

Causes of Drought Vulnerability and Indigenous Drought Early Warning Methods among the Turkana Nomadic Pastoralists of Ilemi Triangle Region of Northern Kenya

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Abstract

Drought has remained a major disaster that has contributed to a higher vulnerability among the mobile pastoral population because of its slow onset and accumulative impact over period. Centre for Research on Epidemiology of Diseases (CRED) has quantitatively provided that Kenya has experienced about 19 droughts from 1989 to 2010. These drought scenarios are mainly in arid and semi-arid areas where Turkana belongs but the Turkana nomadic pastoral population has been surviving in such harsh environment where humanitarian assistance is barely absent. Therefore, the researcher in the objective prompts to ask, and find out what mainly causes their vulnerability to drought in such isolated and tough environment and what early warning methods are utilised in Ilemi triangle region. The studies available for this region have concentrated mainly to specific areas of Turkana without touching Ilemi triangle belt in Northern Turkana areas that is more prone to droughts. The study utilises multiple research design and a multistage random, purposive and quota sampling methods. The qualitative and quantitative data were analysed and the findings indicated that low rainfall, recurrent drought and extreme weather conditions are the main cause of vulnerability to drought and it recommended for a comprehensive framework for drought management in Ilemi triangle, preparing population for eventual drought and development of adequate water resources and Government must not only recognise, strengthen, and incorporate the importance the pastoralist's indigenous early warning processes in order to have capacity to predict drought but also ensure the pastoralists are involved in their own drought management plans.

Keywords

Vulnerability, early warning methods, Turkana community, nomadic pastoralist, Ilemi Triangle

1. Introduction

Drought forms a period of months or years that rainfall gets less than the annual average and it results in a severe scarcity of water according to Mayunga (2007). Drought according to Opiyo et al. (2014) has remained one of the major disasters that contribute to a higher vulnerability among the mobile pastoral communities who are the endemic population to drought effects, because of slow drought onset and accumulative impact over a period to their livelihoods. Therefore, it has caused severe economic, social and environmental losses in both developing and developed according to Gupta and Singh (2010).

Mureithi (2012) classifies droughts as to either being meteorological, hydrological and social economic. In Kenya, drought has been experienced almost every ten years in the 1960/1970s to once in every five years in the 1980s (Nkedianye et al., 2011). However, this trend has increased to every 2-3 years in the 1990s and is getting more unpredictable since the year 2000. CRED (2010) has quantitatively provided that, Kenya has experienced about nineteen droughts from 1989 to 2010, mainly in ASAL areas where Turkana belongs.

ASAL of the world make up over 40% of the earth's surface on which over one billion people depend for their livelihoods according to Nkedianye et al. (2011). Drought is more frequent in ASAL region according to Kirkbride and Grahn (2008), Osano et al. (2013) and Nicholson (2014) that already have dilapidated infrastructure and weak rain pattern (Herrero et al., 2009; Reid et al., 2008).

Wakhungu (2013) further suggests that the high frequency of drought above allows no time to recover between droughts and, therefore, populations get more vulnerable to any shock of any nature and intensity. Droughts in Kenya, according to the AU (2010) affect adversely all sectors of the economy and the population as a whole. Speranza (2010) and AU (2010) provide some of the impact of this drought to nomads to include a scarcity of water and pasture for herds, starvation and malnutrition, livestock deaths, altered herd structure, the deterioration of herds condition and a collapse of livestock markets.

Turkana County a high hazard part of Kenya to droughts according to the Kenya interagency Rapid assessment (2014) and Kenya Meteorological Service (2010) do receive annual rain of about 1800mm to 2000mm with an average of 186 mm per year according to Wikipedia (2016). Nevertheless, the nomadic populations of Ilemi Triangle belt (study area) have never left their livestock keeping livelihood option and keep on surviving in such harsh environment where humanitarian assistance is barely absent.

Therefore, this has prompted the researcher to ask and find out what mainly causes their vulnerability to drought in such isolated and tough environment.

Ilemi Triangle region constitutes a four hundred square kilometres triangular disputed area between Kenya, South Sudan, and Ethiopia that has remained a conflict zone between the tribes living in Ilemi both mobile and practice nomadic pastoralism. This complex region according to UCDP (2015) has remained disputed since colonial period with temperatures continually rising, and droughts have

occurred with higher frequency and intensity.

The physical environment inhabited by the pastoral communities remains an important element of the pastoral system and their livelihood options. Accordingly, the Greater Horn of Africa (GHA) countries according to Randall (2008) are among the thirty-six countries in which most of the lands are characterized as arid and semi-arid. These environments according to Opiyo (2013) are considered extreme variable and receive unreliable rainfall both in space and time. Consequently, these areas are characterized by the scarcity of water and seasonal variability of vegetation, and thus, more prone and vulnerability to drought.

Nevertheless, droughts have become part of this nomadic pastoral population natural cycle, with temperature continuously ranging between 24 °C to 38 °C according to Mureithi (2012) and the rainfall ranges between 120mm and 500mm per year. Field (2005) suggests that even with such extreme weather and climate, pastoralists have accepted and coped with such extreme difficult pattern of life. This aridity in the pastoral environment makes other livelihood option like crop production unsupportable. Hence, the livestock productions remain to be the only viable and rational option under the existing technologies and environment to be practiced. Moreover, together with a lack of enough water and pasture in pastoralist environment, certain constraints on pastoralist settlement patterns and livestock production occur (Lind & Scoones, 2013).

A qualitative study in Turkana County by Oba and Ebei (2007) indicated that Turkana County has experienced drought in almost every ten years and their nomadic pastoral environment has been experiencing high temperatures, strong winds, and low relative humidity according to Opiyo (2013). The author agrees with these findings and suggests its adaptation and consideration as it portrays exactly characteristics of the research setting.

