

# Environmental Drought Effects On Human Vulnerability To The Turkana Nomadic Pastoral Population Of Ilemi Triangle Region, Turkana County In The 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 nineteen 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. The study employed multiple research design and a multistage random, purposive and quota sampling methods. Instruments of data collection used for this study were interview schedule, observation, and questionnaires and focus group discussions. Descriptive statistics using mean, standard deviation, frequency and percentages were used for data analysis for this study. 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. The findings has indicated that there is excessive loss of water for both human and livestock usage; excessive migration leading to conflicts and cattle rustling between the Turkana nomadic population with other neighbouring ethnic groups in Ilemi triangle. The study has recommended for a comprehensive framework for drought management in Ilemi triangle, preparing population for eventual drought and development of adequate water resources and implementation of viable programs that promote livelihoods and supporting traditional coping strategies.*

*Keywords: Drought, Human Vulnerability, Ilemi Triangle, Early warning methods, Turkana community, nomadic pastoralist, Ilemi Triangle.*

## ABBREVIATION

ASAL	Arid and Semi-Arid Landscapes
AU	Africa Union
CRED	Centre for Research on Epidemiology of Diseases
GAM	Global Acute Malnutrition
GHA	The Greater Horn of Africa
FAO	Food Agricultural Organization
FARMD	Forum for Agriculture Risk Management
FGD	Focussed Group Discussion
ILRI	International Livestock Research Institute

NDMA	National Drought Management Authority
OCHA	Office for Co-ordination of Humanitarian Affairs
UNDP	United Nations Development Program
WHO	World Health Organization

## I. 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. Drought 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 livelihood (Opiyo *et al.* 2014). Therefore, environmental drought has caused severe economic, social and environmental losses in both developing and developed nations. 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. Arid and Semi Arid Landscapes (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 have already dilapidated infrastructure and weak rain pattern (Herrero *et al.*, 2009; Osano *et al.* 2013, 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 Africa Union (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. 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 the main drought impacts do this population and what evidence based can be practical and applied, to lessen vulnerability to these drought effects in such populations in order to ensure continued survival in such harsh 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 and 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. These 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 has 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 Mureithi (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 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.

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. These adduces to the fact that this 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.

According to ILRI (2006), drought impact will entirely depend on the recent history of drought events, underlying coping strategies in place, the resilience of the pastoral system and severity of drought in the meteorological form. The first phase occurs when there is a decline in forage production, with an imbalance between livestock numbers and available forage and livestock numbers dwindling through mortalities and sales. The conditions of livestock become worse, grains harvest fails grains prices raise, and livestock prices reduce. The second phase happens when the herd's numbers continue to fall as deaths and sales continue, shortage of grains continue to keep food prices high and continued pressure on herders to further sell livestock in order to purchase food. The final third phase is involved with livestock numbers remaining below the level, which could make effective use of the available pasture with the poorer still be under pressure to sell livestock due to food shortage while the richer households may be able to

reconstitute herds and some pastoral households become totally destitute and must receive food aid.

This is further corroborated by other quantitative studies by Coleen *et al.* (2006) and UNISDR (2009) have both classified these impacts into social, economic and environment impacts. The above authors provided some of the drought impact of drought to nomads to include some livestock deaths, water shortages, soil degradation, acute food shortage and increased migration by pastoralist communities due to depletion of pasture and water for livestock have been reported. The prolonged dry spell was also leading to increases in food prices, which were further compromising the food security for vulnerable populations in Kenya. Omar (2014) has elaborated three main phases of drought that affect the nomadic population. The first phase is concerned with the decline in forage production Imbalance between livestock numbers and available forage, livestock numbers dwindle through mortalities, sales Conditions of livestock become worse and prices rise with livestock prices reducing. The second phase occur when their severe reduction and shortage of grains that will continue to enable prices is increased, number of livestock falling as sell and death of this animals continue and nomads having pressure to carry on selling their livestock to purchase food and the final phase involves and arises when pastoralists get totally desperate for food aid with poor pastoralists having pressure to sell remaining animals due to shortage of food and richer families reconstituting herds. With different definitions and sectors of drought above, Wu and Wilhite (2004) suggest that it is difficult to assess drought impact because these impacts can be local or just regional specific. Moreover, drought can last shorter or longer with these different terms having a huge impact on the agriculture or other different livelihoods options. The impact of drought moreover spread gradually from agricultural sector to other sectors and finally to a shortage of stored water resources becomes noticeable in many pastoral populations (Lekapana, 2013). Impacts of drought (Table 1 and Table 2) can extend beyond the areas physically affected by drought after the event has ended according to Coleen *et al.* (2006). These effects can be diverse and classified broadly as economic, environmental and social. (Table 1 and Table 3).

