



RESEARCH ARTICLE

**THE ROLES OF INSTITUTIONS AND ORGANIZATIONS IN ENHANCING PASTORALISTS' RESILIENCE AND INNOVATIVE ADAPTATION STRATEGIES TO IMPACTS OF CLIMATE CHANGE IN LONGIDO DISTRICT-TANZANIA**

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ABSTRACT

The study aimed at investigating on the pastoralists' resilience and Innovative adaptation strategies to the impacts of climate change in semi-arid rangelands in Longido District. The study employed exploration of secondary information, observation, household survey, structured interview and focus group discussion as methods for data collection. The results indicate that; migration with livestock for search of pasture and water, dam construction, supplementary food/feeds, savings, finding an alternative source of income, traditional climate forecast and formation of by-laws, adoption of drought resistant species of livestock, regulation of livestock reproduction and livelihood diversification were main pastoralists' resilience and innovative adaptation strategies to the impacts of climate change.

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**INTRODUCTION**

Climate is a vibrant aspect for the survival of animals, plants and human beings all over the world but the alteration of its physiognomies in terms of temperature increase and rain shortage, disturbs the whole ecosystem, especially for pastoralists and farmers who directly depend on natural resources for their survival (Waugh, 2009). These changes in temperature and humidity have caused prolonged droughts globally and at local levels (IPCC, 2007) hence climate variability which leaves the ecosystems disrupted, causing disability and instability on dry lands particularly in poor communities (Mubaya, 2010).

In Tanzania, climate change in semi-arid parts has diverse impacts on the pastoralists including water shortage, loss of pasture and eruption of diseases. In this context, for the pastoralists to resilient and adapt to the climate change impacts they have to employ various strategies and they (pastoralists) have to obtain assistance from the internal and external institutions in improving their livelihoods despite the impacts acerbated by climate change (Mwilawa *et al.*, 2008; Martin, 2012).

The objective of this paper was to investigate the roles of institutions and organizations in enhancing pastoralists' resilience and Innovative adaptation strategies to the impacts of climate change in the semi-arid Longido District in Northern Tanzania.

**MATERIALS AND METHODS**

*The study area*

Longido District (7782 km<sup>2</sup>) which is administratively in Arusha region lies at an altitude of between 600 and 2,900 m asl is located between Latitude 2<sup>0</sup>20" and 3<sup>0</sup>10" South of the Equator and Longitude 36<sup>0</sup>00" and 37<sup>0</sup>30" East of Greenwich. It is bordered by Meru and Rombo Districts to the East, Ngorongoro to the West, Monduli and Arusha Districts to the South and Siha District to the South East. The District stretches

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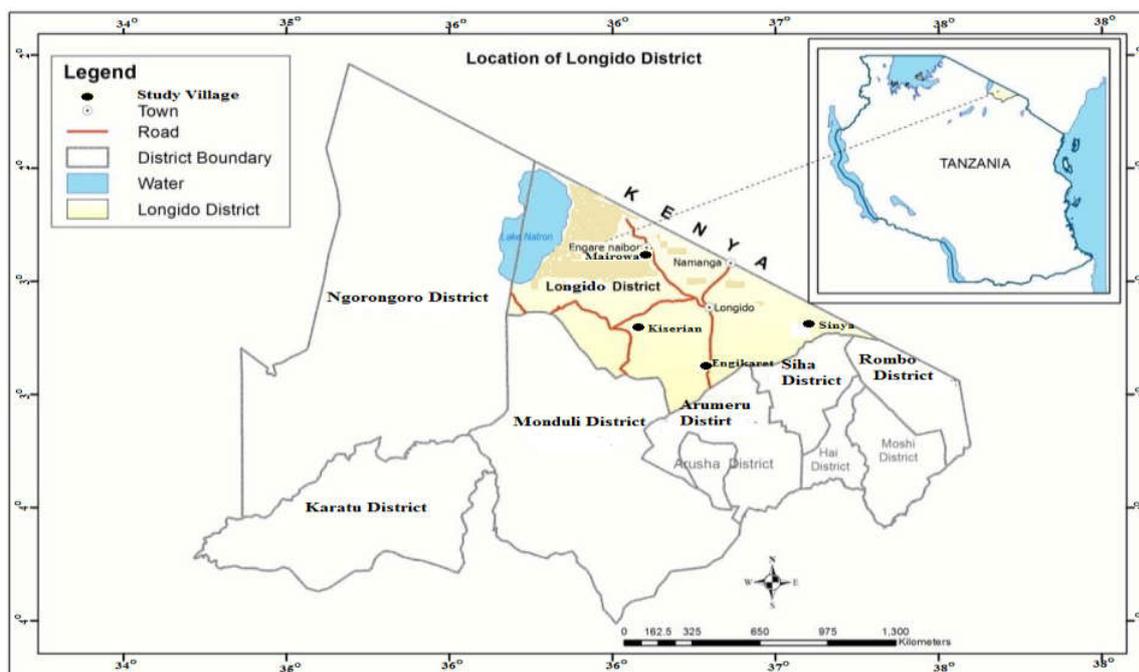