The above Oba and Ebei (2007) findings corresponds to another case study by Nkedianye et al. (2011) that found out that Kenya arid and semi-arid area where Turkana belongs since 1960's have been massively vulnerable to constant drought intensity. This severity, intensity and frequencies of these droughts according to Angassa and Oba (2007) have hindered the recovery because the recurrent droughts disrupt the livestock growth before the recovery phase is completed.

Together with the experiences of these recurrent droughts in this pastoral environment, the Turkana pastoralists like any other nomads are usually forced to migrate in and around Ilemi Triangle region, in search of water and pasture for livestock. This movement often trigger conflicts with the neighbouring communities of South Sudan and Ethiopia (UNDP, 2011).

The level of the humanitarian needs in nomadic pastoral environment has of recent increased dramatically and been in ominous critical need according to Murithi (2012). It is therefore, for the opinion that the pastoral system due to recurrent drought impacts can no longer support the basic needs of this pastoral population. Therefore, a huge outcry has been heard and reported recently in the media during the Kenyan for Kenya initiatives in 2011 and in 2017 on drought effects in Turkana County and most affected areas in the County were in the Ilemi Triangle belt. However, the pastoralists in the

region have never left their livestock livelihood option.

A recent quantitative study by Blackwell (2010) on a dry environment and regions of ASAL lamented that pastoralist has been side-lined in all decision-making processes that touches their livelihoods since the colonial period. This side-lining has resulted to chronic under-investment in these pastoralist population areas and hastened their vulnerability to different hazards. Basic services provision such as water within ASAL region according to Blackwell (2010) is inadequately provided or adapted to the pastoralist community way of life. The researcher will look at this service within Ilemi Triangle belt how it is managed.

Water is an important element in the pastoral living and pastoralists do settle in areas and environment where water is present and relocate to areas closer to water sources (Leaky, 2011) and the availability of water according to Haskins (2011) determine the amount of pasture and number of livestock these pastoralists can accommodate. Hence, water has remained an essential commodity in the pastoral population to have for their livelihood sustainability. It is consequently lack of this commodity that migration and drought that conflicts between different pastoral ethnic groups in Ilemi Triangle arise and increase. Hence, water shortages in the pastoral environment and during drought play a crucial role in determining how this conflict will be according to Blackwell (2010) and Kablit and Lokwei (2012).

Study findings by Wabwoba and Wakhungu (2013) have both proposed a holistic approach to be taken in water management and provision in the pastoral environment and communities towards a reduction of such conflicts. Water for livestock needs to be prioritized and be integrated into domestic water projects installations. The government and humanitarian organizations need to assure this must happen in order to alleviate the suffering (OCHA, 2007).

Wabwoba and Wakhungu (2013) study on factors affecting the sustainability of community food security projects in Kiambu County further suggested of encouraging communities own initiatives and interventions in such harsh environment. Coping strategies according to Wabwoba and Wakhungu (2013) are solid approaches that last, sustained and hence, need to be encouraged. Tapping of pastoral community experiences and approaches will not only assist in planning and manage predictable disasters, but also support own community solutions to drought management thus a great empowerment and ownership to community initiatives that promote resilience activities to curb drought effects.

What is known from the above literature is the characteristic of a typical pastoral environment and behaviour of pastoral population in relation to drought is dealt with, however, as many similar pastoral environment is managed differently, and diverse governments manage pastoral affairs differently, it will be sound to understand fully how Ilemi Triangle belt pastoral environment affairs is managed because no much specific information on Ilemi Triangle region on drought related environment has been documented and researched.

Selvarajan et al. (2002) define vulnerability as the extent to which a natural or social system is susceptible to sustaining damage from climate change while Gallopin (2006) describes being the vulnerability as just a concept that has been used in different research traditions, but there is no

agreement on its meaning. However, Opiyo (2013) agree that vulnerability shows the degree of defencelessness or rather powerless to different societal hazards that can vary either because of variable exposure to the hazard.

Vulnerability to drought is a complex topic with many facets and perceptions according to Villagra'n (2006). The lack of universal definitions of both words increases the difficulty in designing an acceptable framework. Vulnerability to drought has both biophysical and social dimensions. The impact of the drought hazard is dependent on the coping capacity of the people and the severity of the hazard, nevertheless, the nomadic population will remain vulnerable if the coping strategies are not put in place and or not the indigenous nomadic pastoralists coping strategies are not strongly supported. The coping capacity of the nomadic population will entirely depends on accumulated assets at biophysical and social levels according to and OCHA (2007). According to Hosseini et al. (2009), vulnerability to drought is caused by factors such as; undeveloped infrastructure, weak authority, ineffective markets, high population growth, desertification, deforestation, inadequate/inappropriate technology, lack of information and awareness, urban development, lack of social benefits and institutional support, lack of communication with macro political and economic systems.

Vulnerability according to Hosseini et al. (2009) has damaging effects to population's livelihood and not just life and properties. According to the above authors, the more affected people are, the more they find it hardest to readjust to hazards effects and reconstruct their livelihoods following the disaster.

A recent case study on resource based conflicts on traditional adaptation to climate variability and change amongst northern Kenya pastoral communities in Wajir County, by Omar (2014) submitted to Masinde Muliro University CDMHA argues that the current ability of pastoralists to respond to drought is limited not only due to the increasing frequency of drought, but also increasing population, a dwindling resource base, conflict, changes in access to land and water, as well as the impact of other shocks such as flooding and disease outbreaks. Moreover, World Food Programme (2016) suggests that this pastoral population vulnerability is mainly associated to being poverty.

