the consequences of climate change for food security is of serious concern as food supplies are inadequate. On the other hand, about 11% and 14% of respondents from Gisambalang and Dirma said food insecurity is decreasing as they are currently engaging in different economic activities.

3.2.2 Change of income

The majority (72% and 64% from Gisambalang and Dirma respectively), said that there is a decrease of income because changes in climate affects pastoralism which is the main dependent economic activity in the Barbaig community. Through the activity they tend to sell milk and other animal products and during hard times, they sell animals to obtain money but due to climate change, they fail to sustain their original life.

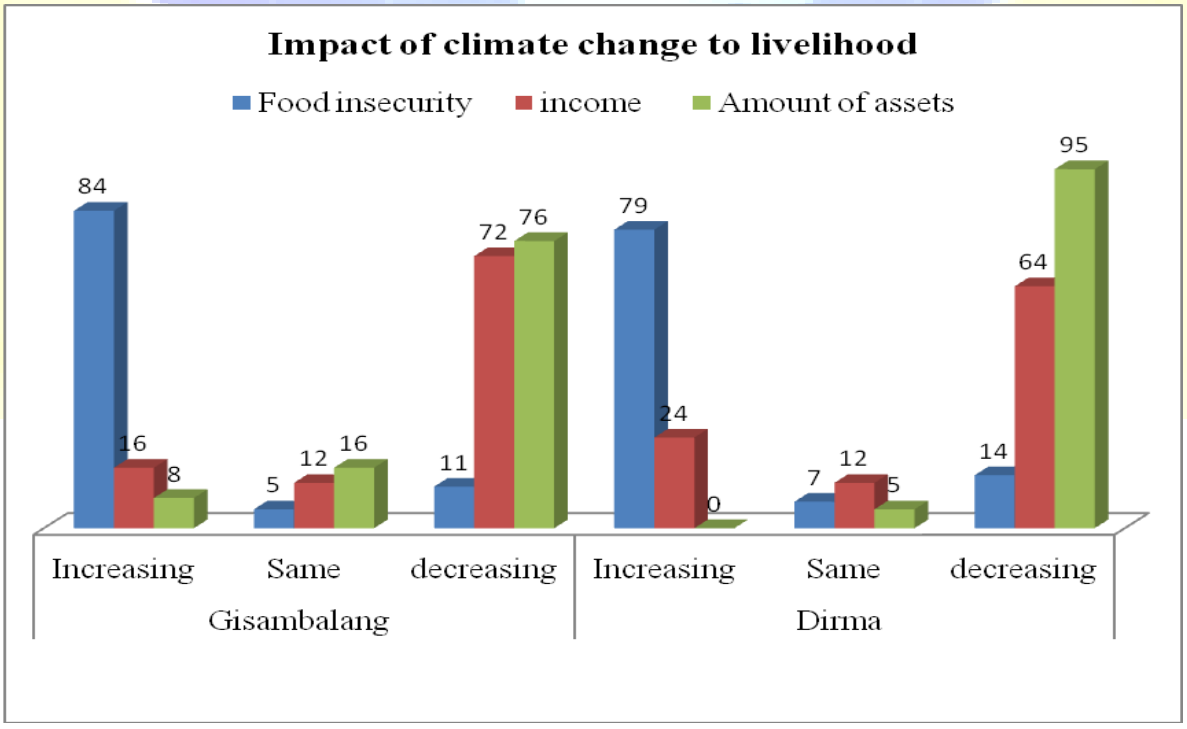

Figure 2: impact of climate change to Barbaig pastoralist's livelihood

3.2.3 Loss of assets

The study reveals that 76% and 95% of respondents from Gisambalang and Dirma lost their assets such as livestock; pasture land, water sources and forest due to climate change. This deteriorates life and accelerates poverty among the community members. Agrawal *et al.,* (2009), supported this by saying *'the most impacts of climate change on pastoral livelihoods include decrease of assets, reduction in livelihood opportunities and stresses on existing social institutions'* only 11% of respondents said they did not lose anything, this might be due to lack of enough knowledge on climate change.

