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IMPACT OF CLIMATE VARIABILITY ON LIVELIHOODS OF PASTORAL COMMUNITIES IN LONGIDO DISTRICT-TANZANIA

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ABSTRACT

This study investigated the impacts of climate variability on livelihoods of pastoral communities from two villages namely Engikaret and Namanga in Longido district. Primary and secondary data were collected using methods such as questionnaire, interview, focus group discussion and observation. The Statistical Packages for Social Sciences (SPSS) programme and Microsoft excel were used to analyse the data. The findings showed that variation in climate has severe impact on livestock keeping activities which affected the livelihood of people in the community and the whole district. This led to prolonged and frequent periods of drought which resulted in degradation of rangeland resources leading to starvation, death and reduced of livestock production. Given the range of negative impact of current climate variability hazards on pastoralist livelihoods, the implications of climate variability must be taken into account to ensure longer-term survival and sustainability of these communities. Generally, the study recommends that, government and non-governmental organisations should support the activities that pastoralists are undertaking in order to deal with climate variability for their livelihoods sustainability.

Introduction

Climate variability and change pose a significant threat to the livelihoods of more than three quarter of Tanzanian population including pastoralism (URT, 2013). Compared to many other livelihood activities, negative impact of climate variability and change is mostly felt by pastoral households because at least 50 percent of household gross revenue including income and consumption comes from livestock or livestock-related activities (Swift 1998). Livestock represents more than just economic assets, they are also social, cultural and spiritual assets, and they define identity (Gaiballah and Abdalla, 2016).

Pastoralists live in the context of environmental uncertainty and have developed a diverse range of strategies, institutions and networks to exploit this unpredictability and risk to their advantage. Livestock mobility and the carefully controlled breeding of animals to feed selectively on the best quality pastures highly dispersed in time and space are two of the more critical strategies. Despite their proven value, these strategies are still poorly understood and integrated in policy design. In order to provide sound policy advice, it is critical now to gain a better understanding of these strategies in light of increasing climate variability, growing competition for land, rising population and decentralization (<https://www.iid.org/pastoral-livelihoods-climate-change>).

Most climate change models predict rising temperatures and decreasing rainfall in many dry land areas (McCarthy *et al.*, 2001). As a result, these areas will tend to become drier, and existing water shortages will worsen. In addition, climate variability is likely to bring about even more erratic and unpredictable rainfall and more extreme weather conditions such as longer and more frequent droughts (Toulmin, 2009). Where this happens, the delicate balance on which pastoral systems depend on is undermined. The quality, quantity and spatial distribution of natural pastures are mainly shaped by rainfall (Bolling, 2003). Predicted changes in rainfall patterns are bound to result in increasingly scarce, scattered and unpredictable pastures. The number, distribution and productivity of permanent pastures and water points, which are so critical for livestock survival during the dry season, are bound to decline (*Ibid*).

Climate variability and change is expected to affect disease and pest distribution, range, prevalence, incidence and seasonality but the degree of change remains highly uncertain (IPCC, 2007). Climate change is expected to affect both pathogen and vector habitat suitability through changes in temperature, precipitation, humidity and wind patterns (Agrawala *et al.* 2003). Heat stress and drought are likely to have further negative impacts on animal disease resistance (IPCC, 2007).

Climate variability and change and pastoralist's livelihood are interlinked processes: pastoralists and their livestock depend directly or indirectly on the environment; hence threats from climate variability and change, particularly persistent drought, have far reaching consequences for them. Severe drought affects the availability of water resources and forage for livestock, and long periods of drought have led to the loss of large numbers of livestock in most pastoral areas (Tyson *et al.*, 2000). For example, the drought of 2009 that took place in northern Tanzania decimated upwards of 55% of the local herds in the Maasai section of Emanyara and Longido (Goldman and Riosmena, 2013).