Poor community initiatives, involvement, and empowerment in drought management, lack of support to traditional coping strategies and overdependence on traditional livestock livelihoods, poor soil, low government policies on drought management in ASAL regions, illiteracy among the pastoral community among the major causes cited by the Osano et al. (2013) and Nicholson (2014) to be among the top causes of vulnerability to drought hazards.

A similar case study by Murithi (2012) in Turkana County, the research setting, provided a number of causes of vulnerability to drought in Turkana pastoral environment to include; the traditional perception of resources ownership, non-conservation of pasture to be used during the dry season, inadequate security apparatus in the boarders and poor infrastructure in ASAL regions. The author agrees with the above suggestions and suggests a consideration of the above study findings globally but not for Ilemi Triangle of which the study will try to find out.

A multimethod study by Opiyo (2014) on measuring household vulnerability to climate-induced

stresses in pastoral rangelands of Kenya concluded that poor community initiatives, involvement and empowerment in drought management, little knowledge on other modern ways of livelihood, cultural beliefs, habits and traditions, inadequate rainfall and inadequate adaptation to new challenges, lack of support to traditional coping strategies and overdependence on traditional livestock livelihoods as the main causes of vulnerability to drought. Osano et al. (2013) and Nicholson (2014) have also suggested of weak government policies on drought management in ASAL regions, to be among the top causes of vulnerability to drought hazards.

The literature available provides the global causes of Vulnerability to drought within nomadic pastoral environment; however, not much information is documented on the causes of vulnerability to drought in the Turkana nomadic pastoral environment in Ilemi Triangle. Therefore, this study will find out this gap of knowledge in order to provide evidence based information to will be used to put in place measures to guard against excess vulnerability. ILRA (2006) suggests that nomadic population observe plants, solar system, wind and bird's movement, clouds patterns and behaviour of living organism's recognition as their early warning signs for impending drought. These indicators and pastoralists feeling support the traditional early warning system employed by the nomadic pastoralists, usually issued by elders to enable the nomadic population cope with anticipated drought event or a natural hazard.

However, little literature is available online and documented on the early warning system within the population of Ilemi Triangle. Detection of drought eminence by the Turkana nomadic pastoral population of Ilemi Triangle region detect drought has not been researched and elaborated in any relevant study. However, Table 1 information is available with NDMA Turkana County on warning stages adapted to detect drought. However, the Turkana nomadic population will not be aware of such criteria if they are not well educated or informed. Therefore, having not researched, discussed and documented, this study will provide an opportunity to understand the mechanisms of the early warning systems within the Turkana nomadic pastoral population of Ilemi Triangle. This gap of knowledge on the indigenous early warning system methodologies prompts an investigation into what exist that is utilized by the Ilemi Triangle nomadic population to detect drought.

Table 1. Drought Warning Stages Adapted for Turkana and Used by Kenyan National Drought Management Authority (NDMA)

Situation	Description
Normal:	Environmental, livestock and pastoralists welfare indicators show no unusual Fluctuations but remain within the expected seasonal ranges.
Alert:	Environmental and livestock stress indicators start to fluctuate outside the expected seasonal ranges within certain localized areas. An alert stage can also be signaled when unusually low asset status is reached within the district.
Alarm:	Environmental and livestock stress indicators continue to fluctuate outside the expected seasonal ranges and this situation extends to most parts of the district.

Pastoral welfare indicators begin to fluctuate outside expected ranges. Reports of displaced population groups due to collapse of the pastoral system become more frequent.

Emergency: The environment and the pastoralist population are in a state of emergency. Displacement of herders and their families continues due to large-scale mortality of livestock and the further collapse of the pastoralist system. All indicator values including those of pastoralist welfare fall to very low or minimum levels.

Source: Adapted from NDMA (2016).

2. Methods

2.1 Research Context

The study was conducted in two places within the Ilemi triangle region of Turkana County. Turkana County in North West part of Kenya, with a mobile nomadic pastoral population, has a population estimated to be 939,080 people (Kenya Bureau of Statistics, 2009) of whom 90% of their population lives in the remote rural areas that lack infrastructure. The county is bordered by Uganda to the west, South Sudan to the north, Ethiopia to the northeast, West Pokot County to the south, Baringo and Samburu counties to the east.

The Turkana County is mainly made of pastoralist communities with deeply rooted traditional customs and value systems. Customs and traditions include frequent migration, livestock borrowing and cattle rustling that often expose the vulnerable members of the community like women and children to armed conflicts with the neighbouring community's. These regular conflicts do prevent them from accessing other basic services like formal education, health care or practice other livelihood options. The Turkana County do experience high volatile levels of insecurity with frequent attacks from neighbouring Counties and countries, such as the Pokot, Uganda, Ethiopia and South Sudan. Most of the places of these countries lie inside Ilemi Triangle.

Ilemi Triangle region is triangular part in the extreme North of Turkana County, disputed between Kenya, South Sudan, and Ethiopia. The area measures between 10,320 and 14,000 square kilometres according to Collins (2004), Haskins (2010) and Shokri et al. (2008) suggests that this Ilemi Triangle region has witnessed intensive ethnic and inter-boarder conflicts emanating from recurrent drought effects to include the shortage of water, loss of livestock and disruption of the vegetation pattern. Kenya has remained the de facto controller of this Ilemi Triangle. The Ilemi Triangle region according to Collins (2004) has remained disputed land since colonial period with temperatures continually rising and successive drought episodes occurring with higher frequency and intensity. The region is further characterized by the poor road network, inadequate commitment of the veterinary services, health infrastructure, and an inadequate livestock market. These conditions heighten the impacts of drought on pastoralists that live in the Ilemi Triangle region.