Type of Drought	Impact of Drought
Social impacts of drought	Lack or poor distribution of resources (Food and water) leading to Migration, resettlement, conflict between water users Increased quest for water leading to Increased conflict among water users Marginal lands become unstable therefore, Poverty and unemployment Reduced grazing quality and crop yield thus overstocking; reduced quality of living. Employment layoffs leading to Reduced or no income in the house holds Food insecurity and therefore, Malnutrition and farming; civil strikes and conflict Increased pollutant concentration ensuring Public health risks Inequitable drought relief therefore, Social unrest and distrust Increased forest and range fires that results in to Increased threat to human and animal life Urbanization leading to Social pressure and reduced safety
Economic impacts	Reduced business with retailers leading to Increased prices for farming commodities

	Food and energy shortages leading to Drastic price increase; expensive import/subsidies Loss of crops for food and income leading to Increased expense of buying foods from shops Reduction of livestock quality enabling Sale of livestock at reduced market price. Water scarcity leading increased transport cost and mobility. Loss of jobs, income and property thus deepening the poverty and unemployment. Less income from tourism and Recreation leading to Increased capital shortfall Forced financial loans Increased debt thus <u>increasing the credits for financial institution</u>
Environmental Impacts	Damage to natural habitats leading to Loss of Biodiversity Reduced forests, crop, and rangeland productivity thus reduced income and food shortages. Reduced water levels therefore, lower accessibility to water. Reduced cloud cover making the Plant scorch Increased day time temperature thus Increasing the chances of fire hazards and dryness of land Increased evapotranspiration making Crop wither and dry More dust and sand storms ensuring an Increased soil erosion and increased air pollution Decreased soil productivity thus Desertification and soil degradation (top soil erosion) Decreased water resources leading to shortage of water for livestock, domestic use Reduced water quality thus More water borne disease and increased salt concentration Increased incidences of animal diseases and mortality and therefore, Loss of income and food; reduced breeding stock. Soil desiccation making soil more vulnerable to be blown or rather Increased soil 'blow activities Degradation of landscape quality therefore, Permanent loss of biological productivity of the landscape Species concentration near water thus Increased vulnerability to predation

Source: Adapted from Coleen et al. (2006).

Table 1: Diverse and global classifications of drought impacts

Moreover, Mureithi (2012) argues that increased disaster contributes to food insecurity, inter-clan conflicts, shortage of pasture, depletion of water resources, lack of proper healthcare and sanitation, increase in school drop outs, early marriages, widespread rural-urban migration, loss of livestock, breakdown of traditional coping strategies, general poverty, loss of livelihood, spread of animal diseases, environmental degradation, deaths, and paralyzed economic activities.

Sector	Effects of drought	Implication
Pasture and rangeland	Reduced production of forage in range land	Increased hay prices/high fodder prices
	Development of sabulous and desert areas	Increased hay feeding
	Reduced utilization of rangeland and forest by products	Unavailability of fodder for livestock
	Changes in vegetation composition of range lands	Desertification
	Reduced productivity of range lands	Increased dust storms Livestock poisoning due to grazing toxic forage
	Reduced regeneration of desert species	

	Produce poor-quality forage	
Livestock	High livestock mortality rate	Income loss for pastoral nomads
	Lack of livestock pregnancy and abortion occurred	Average sale weight reduction
	Weight loss in livestock	Increased malnutrition and famine
	Loss from dairy and livestock products	Increased debt
Environment and Desert	Side losses: increased fodder costs, water supply and parasitic diseases	No money to treat livestock
	Loss of biodiversity	Loss of resilience
	Sand influx	Increased wind and soil erosion
	Damage to shrubs by livestock	Saline-water intrusion
	Loss of forests	
	Increased desertification Increased ground water mining	

Source: Adapted from Wilhite and Vanyarkho (2000).