3.3 Strategies adopted by pastoral community against Climate variability and change

3.3.1 Diversification of income generating activities

Findings from this study indicate that Barbaig community diversify their income generating activities as the main strategy to overcome climate variability and change effect as 97% and 90% of respondents from Gisambalang and Dirma mentioned. Pastoralists have engaged in other economic activities like crop cultivation, wage employment and petty business to supplement their natural activity of relying on pure pastoralism. This implies that climate change is affecting them to the extent that many decide to deal with other activities as well. This is supported by the study done by Kulindwa (2002); *'there is a gradual shift of activities as the Barbaig are moving away from their tradition, which was centred around livestock keeping'*. Also Markakis (2004) *'pastoralists are investing in non-pastoral occupations to increase their income'*

3.3.2 Migration to other areas

The information gathered depicts that once incidences of climate change like prolonged droughts hit the areas, Barbaig tend to move to other areas searching for pasture and water for their animals. These results are in line with that obtained by Lane (2001) *'migration has been one of the major strategies to the problem of climatic changes among the pastoralists'*. Respondents mentioned places where the Barbaig move as Singida region, which seems to be the popular destination of emigrants, followed by Mbulu and Babati districts. Barabaig pastoralists have moved in large numbers into Dodoma, Shinyanga, Iringa, Morogoro and Mbeya regions (Markakis, 2009).

3.3.3 Type of livestock

It was also mentioned by respondents (83-87% Gisambalang and Dirma respectively) that animals of designate colors are favored over others. Pastoralist keep light colored cattle as they adopt well heat stress and require less water. Also they prefer small body size animals with less body weight as a mechanism to maximize risk during crisis. This implies that the barbaig pastoralists are very careful in selecting their animals and are well aware with the problem of climate change.

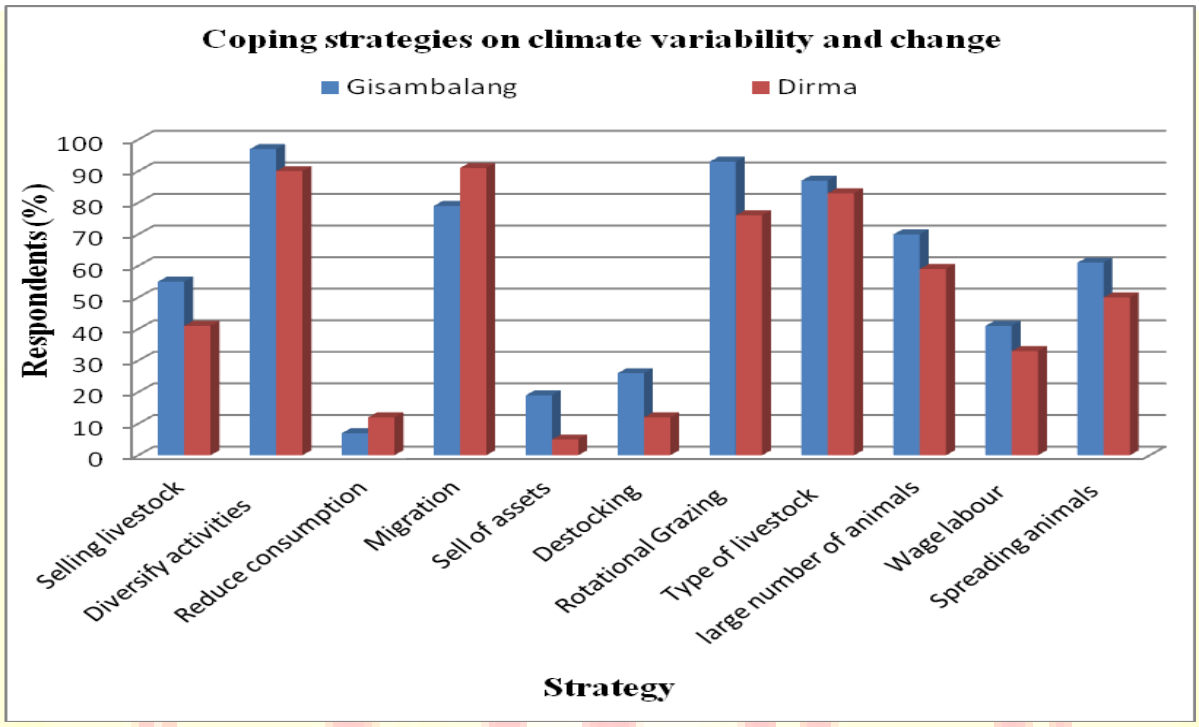

Figure 3: coping strategies on climate variability and change

3.3.4 Rotational Grazing

Pastoralists practice rotational grazing in their areas as the strategy against climate change as supported by Lane (2001) '*grazing lands are usually divided into portions, use one after another in rotation to allow them regenerate'*

It was well explained during FGD conducted in Gisambalang village that;

> 'Traditionally because of the variability of climate, we have developed an efficient grazing rotation system which utilizes eight major portions. The first one is the *muhajeda* **(**plains) used between October and June, *darorajand* – used mid May and September, *hayed* **(**hills) best between mid May and September, *gileud* (lake side margin) used between July and early October, *Labayd* (mountain) used

between late July and early October, *badod* (range) used between early October and January, *darabet* (bush lands) used between early October and January. The last is the *ghutend* **(**river margin)**,** used throughout the year' (FGD data, Gisambalang 2012).