Accordingly, Collins (2004) has named the nomadic pastoral communities neighbouring each other inside Ilemi Triangle to include Turkana of Northern Kenya, Jie, Dodos and Karamojong of Uganda

on the West of Turkana, Toposa of South Sudan and Nyangatom of Southern Ethiopia. All these neighbouring tribes inside Ilemi Triangle according to ILRI (2006) and the Kenyan Ministry of livestock (2016) form part of what is commonly known as “Ateger” who speak a similar language, rear livestock as their livelihood option, do often migrate within Ilemi Triangle in search of grass and water for their livestock and have similar social-economic and cultural background. Their economy, therefore, revolves around livestock keeping according to Notenbaert et al. (2007). These livestock include camels, cattle, sheep, goats, and donkeys.

The purposively chosen areas in Ilemi Triangle region of Turkana County for the study Loruth in Kaaleng division towards the West of Ilemi Triangle, in the direction of South Sudan and Napak in Kibish division towards the North of Ilemi Triangle in the direction of Ethiopia. The Kenya bureau of statistics (2010) puts the total demographic information for the two divisions to be 57,647 people while the two study areas at 9667 people; for Loruth (1787) and Napak (1880) with a total of 1600 households. The area is characterized by dry and hot landscapes and ranges with the temperatures ranging between 23 and 38 degrees centigrade average of 216 mm rains usually received during long rains. Kaikor was picked as a pilot area for the study. The choice of the setting was preferred because the nomadic population has lived in the areas for a longer period to easily identify own coping strategies with recurrent droughts, yet these population has never abandoned their livelihood strategy to change to another means of survival. It is to the interest of the researcher to discover how these Turkana communities have been able to cope with recurrent droughts.

The study population are pastoralists living in the selected villages (drought prone areas of Ilemi Triangle), the key informants from the ministry of livestock and water, County officers for disaster management, the member of the County assembly of study area, the community administrator (Chief), local community leader, sub-county administrator in Ilemi Triangle, Turkana metrological station officers, Chief county executive dealing with disasters management and Turkana County disaster management director. Institutions like humanitarian Organizations working in Ilemi Triangle program managers.

The inclusion criteria for data collection were the participants only being the head of the household, adult (>18 years), a Turkana by ethnic group, permanent resident of the area and practice pastoralism. The FDG were for the leaders of various groups and community leaders while the interview guide was done only for the heads of institutions and departments or their deputies and or assistants when the head was not available. The participants were provided with full information about the research to receive his or her consent. Outside these inclusion brackets were excluded.

2.2 Sample and the Designs

A mixed research design of both qualitative and quantitative method was preferred because it outweighed a single research design because it is helpful in designing and validating study instruments according to Biddix (2016). The four hundred households were randomly selected and interviewed to represent the study population. Key informants from the community, ministries and

Turkana County were purposively chosen.

2.3 Measures

With the researcher being a disaster mitigation expert, the research team composed of the researcher, eight research assistants who were mainly university graduates from the Turkana community and two local security staffs. These research assistants were trained to assist with data collection. The questionnaires were pretested to 50 households in Kaikor village and slight adjustments were made accordingly prior to data collection.

The data collection process involved in the operational procedures for both quantitative and qualitative approaches. The indigenous coping strategies were captured using both primary data collection methods. This was with the help of the household questionnaire, interview guides, key informants interviews, focus group discussions and Observation checklist as study instruments. Two hundred questionnaires for each location. These instruments collected data on the household social demographic characteristics like education levels, age, gender, religion and other relevant characteristics; data on factors causing vulnerability to drought, how drought get detected by nomads, impacts of drought on nomadic population and data on community own drought coping strategies.

Key informant interviews were conducted with representatives of relevant departments and or institutions. Exposure of the interviewees and their respective level of education were considered in determining the interviews numbers. These self-administered interview guides on officials were closed ended questions. The purpose of opting to self-administer the interview guide questionnaire was to achieve a maximum and an increased response and reduce the time of processing. The explanation to the officials was provided first before providing the questionnaire. They were informed not only about the study objectives, an importance of their own opinion on survey results but also on confidentiality of the information they provide.

Focus group discussions were used to capture other qualitative information that is not captured in the questionnaire and affirm some of the information from a questionnaire, key informants, interviews, and observations. Two Focal Group Discussions (FGDs) from each study place had questions for discussions. The Focal Group Discussion consisted of local elders, chiefs and assistant chiefs, water point caretakers, food monitors, social workers, community health workers, community focal persons, Community opinions leaders, women group leaders, Youth group leaders and community volunteer's leaders. Their size was 8-12 members.

Observations checklist was used to collect data on general characteristics of the area, economic activities available, and activities by nomads, a general problem seen, solutions and options available and how nomadic pastoralists relate to outsiders. Photography was utilized to capture data observed. Observation sheets will be used to collect general and related information not captured in the other instruments.

Secondary data were received and reviewed from Ministry of livestock, Ministry of water, National Disaster Management Authority (NDMA) and meteorological department all located in Lodwar. This

data was collected to compare, validate and strengthen the above collected primary data. Supplementary relevant literature in scientific and peer-reviewed journals in the Internet and virtual library were further reviewed.

To ensure validity of the study data instruments, the content were analysed by the expert judgments. The questionnaires, observation sheet, and participant information sheet were thoroughly checked by the Masinde Muliro University supervisors and improved, organized consistently with the research objective and expected data. Their feedback was put into consideration. The reliability was ensured by piloting the instruments in Kaikor village to ensure the instrument can be replicated, relied upon and free of errors.