Pastoral communities are extremely vulnerable as climate variability and change is shrinking the rangelands which are necessary for livestock keeping communities in Tanzania. Currently, it is estimated that about 60 percent of the total rangeland is infested by tsetse fly, making it unsuitable for livestock pastures and human settlements (URT, 2007). These impacts will increase sector's susceptibility, which already subjected to other non-climatic challenges especially inadequate extension services and technology, market and infrastructure.

Purpose of the study

The purpose of the study was to assess the extent to which climate variability effects people's livelihoods in Longido District. The research answers the following questions;

- How do local people perceive climate variability?
- What are the effects of climate variability on people's livelihood?

The Study Area

Longido District is one of the newest Districts in Tanzania, formerly part of the Monduli District in 2005. It is situated between latitude 2'20" to 3'10" south of the equator and longitude 36'00" east of the Greenwich meridian.

Longido District has two ecological zones which are the high altitude zone comprising agriculture activities which is about 5 percent of the total area (land) and the low zone which is a livestock keeping zone comprising 95 percent. Economic activities found in the high land zone include cash crops farming (maize, wheat and beans) and improved livestock keeping where pastures and water are found throughout the year. About 132 dairy cattle and 74 dairy goats are kept in highland zone while extensive livestock keeping is practiced in low lands mainly indigenous cattle, goats and sheep. Generally 80 percent of the total populations depend on livestock for their food and earning income for their social services provisional. For that reason, the population of this District obtain food out of their area of about 63 percent. The District has an area of 639,235 hectares used for pastoralism equal to 95 percent of the total area. It has an approximation of 914,707 livestock, 356,664 cattle, 329,683 goats, 192,970 sheep, 22,730 donkeys, 160 pigs, 12,320 poultry and 180 camels with a growth rate of 3.8 percent per year (Longido District Profile, 2009).