Fig. 1 The study area, Source: Developed from Odgaard and Maganga, 2013)

from the western slopes of Mount Kilimanjaro in the East to Lake Natron in the West. Out of the total District land area 82.14% is grazing land, 13.6% is arable land and 4.7% is forest land (LDP, 2015). Four villages namely Sinya, Engikareti, Keseria and Mairowa were involved in the study (Fig. 1). The study area is predominantly occupied by the pastoral Maasai community. Both water and natural pasture are sometimes insufficient, especially during dry periods. The District is also rich in wildlife (LDP, 2015). The vegetation in the area can be described as mixed forest, bush lands, and grass lands (LDP, 2015). Agro-ecologically the district has two distinct agro-ecological zones- highlands and low lands.

The highland zone is characterized by a number of isolated mountains with an average altitude of 2000 m above sea level. It has mainly deep, freely drained loamy soils with natural fertility status. It is occupied by forests on top of hills. Major economic activities in this zone are livestock keeping and agro – pastoralist where livestock keeping is practiced on a moderately large scale (LDP, 2015). The low zone is characterized by flat and rolling plains with altitude ranging from 600m to 1,200m above sea level. It has mainly deep, freely drained loamy soils with natural fertility status. It is occupied by forest on top of hills. The major economic activities are extensive livestock keeping and tourism. Livestock keeping in this zone is practiced on a large scale and include cattle, goats, sheep, donkeys and camels (on a small scale) (LDP, 2015). The District is one of the driest areas in Tanzania, the temperature ranges from 20°C – 35°C. Rainfall ranges from less than 500mm in low lands to 900mm in high altitude. From year 2007 the District has been experiencing prolonged dry seasons.

#### Data Collection Methods

Data were gathered through a questionnaire survey, FGD, key informant interviews, and field visits. The questionnaires consisted both closed and open-ended questions. An open-ended question gives respondents room to give their own views without being influenced by researcher. On other hand, closed-ended questions gives options to respondents and are good in collecting quantitative data, hence can simplify data analysis. The aspects included in questionnaire were: role of institutions and organizations in enhancing pastoralists’ resilience and innovative strategies to impacts of climate change in Longido District. Before using the questionnaires they were pre-tested for testing the questionnaire wording, sequencing and lay out.