No statistician was involved, and data was collected from the data instruments. This included interview guide, observation, questionnaire and focus group discussions that were edited, coded and arranged, tabulated and entered into an Excel spread sheet in a standard format to allow for analysis of both descriptive and inferential statistics where Statistical Package for Social Sciences (SPSS, version 21) computer software was used. Some information on some variables was collapsed because they were in excess of the study requirements.

In addition to proposal approval from the University of Masinde Muliro, research permit was sought and obtained from the Kenyan National Commission of Science, Technology and Innovation (NACOSTI). All study participants were respected, appreciated and informed of their participation being voluntary with an informed consent sought from all participants before is data collected. There was no citation of participant's identity to ensure involvement and confidentiality.

2.4 Data Analysis

For the demographic and socio-economic characteristics of the sample, descriptive statistics was utilized to analyses data such as Standard Deviation (SD), frequency and percentage, mean and median. Bivariate analyses (Chi-square tests) were used to examine the relationship between the independent variables like age, marital status, gender and income and the coping strategies. In the analysis, a Chi-square P-value of less than $p < 0.05$ (the significance level, 0.05) indicates a no statistically significant relationship between the measured variables. Pearson Correlation test will be undertaken for continuous variables (Porta, 2008) to assess the linear associations between different coping strategies and variables. Pearson's correlation coefficient is a statistical measure of the strength of a linear relationship between paired data. In a sample it is denoted by r and is by design constrained as $-1 < r < 1$. Positive values in the analysis denote positive linear correlation while Negative values denote negative linear correlation and a value of zero denotes no linear correlation. The closer the value is to 1 or -1, the stronger the linear correlation between the measured variables. Frequency tables generated from the above variables, pie charts, and bar graphs were utilized to assist in the visual appreciation of social, demographic characteristics and different adaptability mechanisms used by the nomadic population.

3. Result

About ninety one percent of Loruth respondents and fifty two percent in Napak were female. More than eighty percent of these respondents were married in both locations with more than ninety percent of them not having any basic education. More than fifty percent of the household types were not permanent in both places.

3.1 General Characteristics

Table 2. Demographic and Other Characteristics of the Sample in Each Location (N = 200)

Characteristics	Categories	Loruth (N and %)	Napak (N and %)
Gender of Respondent	Male	19 (9.5)	96 (48)
	Female	181 (90.5)	104 (52)
Age in years of Respondent	18-50 years	186 (93)	177 (88.5)
	>51 years	14 (7)	23 (11.5)
Marital Status of Respondent	Single	2 (1)	8 (4)
	Married	166 (83)	174 (87)
	Divorced	2 (1)	8 (4)
	Widowed	30 (15)	10 (5)
Are you the head of household?	Yes	32 (16)	45 (22.5)
	No	168 (84)	155 (77.5)
Head of the household	Male headed	176 (88)	170 (85)
	Female Headed	24 (12)	30 (15)
Level of education of Respondent	None	196 (98)	189 (94.5)
	Primary	4 (2)	10 (5)
	Secondary	0 (0)	0 (0)
	College and University	0 (0)	1 (0.5)
Type of household	Temporary	137 (68.5)	124 (62)
	Permanent	63 (31.5)	76 (38)
House hold religion	Traditionalist	1 (0.5)	25 (12.5)
	Christian	198 (99)	165 (82.5)
	Muslim	1 (1)	1 (0.5)
	None	0 (0)	9 (4.5)
What is the main source of water for the livestock?	River/spring/stream	8 (4)	92 (46)
	Water pans and dams	189 (94.5)	5 (2.5)
Tick where appropriate	Rock catchment	2 (1)	0 (0)
	Piped water	1 (0.5)	0 (0)
	Wells and Boreholes	0 (0)	103 (51.5)

Almost all respondents had no basic education in Loruth (98%, 196) and 84.5% (169) in Napak while majority of the Ilemi triangle household remain temporary (68.5%, 137) for Napak and 62% (132) for Napak.

3.2 Causes of Vulnerability of the Turkana Nomadic Pastoralists of Ilemi Triangle, Kenya

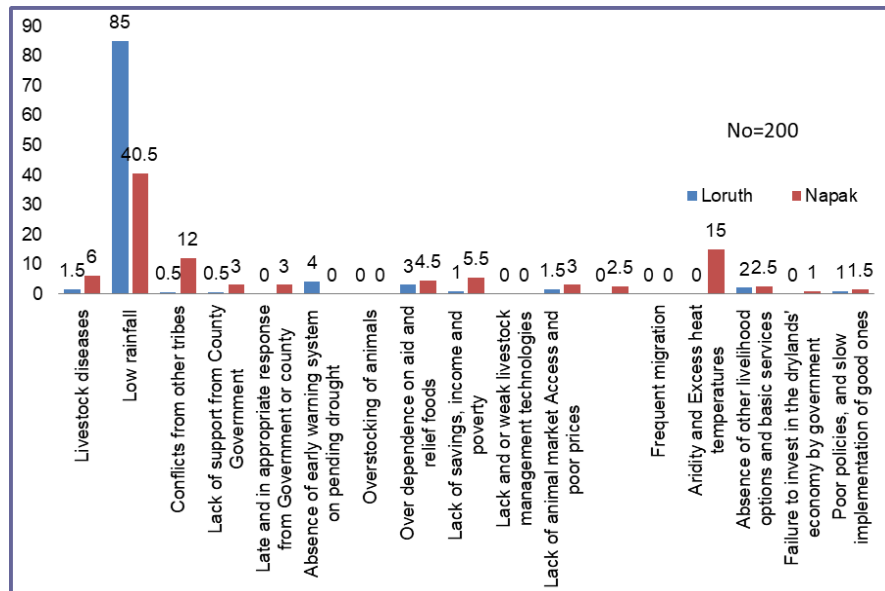


Figure 1. Above Indicates the Main Causes of Vulnerability Identified in the Household Questionnaire

Figure 1 indicates that low rainfall as the leading cause of vulnerability to drought in both villages 85% (170) in Loruth and 40.5% (81) in Napak. Other major factors mentioned by households in both areas were livestock diseases, aridity, and excess heat, over dependence of relief foods and lack of savings and incomes, lack of support from the County and government and frequent raids, conflicts from the neighbouring ethnic groups, lack of early warning system and communication on drought and poor government policies and slow implementation of good ones.