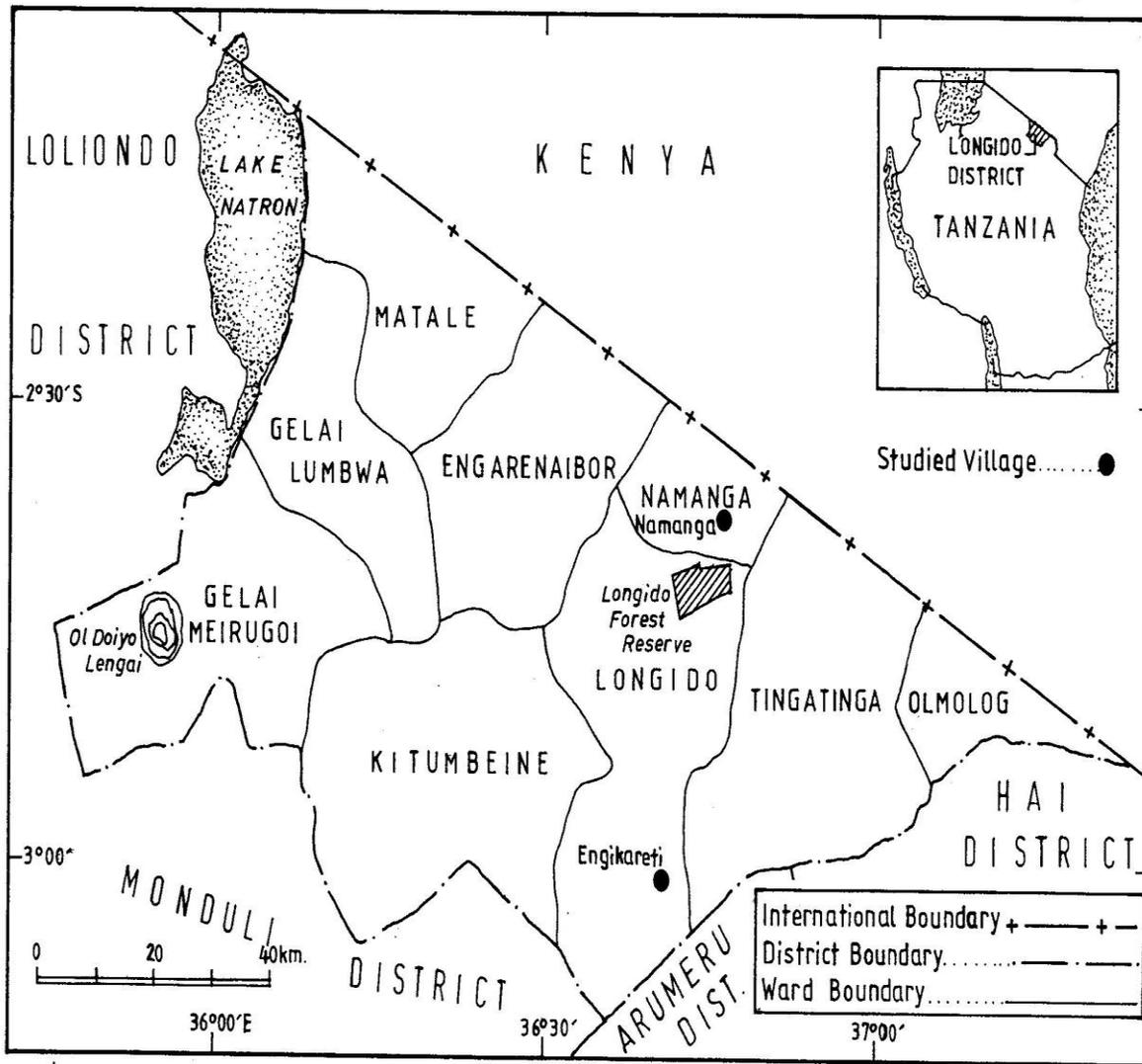


Figure 1: Map of Longido District showing the location of study areas.

Source: Cartographic Unit, University of Dar es Salaam, 2010.

Methodology

The data upon which this study is based was collected in two villages located in Longido district namely, Engikareti and Namanga. In this study both secondary and primary data were collected. Secondary data include relevant published papers and reports, rainfall and temperature data from Tanzania Meteorological Agency (TMA). Primary data was collected using both quantitative and qualitative methods. The qualitative methods used were interview and focus group discussion, also the history of different climate related events over the past years that could be narrated and recorded. Lastly direct observation was done. The quantitative data was collected through household questionnaire interview to a 10% sample of household for each village.

Table 1 : Number of households sampled according to villages

Villages	Number of households	Sample of households	Percentage
Egikaret	508	51	10
Namanga	684	68	10

Source: Field Survey, 2010.

Perceptions of climate variability by indigenous people

Normally, indigenous people are very familiar with their environment and changes that are taking place. Because indigenous people are exposed to the impact of climate variability, they have a better understanding of the implications of climate variability and change to their livelihoods. In determining local people’s perceptions and experiences of climate variability the study found out that local people were strongly aware of climate variability and had clear opinions on variations, especially in rainfall patterns and intensity of climate events. Climate variability was perceived to be a phenomenon that was related to changes in weather elements such as rainfall. Local people’s perceptions regarding climate variability is shown in Figure 2 below;