The key informant’s interview was conducted using interview guides. Eight Village Extension Officers (two extension officers from each village from the four selected villages - livestock and agriculture) and four District officers (two environmental officers and two District livestock officers) were involved hence made a total number of 12 key informants. Aspects covered during interviews were major roles of institutions and organisations in enhancing pastoralists’ resilience and adaptation strategies to impacts of climate on pastoral communities. Focus Group Discussion involved two groups in each village, males and females. Each group comprised of 10 people, making a total of 80 group members. These two groups were involved in order to capture views as they are likely to perceive issues differently even for the same problem or issue (Creswell, 2012). During the discussion the authors were mainly facilitators and this had the advantage that participants were able to discuss issues at hand freely and without fear. The main subtopics discussed included roles of institutions and organisations in enhancing pastoralists’ resilience and adaptation strategies to impacts of climate on pastoral

communities. Direct field visits were undertaken in study villages to observe different roles played by institutions and organizations in enhancing pastoralists' resilience to impacts of climate change in pastoralists' communities. Through field study the authors were able to see the roles played by institutions and organizations in enhancing pastoralists' resilience and innovation strategies to impacts of climate change in semi – arid range lands.

Data collected were qualitative and quantitative in nature. Therefore, the nature of data necessitated the use of qualitative and quantitative data analysis techniques. In this perspective both qualitative and quantitative information were analyzed separately to complement and supplement each other. For example, qualitative data collected from Focused Group Discussions were analyzed basing on themes and content. The themes were classified whereby every answer was patterned in relation to a theme in question. For Key Informant interviews, data was analyzed through themes and content analysis. Subsequently, quantitative data were collected through questionnaires, and were analyzed through statistical analysis where data were edited, coded, summarized, and analyzed using the Statistical Package for Social Sciences (SPSS) version 16.

## RESULTS AND DISCUSSION

### *Identifies Institutions and Organization in Longido District*

Field findings reveal that there is large number of institutions and organisations operating in the area for the purpose of assisting pastoralists to cope with climate change impacts. These institutions and/or organisations can be classified into two major groups, viz: government institutions, NGOs (local and international) and Faith Based Organisations (FBOs) (See Tables 1 and 2). What is also evident is that some of the institutions and organisations are village specific (operate within) while some are generic (are both inter and intra in coverage). For example, institutions like the Longido Community Development Organisation (LCDO), Community Research Development Services (CORDS), Ujamaa Community Resource Team (UCRT) and the United Nations Development Program (UNDP) are generic while some institutions like Maasai Women Development Organization (MWEDO), Imara, and the International Union for Conservation of Nature (IUCN) operate within a specific village.

### *Roles Played by Institutions and organisations in the Study Area*

According to household survey on the role of Institutions and organization in enhancing pastoralists' system in resilience and innovative strategies (See Tables 1) against impacts of climate

reservoirs construction, restocking, provision of environmental education and employment provision to mention few (See Fig. 1).

Focus group discussants and VEO, identified more roles such as sensitizing pastoralists on their rights (e.g. land ownership rights and grazing rights), restocking, construction of livestock infrastructure, provision of environmental education, veterinary services, advices on livelihoods diversification, capacity building on adaptive capacity, conflicts mitigation, and employment (See Tables 3 and 4).

### *Construction of Livestock Infrastructure*

Overall, in the four villages combined, construction of livestock infrastructure (see Fig.1) was associated with role institutions and organisations as was felt by 78.1% (N=220) of respondents. In the village, specific level construction of livestock infrastructure was common in Engikaret and Kiserian villages in which 89% (n=55) and 78.1% (n=55) of the respondents felt the construction of livestock infrastructure was a role played by institutions in the area. The reason for these respondents depicting construction of livestock infrastructure as one of the roles played by institutions in Longido District is because institutions such as the Longido District Council (LDC) in collaboration with UCRT, LCDO and TRIAS have been at the forefront in assisting pastoral communities in the study area to cope with climate change impacts through construction of water reservoirs/dams and/or piped water lines, veterinary dips, water tanks, water holes, wells, and veterinary diagnosis centres.

During FGDs it was reported that before the drought of 2009 there were few water dips and/or water reservoirs in the villages, but currently at least in each village there are more than two dams constructed by the LDC in collaboration with other NGOs working in the area such as LCDO, UCRT, IIED and Hakikazi Catalyst. It was further explained that the construction of veterinary dips and the provision of veterinary livestock drugs have helped in the eradication of livestock diseases and pests such as foot month disease, ticks, skin disease and Rift Valley Fever. Mwilawaet *al.*, (2008) asserts that dipping is the most efficient way to control ticks since the whole body of an animal gets wet and concentration of acaricide can be controlled for the whole herds and from different *bomas* (homestead) in the area. Dipping makes easier for controlling treatment for livestock at once.