While discussing this vulnerability causes, key informant in Napak mentioned that the Turkana will soon lose all animals because of excessive vulnerability caused by drought, lack of drought information, poor education, lack of clear adapted drought management policies, excessive dying land, lack of drought early warning information from authorities, strong dry winds and heat will eventually make pastoralism to diminish if no radical measures are taken to ensure survival of this livelihood and indigenous options.

The key informants in both areas further mentioned of lack of lasting water solutions, repeated drought without adequate support from the government, poor institutions in the area, and poor market for animal products, poor support of indigenous coping strategies that have existed and absence of strong pastoral traditional institutions that deal mainly with livestock keeping populations.

The key community leaders in Loruth and Napak and researcher observation showed there is sense of overstocking and preference of keeping more animals even when drought bites. Keeping of many livestock in Turkana culture is a source of pride and the author thinks during droughts these stocks are washed away by drought and the nomads then get more vulnerable to effects of droughts. The researcher thinks that if more livestock's are stocked; diseases prevalence can increase and cattle rustling tendencies are elevated. This practice the researcher thinks is redundant because livestock are washed away during drought and options of management of livestock need to be exploited to reduce chances of losing all during drought.

The FGD interviewed in Loruth and Napak view the idea of continuous relief during drought as a catalyst of increasing vulnerability. This is promotes laziness instead other methods of supporting livestock livelihoods can be empowered. The FGD advocated for cash for work programs, construction of dams, roads leading to remove areas construction, planting grass, drilling water and constructing water pans to tap rain water, ensuring availability of livestock market.

The key informants of Napak cited insecurity and excessive use of illegal fire arms in Ilemi triangle that is fuelling war and frequent attacks. According to the key informants in Loruth, the Karamojong of Uganda have invested heavily on pastoralists education, supporting drought coping strategies and drought mitigation programs especially along the pastoralists migratory routes, modified their pastoral drought management policies to be more pastoralists friendlier after taking over all illegal fire arms from Karamojong and receive support from their government in being empowered to take initiatives of improving their livelihoods against drought. These the key informants mentioned this after having had migrated towards Karamojong districts during the recent drought of 2016 and thought could be emulated by Kenyan government to reduce vulnerability. Ugandan government has actively created affairs of the pastoralist special ministry that tackle all nomadic pastoral issues and this is missing in Kenya. The FGD of Loruth lamented that the Kenyan government has done little to improve the population livelihood amid repeated droughts, improper mitigation measures and poor communication of early warning system and coordination of services in this part of Ilemi triangle, Turkana, Kenya.

Nongovernmental local organizations working in Ilemi triangle region interviewed suggested that mitigation measures and drought management require huge investment of which their small budget cannot be able to cater for. This calls for development partners to support the government in findings a long term solution to the causes of this outcry.

Additionally, the Kenyan government, County governments and humanitarian organisation present in Ilemi triangle have both failed to implement viable drought management programs and frameworks of intervention in the region to prevent the extreme impacts of drought that make population more vulnerability barely to any hazard of any magnitude. Up to date according to the key informants, there is no observable, practical strategy and policy that mitigates drought that lessen the vulnerability have been realized. The FGD argued that intervention of relief foods that wait until crisis happen should not be utilized together with the notion that the local population capacity is low towards the coping

capacities. The author contemplates that this kind of perception retards innovation for proper drought management and needs to be dealt with; otherwise, the Turkana nomadic population vulnerability will remain as it is present without any change.

This weak implementation and adaptation of the drought management policy of 2011 to the Ilemi Triangle population makes this population remain vulnerable. The FGD in Loruth lamented these drought policies that are supposed to direct how various drought management components respond to drought have remained non-friendly to pastoralists. This brings back to the importance of having regional blocks like IGAD and East Africa community that can be utilized to make policies and programs for the drought management among the migratory population along common Countries borders.

Turkana being in the remote and isolated part of Kenya, excessive drought challenges and uncoordinated information on drought Early Warning Systems (EWS) remain a factor that hinders drought information flow and increases vulnerability.

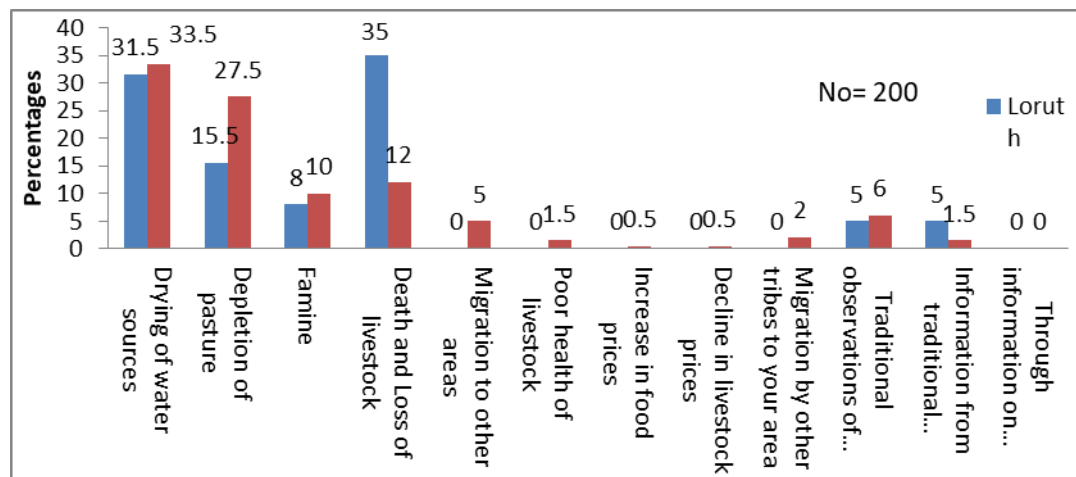


Figure 2. Indigenous Early Warning Methods in Ilemi Triangle, Turkana County, Kenya