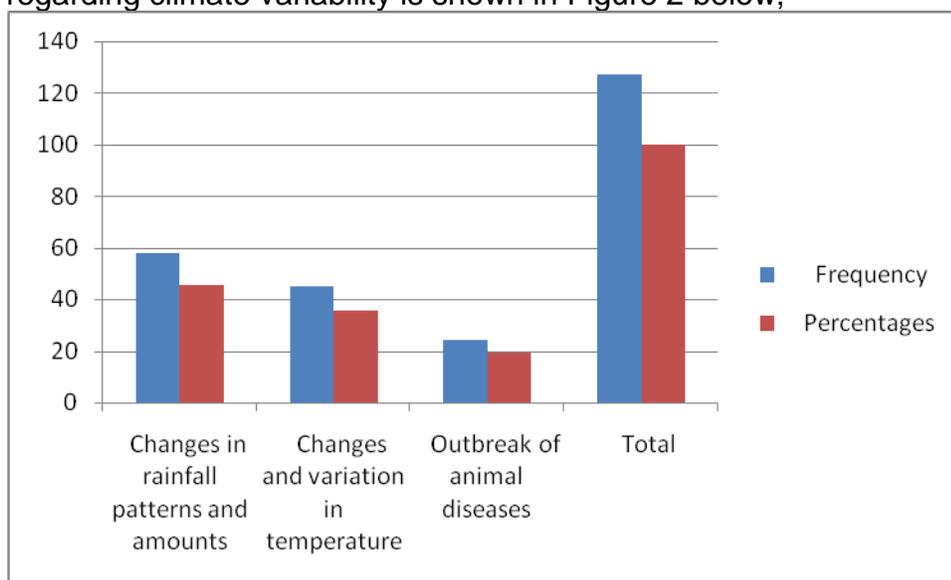


Figure 2: Perception of climate variability by villages.

Source: Field survey, 2010.

As indicated in the table 2 above, majority of respondents 45.4 percent in both studied villages perceived climate change and variability as a phenomenon that has to do with changes in rainfall pattern and amount. On the other hand 35.4 percent of respondents linked changes of variations in temperature as something related to climate variability. Additionally 19.2 percent of the respondents perceived climate variability as something related with outbreak of animal diseases. These results are more or less similar to what has been observed by Maddison (2007); and Liwenga *et al* (2006) who observed that,

climate elements such as rainfall and temperature are normally used by local people to describe climate variability.

Indigenous people's perceptions of rainfall and temperature trends

In determining the trends of rainfall and temperature from local people's observation, the study revealed a uniformity of observation in both villages studied. The overall perception on long term changes in rainfall from the 68.2% of respondents is that, rainfall is decreasing and the community is getting drier. Furthermore, 31.8 percent of the respondents reported rainfall to have fluctuated. It was reported in the past especially in 1970s rainfall was high, adequate and evenly distributed but today, people are experiencing frequent droughts and erratic rains.

"Before, it rained more and the dry season lasted only three months. The other months we had a lot of rain, so there was no problem. These days it rains for just one month in a year and it does not rain solidly for the month. It rains for one day and then stops. I have never seen such drought, it is terrible. We never used to have all these problems".

These responses correspond with the meteorological statistical findings obtained from Arusha station, shown in figure 3 below. Records of precipitation in the area show high rainfall variability. For example, from the office of the Executive District Officer it was reported that for three consecutive year's rainfall dropped from amount of between 400mm and 600mm to between 70.9mm and 178mm (Longido District Profile, 2009).