### *Restocking*

Overall, 71.3% (N=220) felt restocking as the role. At the village level, the restocking was felt to be more serious in Mairowa 81.8% (n=55) and Engikaret 72.2% (n=55) (see Fig 1). Restocking as a role was revealed by the respondents due to the

**Table 1** Major Institutions and Organizations identified by household respondents

Major Institutions	Institutions and Organizations'								
	CORDS	MWEDO	IMARA	PWC	IIED	IUCN	UNDP	IRIS	UCRT
Mairowa	✓	✓	✓	✓	✓	✓	✓	✓	✓
Kiserian	✓	✓		✓	✓		✓	✓	✓
Engikaret	✓		✓	✓	✓	✓	✓		✓
Sinya	✓	✓	✓	✓	✓	✓	✓	✓	✓

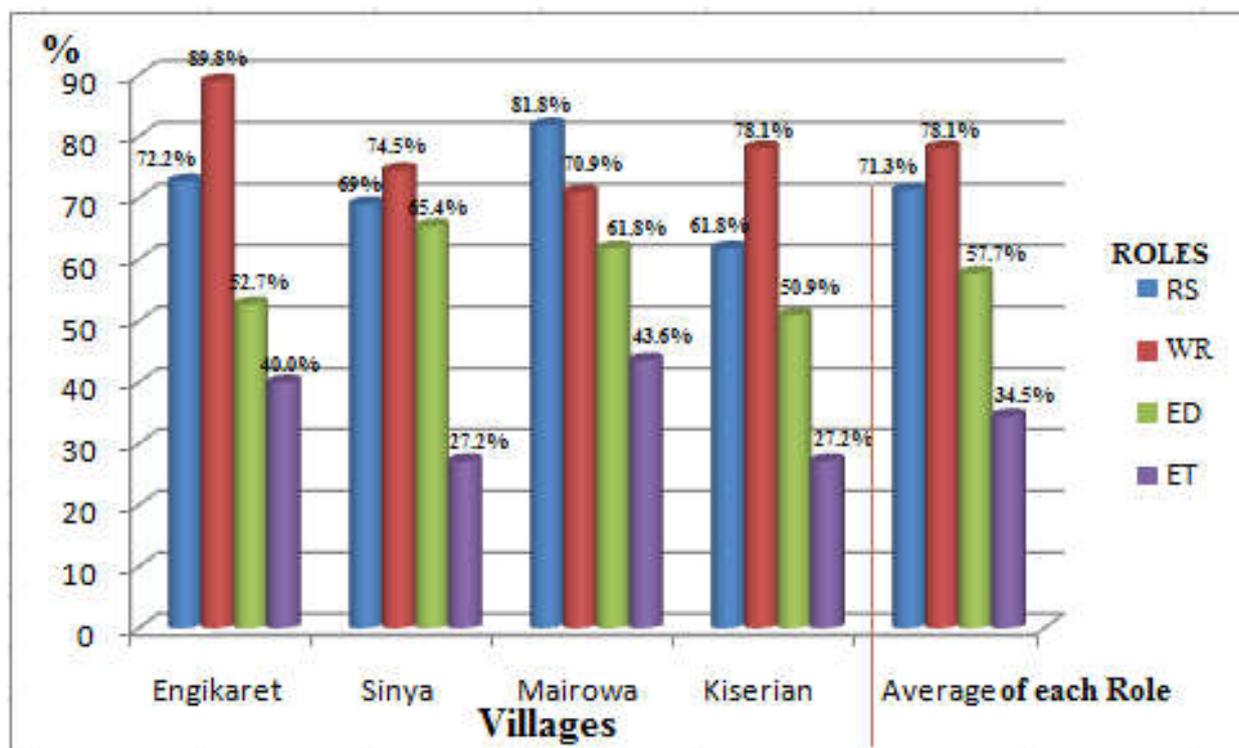
C Source: Author, 2015

Shortages of water for livestock in Longido District were water

**Table 2** Major institutions and Organizations identified by FGDs

Villages	Mairowa	Kiserian	Engikaret	Sinya
Men	World Vision, Longido community Development Organization, Village Environmental Communities, Climate Change Group Work and community Research Development Services	International Union for Conservation of Nature, Longido Community Development Organization, United Nation Development Program, Tanzania natural Resource Forum and TRIAS	World Vision, Longido community Development Organization, Village Environmental Communities, Climate Change Group Work and community Research Development Services	International Union for Conservation of Nature, Longido Community Development Organization, United Nation Development Program, Tanzania natural Resource Forum and TRIAS
Women	World Vision, International Union for Conservation of Nature, Longido Community Development Organization, United Nation Development Program, Tanzania natural Resource Forum and TRIAS	Ujamaa community Resources Team, World Vision, Longido community Development Organization, Village Environmental Communities, Climate Change Group Work and community Research Development Services	Ujamaa community Resource Team, International Union for Conservation of Nature, Longido Community Development Organization, United Nation Development Program, Tanzania natural Resource Forum and TRIAS	International Union for Conservation of Nature, Longido Community Development Organization, United Nation Development Program, Tanzania natural Resource Forum and TRIAS

Source: Field Data, 2015



**Figure 1** Roles of Institutions\*

Source: Field Data, 2015.

\*= Multiple responses; RS= Restocking; WR= Construction of Water Reservoirs; ED= Provision of Education, ET = Employment