Figure 2 specifies that death of livestock (35%, 70), drying of water sources (31.5%, 63) and depletion of pasture (15.5%, 31) are the top indigenous early warning methods utilized in Loruth while in Napak drying of water source (33.5%, 67) and depletion of pasture (27.5%, 55) being the top methods used to detect drought. Other important source of early warning system utilized in Ilemi included traditional observation of sky and birds movement (5%, 10 in Loruth and 6%, 12 in Napak and information from traditional religious leaders (5%, 10 in Loruth and 1.5%, 3 in Napak).

The above findings were affirmed by the key informants from both areas who articulated the importance of including traditional leaders in the drought early warning process. They mentioned of importance of the witch doctor named “Emuron” in Turkana language do provide instruction and information on drought eminence and provide instructions on when to migrate. Therefore, they play a key role in the early warning and coping strategy to drought.

The key informants in Napak and Loruth mentioned eminence of drought to be associated with end of pasture and drying forage, observation of livestock intestines and increased conflict between animals and human for water resources as an evident that drought has strike or coming. These animals according to the key informants of Loruth normally live far and only come close to human habitation because of no sufficient water and feeding. The change of wind patterns and direction especially when wind is moving from east to west consistently for more than three months according to the key informants shows the drought is occurring. But the Northern and winds from the West winds in Loruth bring good tidings and rain for livestock. The FGD from the two areas discussed of decreased water levels in the wells, boreholes and springs, increased distance they travel get water, and change in soil colour.

The key informants from Loruth further mentioned that drought is eminent when there is steady decrease and complete disappearance of rain and strong heat with dusty wind. In Napak, the key informant pointed out disappearance of leaves and fruits as indication of looming drought.

4. Discussion

These findings agrees with study findings by Lind (2005), Orindi et al. (2007) and Grahn (2008) that suggested that provision of relief food in poverty and drought do not only affect knowledge of strengthening indigenous coping strategies, ruins the market systems that grows economy of population but also provides a weaknesses to transition of opting for other livelihoods. The author also suggests that other survival and livelihood options need to be exploited so that over dependency can be reduced and the community get motivated to exploit and improve own traditional coping possibilities. Grahn (2008), however, puts relief foods supply as a short term remedy that can only fill the vacuum of emergency. Hence, the population should not over depend on it entirely because it does not assist in the reduction of vulnerability among different population.

According to DVO (2008), the government of Kenya has done little in terms of infrastructure in this hardship area, early warning on drought has been weak and security and basic services are minimal. The security according to Ruto et al. (2006) is mainly because of a porous uncontrolled Ilemi Triangle border that is facilitating a lot of conflicting tribe's hideouts and uncontrolled frequent cattle rustling. Watson and Binsbergen (2008) further suggest that some retrogressive cultures contribute vulnerability of the nomadic population to drought. With the above major vulnerability causes, this study will identify coping strategies (chapter seven) in order curb the above vulnerability causes.

A number of policies implications can be derived from these study findings to assist in improving the pastoralists' local capacities for managing future droughts. Some of the issues, which need particular attention and recommendations by the policy makers, are highlighted below. Moreover, the Kenyan latest policy that led to establishment of NDMA in 2011 (Republic of Kenya, 2011) laid out the risk reduction awareness and education, and coordinates the implementation of risk reduction programs, drought mitigation and relief activities while generating, consolidating and disseminating drought

management information. These roles according to the key informants interviewed in Napak are not practical bearing in mind the climate change with repeated droughts. Nevertheless, none of the strategy is observed in the areas because nomads do not receive any drought information to make them get prepared.

The above findings of poverty being the other cause of vulnerability are supported by findings from NOKEPDA (2011) studies that explained that the main cause of vulnerability of disasters is poverty level among the populations. However, USAID (2013) argues that the huge disparity in the economic, fragile ecosystems and environment situations, social, unfavourable climate, poor infrastructure and historical marginalization make some populations more vulnerable than the rest who receive adequate support from their respective governments.

Unfortunately, Turkana County have found itself among the vulnerable Counties who lag behind in many social-economic, developments and remain relying on relief food (KFSSG, 2005). Mureithi (2012) study findings shows that Turkana populations vulnerability is exacerbated by Illiteracy, poor cultural, beliefs and traditional practices, traditional livestock values that constrain livestock marketing, poor community initiatives, little knowledge in modern ways of life, and weak adaptation capabilities of the nomadic pastoral population.

4.1 Strength and Weakness of Identified Vulnerability Causes and Early Warning Methods

The drought vulnerability causes in Ilemi triangle are evident and severely aggravated by factors ranging from serious neglect, lack of commitments by governments and humanitarian organisation in ensuring sustainable drought management programs are in place to lessen people's vulnerability. Indigenous early warning systems are observed by the population but there is serious wearing and erosion of knowledge on predicting drought because of recurrent drought in Ilemi triangle, Turkana County and weaker coordinated drought information among the key actors. Therefore, the indigenous drought early warning methods gets weaker and weaker.