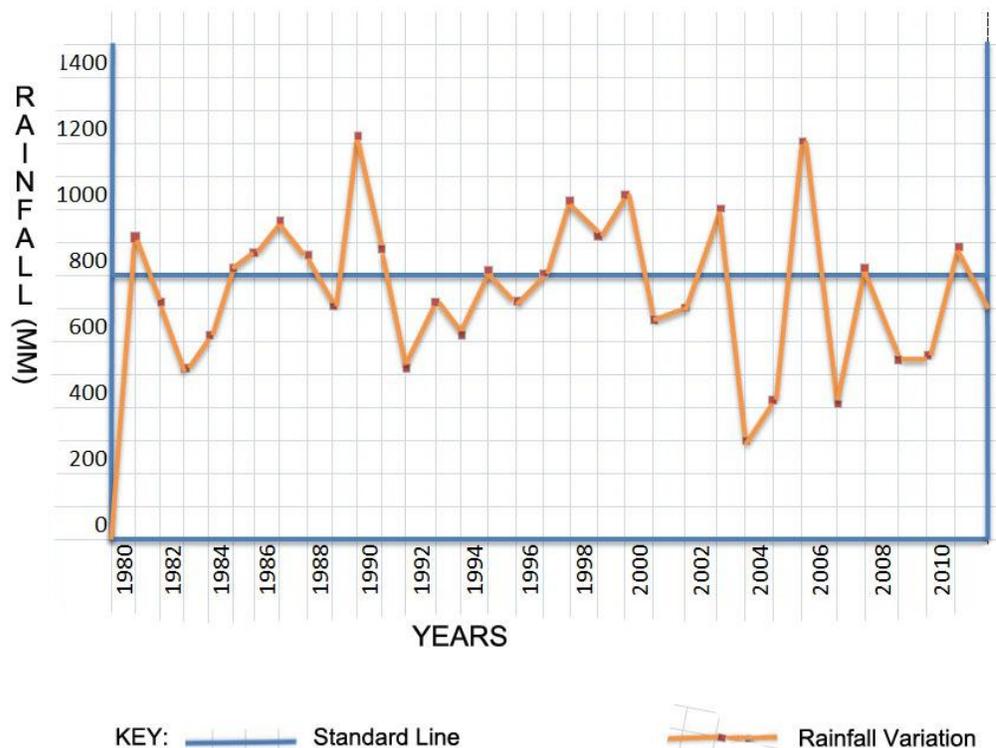


Figure 3: Annual rainfall trend in Longido District 1980-2010.

Source: Tanzania Meteorological Agency, 2010.

Regarding temperature, respondents from the studied villages reported that the average temperature has increased compared to the past. Again, these responses match with meteorological statistical findings as indicated in figures 4&3. Such results seem to suggest that the local people are very good at detecting climate variability and trends in their area which is a basic precondition for adaptation.

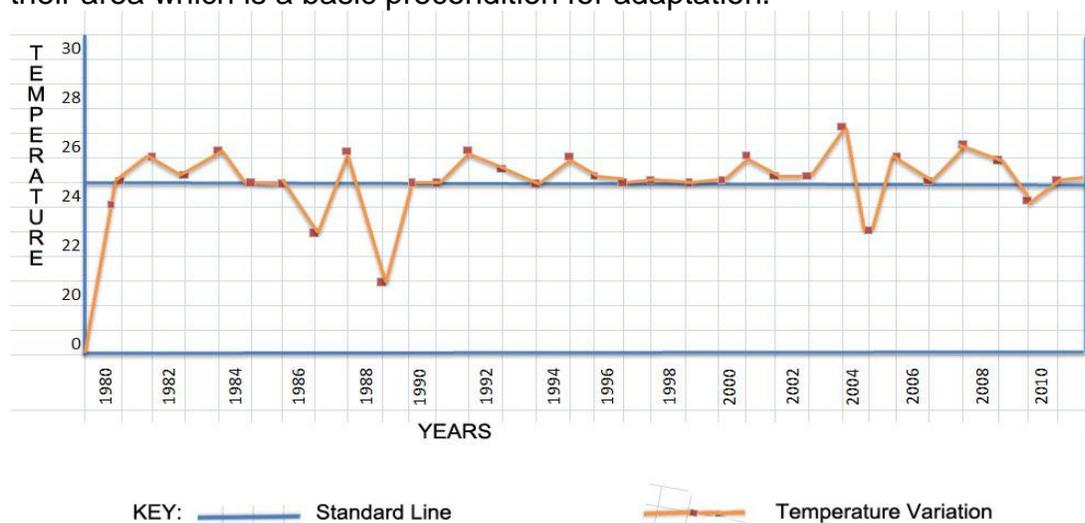


Figure 4: Spatial temperature variation of Longido District 1980-2010

Source: Tanzania Meteorological Agency, 2010

Events related to climate variability

Mertz *et al*, (2008) observed that local communities have a very clear memory of the years dominated by extreme climatic conditions and other significant events leading to disturbances of production. The discussion with respondents was to know years dominated by extreme climatic events since 1980s to date. These periods were chosen because they were able to be remembered and described by local people. It can be noted that the study area has been affected by recurrent drought which has affected people’s livelihood and environment.

Table 2: Historical events related to climate variability in the studied villages.