fact that, the Longido District Council (LDC) in collaboration with the central government, has been compensating pastoralists who unfortunately lost their livestock as a result of natural calamities such as drought or disease outbreaks. For those who lost all of their livestock, the LDC provided them with four herds of cattle and five goats per household.

**Provisional of Environmental Education**

Overall, in the four villages combined, 57.7% (N=220) felt the integrative education offered by various institutions on how to resilience against impacts of climate change as the role. The

role in each village varied with Sinya and Mairowa being seriously perceived by 65.4% and 61.8% respectively. The main reason for the respondents to depict this role is because institutions such as TEMBO, TRIAS, LCDO, UCDD, UNDP, ICUN, TNRF, LDC and CORDS have and continue to provide environmental education to pastoral communities in the study villages and in Longido District as a whole. The aspects taught include impacts of deforestation and environmental conservation. The significance of education in explaining the awareness of people on the importance of natural resources conservation and development is well documented.

**Table 3** Perception of FGDs on Roles of Institutions

Sex	Villages			
	Mairowa	Kiserian	Engikaret	Sinya
Male	Provision of Environmental Education	Construction of water reservoirs	Provision of Environmental Education	Provision of Environmental Education
	Capacity building	Restocking	Capacity building	Capacity building
	Employment	Employment	Employment	Employment
	Construction of water tanks	Advise on livelihood diversification	Advice of Livelihood diversification	Provision of Livestock officers
Female	Restocking	Education on land Use	Building of livestock	Restocking
	Building of Training Institutions	Building of livestock infrastructure	Constructing livestock infrastructure	Building of livestock infrastructure
	Dam construction	Land ownership and grazing rights	Conflict mitigation	Land ownership
	Provision of food			Dam construction
	Construction of dips	Restocking	Provision of Environmental Education	Restocking
	Livestock Diseases diagnosis	Employment	Capacity building	Employment
	Construction of livestock infrastructures	Environmental Education	Employment	Land ownership and grazing rights
	Land ownership	Dam construction	Dam construction	Conflict mitigation
	Provision of environmental officers	Conflict mitigation		

Source: Field Survey, 2015.