4.2 Implication of the Paper to the Health Aspects

One of the most important components of reducing vulnerability, managing drought and protecting communities from disasters impacts is supporting their traditional coping mechanisms that have been neglected and protecting the community's livelihoods from climatic changes. These indigenous coping mechanisms are not well adequately supported by government and available humanitarian organisations thus making these populations more vulnerable. Drought disaster and its effects have contributed not only to public health and social community problems but also a huge outcry especially when the strong drought coping mechanisms get diminished and are not supported by governments. Moreover, having frequent droughts in such already vulnerable and neglected community enable such pastoral populations to move constantly in search of water and grass. In addition to the above, other essential services like human and livestock health care is compromised across the insecure borders where these pastoralists move because no health services are available in these borders and they get easily vulnerable to any hazard. The community is the patient in public health thus needs treatment and

the findings support the need to improve access of health care to such risky populations in the remote setting and target this mobile population.

According to WHO (2017), drought often results in mass displacements of population, leads to water and food shortages and therefore, likely to have a long-term environmental, economic and health impact on the population. The main reasons for mortality and morbidity during drought are the reduced food intake and lack of varied diet that leads to micronutrient deficiency and Protein-energy malnutrition. Vitamin A deficiency according to WHO (2017) increases the risk of death from measles while severe iron-deficiency anaemia increases the risk of child and maternal mortality. According to Noji (1997), migration of population in search of water and grass, loss of buying power and erosion of traditional coping mechanisms and caring capacities limit people's access to health services and can contribute to an overall increase in morbidity and mortality.

There is further association between the communicable diseases increase with drought lack of water. Lack of water supply and sanitation services, malnutrition, displacement and higher vulnerability of the nomadic pastoral population, all increase the risk of infectious diseases such as cholera, typhoid fever, diarrhoea, acute respiratory infections and measles according to WHO (2017).

The strength and the weakness seen in the research findings need to govern the development of guidelines and policies for further interventions that are channelled in improving the health care of mobile population within the national and county strategic frameworks.

5. Summary

The major cause of vulnerability identified by respondents, interviewed humanitarian organisation, FGD, NDMA, political and community leaders included lack of rainfall, aridity and excess heat, absence of other livelihood options, lack of animal markets and poor infrastructure in Ilemi belt, conflicts and raids from other neighbouring tribes, lack of proper County and Government support mechanisms to include weaker implementation of arid and semi-arid land drought management policies, continuous overdependence on relief food packages and lack of savings, income and poverty.

The Turkana nomadic population of Ilemi triangle have used indigenous drought detecting mechanisms before effects are seen. This FGD respondents mentioned of drying of the forage sources; depletion of pasture; death and livestock of livestock; traditional observation of birds, stars, sky, wind and high temperatures than normal; information from traditional leaders and gods and finally poor livestock health as methods of drought detection within them. These traditional drought prediction patterns and practices, and knowledge discussed above for many years have developed acquaintance to enable pastoralists respond to drought effects immediately in their capacity or rather adjust and cope in order not to have bigger effects of drought. However, with the recurrence of drought, the indigenous knowledge, and predictability of drought has long been affected, thus, exposing this population and their livestock, the preferred livelihood option unpredicted drought impacts.

6. Conclusion

The study concluded that there is excessive drought vulnerability causes in Ilemi triangle population ranging from extreme aridity, recurrence of drought, poor infrastructure, and poverty, excessive inter ethnic conflicts related to access to livestock water and pasture within Ilemi region, over dependency on relief handouts without opting for other livelihood options, lack of support for indigenous coping strategies and absence of pastoral institutions and poor early warning system and the current drought management actions are not capable of reducing vulnerability since they do not target at reducing vulnerability.

Although some of the nomadic pastoralists in Ilemi triangle have tried to utilise various traditional early warning methods to predict and manage drought effects effectively, most pastoralists were unable to access modern methods of early warning system principally because of poor early warning systems adapted to pastoralists, eroded drought predictability levels, weakened knowledge resulted from recurrent drought and misinformation on when the next drought occur, lack of resources and greater vulnerability margins. There is an urgent need to provide a proactive functioning early warning framework that will reenergise the early warning system in pastoral environment and recognises and integrates existing indigenous knowledge.

6.1 Recommendation

There is need to make a comprehensive framework for drought management in Ilemi triangle by; preparing population for eventual drought, improving the livestock market-chain access, development of adequate water resources, improvement of livestock health services, prioritizing the road infrastructures, proper border demarcation, introducing credit packages and drought effects compensation mechanisms for nomad, formulation of special ministry for pastoral affairs that reenergises pastoral development programs, capacity building of pastoralists on management of livestock livelihood and drought management related concerns, guaranteeing the security of nomadic pastoral population on the borders and involvement of regional bodies like IGAD that ensure develop a comprehensive and inclusive nomadic pastoral policy framework across the borders.

The Kenyan Government must not only recognise, strengthen, and incorporate the pastoralist's indigenous early warning processes in to the government drought management robust strategies in order to have capacity to predict drought but also ensure the pastoralists are involved in their own drought management plans. They will further require training on drought early warning systems within their environment.

6.2 Recommendation for Further Studies

- 1) The research was on the causes of vulnerability to drought and the coping strategies within Ilemi triangle. There will be a need to find out the effects of drought on the education of the mobile pastoral populations in the Ilemi triangle, Turkana Country, Kenya.
- 2) As the study was limited to Turkana part of Ilemi triangle, there is need to investigate the causes of drought vulnerability and the coping strategies used by other neighbouring ethnic groups who live in

Ilemi Triangle.

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