3.3.5 Keeping large number of animals

Barbaig pastoralists keep many animals as the strategy against climate change impacts (77% from Gisambalang and 59% from Dirma). The reason provided was that large numbers are insurance of remaining with some animals when droughts and other calamities hit them hard. This implies that the barbaig are not only keeping large number of animals for wealth, but weapon against climate change.

3.3.6 Spreading animals to different areas

Another strategy of spreading and splitting animals over different places of climate variations is done by more than a half of Gisambalang and from Dirma pastoralists respectively (61%-50%). This implies that pastoralists spread the risk since not all areas experience the same climatic and weather conditions in one given time.

3.3.7 Wage labour

The study found out that working in town is a result of recurrent droughts and climate change. This is indicated by 41% and 33% respondents from Gisambalang and Dirma respectively. They engage themselves in work like night watchmen, selling of traditional medicines, prettying women hair and other petty businesses. The reason provided was that, wage labour in the urban areas helps to cushion economic stresses, as the money generated by those in towns is taken back for buying food and livestock. This implies that many pastoralists are moving to towns trying to fight climate change effects.

3.3.8 Selling livestock

One of the identified strategies adopted by pastoralist community on the effects of climate variability and change is selling livestock which accounts for 41% to 55% responses as presented in Figure 3. It was explained that since pastoral community keep large number of livestock, due to climate changes, they face shortage of pasture and water and forced to reduce them through

selling. This was supported by Kulindwa (2002) *'pastoralists do adjustment of livestock size and stocking rates to match available natural feed resources'*

3.3.9 Sell of household assets

Furthermore, this study found out that selling of household assets accounts for 13% of total respondents and was among the least cited strategy to cope with climate change in the Barbaig community. This indicate that, negative impact of climate change such as prolonged drought, higher temperature affected the normal income generation and force some to sell their assets like pieces of land. However, results show that majority of barbaig pastoralists do not prefer this strategy.

3.3.10 Destocking of livestock

Moreover, destocking was mentioned as one of the strategy used by Barbaigs who own large number of livestock to cope with changes of climate. This is evidenced by 12-26% of responses from Gisambalang and Dirma villages respectively. This implies that the barbaig currently have a knowledge of the importance of keeping small number of livestock they can manage. The owners of livestock lend some of their animals to their relatives who do not keep livestock and others sell them to remain with manageable number. Lane (2001) said *'animal keepers reduce the number of their livestock by selling some as the drought affect the area, so as to acquire grain or slaughter them for consumption'*

3.3.11 Reduction of consumption

Few Barbaig pastoralists revealed reduction of consumption as a strategy towards climate change effects as only 7% from Gisambalang and 12% from Dirma mention to use this strategy. The implication obtained from the study was that very few are using this strategy.

4.0 Conclusion and Recommendations

4.1 Conclusion

It was found out that climate variability and change has affected Barbaig pastoralists in many ways by causing drought, drying of water sources, death of livestock, increase in diseases and decline of crop harvests. The impacts of climate variability and change are not only physical and economic,

but also social and cultural, jeopardizing environmentally based livelihoods of the Barbaig. It was also discovered that changes in climate has impact on different livelihood, causing food insecurity, deterioration of income and decrease of assets ownership among the Barbaig pastoralists. This situation forces Barbaig pastoralists to shift from one place to another seeking for pasture and water for their animals. Several strategies were used to adopt and cope with climate change, such as diversifying of income generating activities, migration to other areas, practicing of rotation grazing, mortgage and destocking of livestock.

4.2 Recommendations

It is clear from this study that livestock keeping is a viable economic activity and it will continue to be the mainstay of the Barbaig community and thus there is a need to put much focus on how to assist them overcomes effects of climate changes. NGOs and government have to continue mainstreaming climate variability and change in policies, programs and micro-projects as cross cutting issue for sustainable development, help people to reduce poverty and lessen their vulnerability to climate disasters and change.

It is important pastoralist communities to be empowered and trained on the use of new information, technology and infrastructure in addressing climate variability and change. Climate change and adoption strategies must be integrated into development priorities, plans and strategies at all planning levels to deal with disaster reduction, livestock and agriculture development. Preparation of long-term adaptation plans based on the sharing of best practices through community participation, civil society, academic and research institutions to be done.

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