**Table 4** Perceived Institutional and Organization by VEO's

Villages	Mairowa	Kiserian	Engikaret	Sinya
Roles of Institutions in enhancing pastoralists' resilience.	Provision of environmental Education	Provision of education	Restocking	Education on livelihood
	Capacity building on adaptive system	Provision of food	Adoption of drought resistant livestock	Construction of livestock infrastructure
	Restocking	Restocking	Conflict mitigation	Provision of employments
	Construction of livestock infrastructure	Adoption drought resistant livestock	Construction of livestock infrastructure	Capacity building on adaptive capacity
		Conflict mitigation		Restocking

Source: Field Data, 2015

The Tanzania Education and Micro-Business Opportunity (TEMBO), for example, have been providing education to the pastoralists in Longido district as a strategy of enhancing pastoralists' resilience and adaptation to climate change impacts. TEMBO, after raising start-up funds for a micro business program they are now lending money to women in Longido for projects such as raising goats for milk and meat; raising chickens and selling eggs in the village and producing and marketing handcrafted beadwork.

In addition, the organization and institutions also raises funds for informal education efforts, known as "Learning in Longido" and have now managed to establish a community library in Longido and have plans to construct a District Learning Centre which will house the library and other informal education programs. Kajembe and Luoga (1996) argue that there is no development without education. An increase in education level increases the level of awareness and thereby creating positive attitudes, values and hence motivating people to manage natural resources sustainably. Mbwambo (2000) on the other hand asserts that people tend to plant more trees for their own uses at their homesteads as opposed to less educated ones and hence contribute in resources conservation. Planting or retaining of trees around homesteads reduces pressure on micro-catchment forests thereby contributing to their resilience.

**Adoption of Drought Resistant Livestock**

Adoption of drought resistant livestock kinds is one of the roles played by the institutions and organisations in the District. The drought resistant livestock include African Zebu (cattle) selo (goat) and sak (sheep). Burrow (2006), in describing other potential characteristics of Zebu in relation to drought resistance, states that Zebu genotype has been utilized in crossbreeding systems to develop cattle for beef and dairy production systems in hot climates but success has been limited by other unfavorable genetic characteristics of these cattle such as meat quality.

**Provision of Security and Conflict Mitigation**

Provision of security among the pastoralists' societies is one of the roles played by institutions to enhancing pastoralists' resilience in the District. Participants in the FGDs in Mairowa and Sinya stated that "despite the calamity of climate in their areas, the district authority has been very vital in protecting them from thieves who mostly come from the neighboring Kenya". It was also revealed that Longido District Council (LDC), Longido Community Development Organisation (LCDO) and Wildlife Management Areas (WMA) have been solving various land use conflicts between the pastoralists and Conservationists, particularly the Tanzania National Parks (TANAPA).

### ***Provision of Education for Livelihood Diversification***

Education for livelihood diversification is one of the roles provided by institutions and organizations working in the study area. These institutions include LCDO, LD, IIED, TRIAS, UCDD and PWC (see Tables 1-2). These institutions have been creating awareness on the importance of livelihoods diversification by emphasizing pastoralists to look for other sources of income such as small-scale agriculture so as to solve the problem of food shortage; poultry production petty trading and social networking. According to FAO (2008), diversification, intensification and integration of pasture management, livestock and crop production have been identified by several experts as ways to increase adaptation in the livestock sector.

### ***Provision of Livestock and Environmental Officers***

The Longido District Council and Arusha Veterinary Investigation Centre (VIC) have made possible the posting of livestock officers and environmental officers to support the pastoralists and enhance resilience against climate change in the study area. Livestock officials have been visiting pastoralists in their villages and providing timely extension services.

As for environmental officers, during the period of data collection, they were planning to conduct workshops at village level on environmental related issues and problems and how to practice sustainable pastoralism in the rangelands. Not only that, but also the environmental officers, in collaboration with International Union for Conservation of nature (IUCN) and Tanzania Metrological Agency (TMA), have started to integrate traditional weather forecasting system into the scientific and modern approaches to make sure that climate variability are detected before time to allow other measures to be taken.