Table 2: Classification of the impacts of drought on Nomads populations of Ilemi Triangle

The secondary data in Table 2 above, adapted from Wilhite and Vanyarkho (2000) reports on a global assessment on drought provide a unique classification of drought effects on the pastoral population, and per sector. The Turkana mobile nomadic population are not exceptional to have the above impacts of drought. However, for Turkana nomadic pastoral population of Ilemi triangle, the sector involved in the Table 2.3 are pasture and rangeland, Livestock and Environment and desert.

## II. RESEARCH DESIGN AND METHODOLOGY

### DESCRIPTION OF AREA OF STUDY

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 communities. 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 to 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.

#### SAMPLING PROCEDURE, DATA COLLECTION INSTRUMENTS AND DATA ANALYSIS

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. The purposively sampling was employed in choosing 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 was 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. 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. The study population were 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, 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. 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 informant's interviews, focus group discussions and Observation checklist as study instruments and 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. For data analysis, inferential and descriptive statistics were employed for this study. 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.

### III. RESULTS AND DISCUSSIONS

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.

#### A. RESULTS

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)
What is the main source of water for the livestock? Tick where appropriate	None	0 (0)	9 (4.5)
	River/spring/stream	8 (4)	92 (46)
	Water pans and dams	189 (94.5)	5 (2.5)
	Rock catchment	2 (1)	0 (0)
	Piped water	1 (0.5)	0 (0)
	Wells and Boreholes	0 (0)	103 (51.5)

Table 3: Demographic and Other Characteristics of the Sample in Each Location (N = 200)

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.

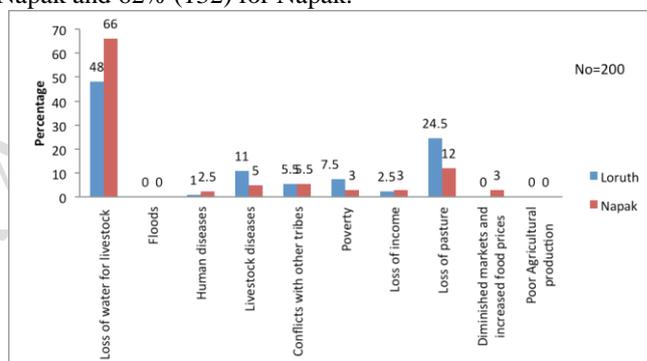


Figure 1: Impacts of drought in Ilemi triangle, Turkana County, Kenya Identified in the Household Questionnaire

Figure 1 indicates that loss of livestock (66%, 132 in Napak and 48%, 96 in Loruth), loss of pasture (24.5%, 49 in Loruth and 12%, 24 in Napak) livestock diseases, increased conflicts with the neighbouring tribes, poverty, loss of income and human diseases are top impacts to droughts in that order.