Years	Events	Impacts
1982/1983	Drought	Death of livestock and Eruption of diseases
1991,1993/97	Drought called engima	Death of livestock especially goats, migration to other places
1998/1999	Floods[El Nino rains]	Destruction of infrastructure, Eruption of Livestock diseases
2003	Drought	Death of livestock and migration of people especially to Kenya.
2005,2007,2010	Severe drought	Death of livestock, Drop of income, Livestock diseases migration for searching water and pasture.

Source: Field study, 2011.

Impact of climate variability on people's livelihood

Livestock keeping is among the key livelihoods in the farming system of the studied villages. Thus, decrease in the amount of rainfall has remarkable impact on this livestock farming.

Climate variability and change and the rainfall patterns in Africa are extending dry seasons and increase the severity of periodic droughts (Yanda *et al*, 2011). Drought is one of the most significant environmental stressors for pastoralists in East Africa. Although drought is a slow onset hazard, it is impacting on more people in Africa than most hazards (*ibid*). The discussion with the villagers revealed that variation in climate has a severe impact on livestock keeping activities and the impact has affected the livelihood of many people in the community and the entire District. This had resulted in a decrease number of livestock. Lack of rainfall had contributed to the deaths and weak livestock.

“If all cattle die we will be devastated. We won't be able to feed our children. If drought continue, we will not be able to buy cloth our children. We cannot afford to send them to school. We are in total shock because all our cows are dying”.

Similar observations were reported by the District officials from the department of livestock in Longido District. In Engikaret and Namanga village the common livestock kept are cows, cattle, goats, sheep and donkeys. The types of livestock kept have not changed much with climate change. The differences can be associated with, among other factors, the availability of pastures and other requirements for livestock. Majority of the respondents were of the opinion that livestock, particularly the grazers, were declining in numbers. Among the factors for the decline of the number of livestock were shortages of quality of pastures and water. According to the discussion with the respondents there were many livestock which died because of persistent droughts. From the sample of 127 respondents the discussion revealed that, in the year 2009/2010, 16,001 cows and cattle, 6276 goats, 4071 sheep and 596 donkeys were reported dead. This is because of the prolonged droughts impacting on pastures and water resources. Deterioration of pastures during droughts and period of overgrazing have resulted in poor health and deaths of livestock, which impact food and livelihood security of those who own livestock (Challinor *et al*, 2007)



Plate 1: Livestock affected by prolonged droughts in Namanga village

Source: Field survey, 2010.

As shown in the figure below 64 percent of the total livestock in the studied villages died. Compared to the past years, the livestock production has decreased. Drought was the most single out cause mentioned by 95 percent of the respondents. Figure 5 illustrated that, goats have high ability to survive in drought conditions compared to other types of livestock. The results are more or less similar to what has been observed by Toulmin (2009), he observed that each livestock species and breed has a different capacity to deal with heat, water and nutritional stress. For example, Africa's commonest cattle breed, *Bos indicus*, increases threefold its consumption of water when the temperature rises from 10 degree centigrade to 35 degree centigrade (NRC, 1981). Camels and goats demand less. Also animals like camels and goats are *browsers* able to reach trees to eat the leaves when no other vegetation is available giving them adaptive advantage over cows and sheep.