### ***Provision of Land Use Education***

The study revealed that, Institutions such as Community Research Development Services (CORDS), Maasai Women Development Organization (MWEDO), and Pastoral Women Council (PWC) have been instrumental in preparing land use plans at the village level, and therefore, instrumental in enhancing the awareness of pastoralists on various land issues such that even pastoralists are now aware of natural resources related policies and legislations something which was not formally not well known to them.

### ***Establishment of Indigenous Knowledge Weather Forecasting Groups***

The study revealed that the integration of Pastoralists Indigenous Environmental Technical Knowledge (IETK) has been a role of governmental and non-governmental institutions in enhancing resilience and adaptation against the impacts of climate change in the study area and in Longido District as a whole. It was revealed that, the integration of IETK is an appropriate strategy of disseminating information related to weather change in the villages and beyond. The Longido District Environmental Officer argued that indigenous information systems are dynamic, and are continually influenced by internal creativity and experimentation. It encompasses the skills, experiences and insights of people

applied to improve livelihoods. In order for IETK to work effectively, there is a need to look for ways of integrating this knowledge with modern science.

### ***Capacity Building***

The study explored that, NGOs such TRIAS, LOPEHCO, VETAID and CORDS have been playing a big role in sensitizing the pastoralists on how to domesticate healthier livestock by controlling livestock diseases through appropriate use of livestock infrastructure. For instance, TRIAS in Kiserian and Sinya has been promoting and conducting training which relate with plans for income-generating activities through (micro-enterprise) training, provision of soft loans, improvement of livestock breeds, animal husbandry and marketing, establishment of community ranches and promoting strategies and approaches which could enhance better use of wildlife and natural resources.

During FGDs it was also revealed that the Government of Tanzania via Tanzania Metrological Agency (TMA), in collaboration with local leaders, has been training pastoralists on how to integrate traditional climate variability forecast with the modern or scientific systems. It was noted that some of the pastoralists have started to adopt some of the strategies on how to forecast unstable regimes in their areas and thereafter able to take appropriate techniques.

The Longido District Livestock Office has also been training pastoralists on how to domesticate dairy goats and sheep. This has resulted to some of the pastoralists now domesticating new kinds of dairy cattle which produce much milk compared to the traditional Maasai cattle. Other strategies done by the LDC is destocking campaigns aimed at reducing the number of livestock and remain with a few and healthier stock. This is important because the population continues to increase but land area is constant. Therefore, the way forward is to reduce the number of livestock. This approach seems to have started to work. One of the FG participants who preferred anonymity, managed to build a modern house as a result of this campaign.

### ***Conclusion and Recommendations***

#### **CONCLUSION**

The study identified various institutions and organisations both local and international NGOs, CBOs, FBOs, District Government and Central Government were involved in enhancing pastoralists' resilience and innovative adaptation strategies. The revealed roles of the institutions and organisations included restocking, construction of water reservoirs, provision of land use education, education for livelihood diversification, provision of employment, and capacity building. Others were veterinary services, provision of livestock infrastructures and the establishment of integrative weather forecast groups in each village.

#### ***Recommendations***

##### ***Therefore the study has the following recommendations***

- ❖ Pastoralists' capacity building on climate change resilience and adaptation should be done by NGOs, CBOs, and the District livestock officials. The initiation and the establishment of programs intended to consolidate the adaptability of climate change upon the

pastoralists will promote the techniques of how to buffer the impacts resulting from climate change.

- ❖ The government and other stakeholders, as appropriate institutes, should provide support for providing technical support as well as providing capital assistance to the pastoralists. The support should be accompanied with advocating the local resilience and adaptation strategies as well as integrating the local innovative adaptation and resilience strategies with the modern technologies. The traditional strategies for predicting weather conditions employed by pastoralists such as the use of the star *Ngakwa*, should be enhanced.

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