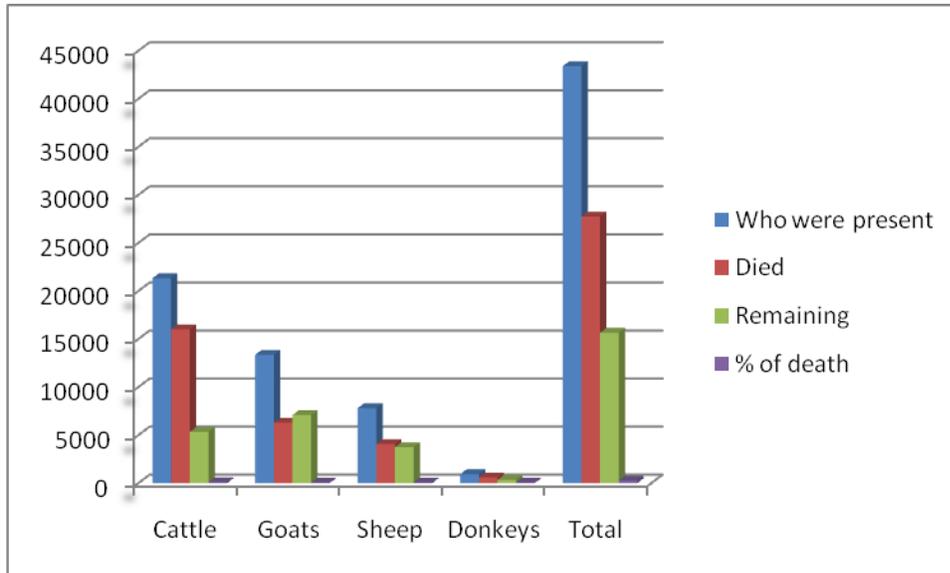


Figure 5: Summary of livestock death in the studied villages

Source: Field survey, 2010.

Basing on the table 5 above, the discussion with the respondents revealed that the normal price for healthier cattle is between 700,000 Tanzania currencies to 1,000,000. In terms of economy (basing on the sample in the bar chart) the community lost about 12,008,800,000 Tanzania money, leaving out goats, sheep and donkeys. This has not affected the families only but also the income of the District and other social services. For example, it was reported that in 2009 that the impact caused the dropping of the capacity of the community to contribute for social services and building of four secondary schools in the District. In the year 2009/2010, the District council was targeting to collect 128,651,000 Tanzanian shillings from its sources and a great source being pastoralism. Only 26,178,612.01 Tanzanian shillings was collected which was twenty percent.

Climate variability and livestock diseases

Livestock production was also reported to have been negatively influenced by increased incidences of livestock pests/ parasites and diseases. The prevalence diseases and pests could be attributed to, among other things, shortage of livestock dips, livestock medications and low financial capacity of people to afford various livestock medications. However, the diseases can also be a result of increased vectors due to the climate change, deteriorating forage quality and shortage of water for livestock (Niang *et al*, 2007). There are evidences associating natural hazards like drought, rising temperature and floods with some of livestock diseases. For example, Anthrax outbreak is often associated with high temperatures and alternating heavy rainfall and drought, while Rift Valley Fever (RVF) spreads rapidly in dry areas following unusually heavy rainfall. Concerning the relationship between animal diseases and natural disasters like droughts, floods and rising of temperature, the discussion revealed that there is a strong relationship between the two. From the Longido District livestock office, the livestock officer gave an evidence of some diseases related to drought, floods and rising of temperature which were reported in the areas under the study..

Table 3: Predominant livestock diseases in Longido District

Bacterial Diseases	Viral Diseases	Protozoa Diseases	Other Diseases
Mastitis	Rabies	East coast fever	Helminthiosis
CBPP	Newcastle diseases	Anaplasmosis	Mange
Black quarter		Coccidiosis	

Source: Longido District Livestock Office, 2009.

Events related to climate variability

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Source: Field study, 2011.

Conclusion

Indigenous people have good understanding of climate variability. Based on their local knowledge, experiences and interaction with local environment, local communities can help to explain the patterns of climate change and other stress factors experienced in their areas. Thus local people observations on climate change should be considered and integrated with scientific knowledge towards forming climate change adaptation strategies and policies.

A detailed long term scientific research should be conducted to verify some of the local indicators that people use in forecasting weather patterns so as to quantify their reliability and relevance. Local knowledge remains the most reliable strategy in the communities studied. Therefore there is a need of recognizing and actively promoting local knowledge through incorporating it into climate variability and change policies and modern knowledge which can add value to development of sustainable climate variability and change adaptation strategies that are rich in local content and planned in conjunction with local people.

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