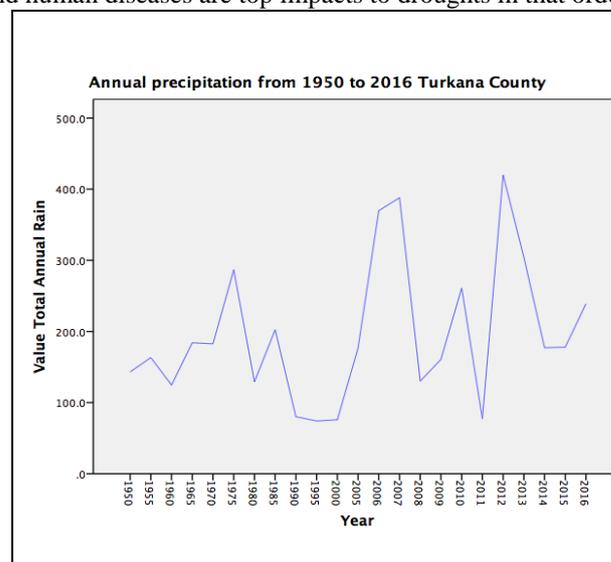


Figure 2: Annual precipitation of Turkana County, Kenya from the year 1950 to 2016 Source: Researcher compilation using SPSS 21 (2016)

Figure 2 indicates fluctuation of rains and period of severe drought since the year 1950 when the amount of rain was very little and this lack of enough rains accordingly makes the pastoralists and their livestock vulnerable.

During the discussion with the FGD in Loruth, the group highlighted that droughts have brought a lot suffering to the population especially when water and grass for livestock diminishes. This loss of grass and water in the excessive sun heat lead to emaciation of livestock (Figure 6.5) that was not bought in the market and no one willing to buy them and will definitely die. A similar trend of emaciation was seen in Napak where the researcher observed some families migrating to the mountainous areas of Ilemi Triangle where grass and water was sought to be available. When probed more for how they ranked these impacts; Loruth focal group discussion mentioned water shortage as the first impact then followed by loss of livestock due to lack of grass, migration and poverty as their top lists of effects of drought. Napak group listed famine, raids, livestock diseases, human disease, and migration to places for pasture in that order as their main effects of drought in Ilemi triangle. Furthermore, one other Key informant's leader interviewed in Napak when probed lamented that many enemies and wild animals surround them because the drought effects has made them to migrate out of their places, with loss of forage and livestock grass. The drought, therefore, results to water shortage; encourages pastoral populations' competition for the inadequate available resources and increase in conflicts.

Year	Goats	Sheep	Cattle	Camel	Donkey
1993	0	0	153,350	63,153	0
1994	0	0	165,000	94,000	0
1995	1,704,000	862,000	198,000	112,800	0
1996	1,788,667	894,333	201,960	114,492	0
1997	1,833,333	916,667	200,000	115,230	0
1998	1,833,333	916,667	200,000	115,230	0
1999	2,168,100	1,084,050	234,420	144,960	0
2000	1,626,000	813,000	176,000	138,000	32,000
2001	1,626,000	813,000	176,000	138,000	32,000
2002	1,951,200	975,600	193,600	140,760	32,640
2003	1,951,200	975,600	193,600	140,760	32,640
2004	2,021,000	1,054,400	197,900	172,400	35,160
2005	2,021,000	1,054,400	197,900	172,400	35,160
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	5,994,881	3,517,148	1,534,612	832,462	558,189
2010	6,023,656	3,545,285	1,638,947	865,177	591,077
2011	6,052,570	3,687,097	1,311,158	899,178	625,903
2012	6,081,622	3,834,581	1,594,368	934,515	662,782
2013	6,111,054	3,987,964	1,942,399	971,242	701,833
2014	6,140,387	4,147,481	1,882,399	1,009,412	743,184
2015	6,169,861	4,313,380	1,945,312	1,049,082	786,972
2016	0	0	0	0	0
2017	0	0	0	0	0

Source: Researcher (2017) and Turkana County ministry of Pastoral economy and fisheries / Livestock (2017)

Table 4: Estimated Representation of the livestock census from 1993-2017, Ilemi triangle, Turkana, Kenya

The numbers of livestock the nomadic pastoralists possess during drought signposts the severity of drought experienced in a given year. The severity of drought goes in hand with the

livestock numbers. The lesser the animal numbers the severe the drought effects experienced. Table 4, informs of missing data of livestock population between the years 2006 to 2008 and from 2016 to 2017, this missing data the researcher argues can be a sign of laxity among the Turkana County ministry of livestock staffs. The researcher understands that in settings like Ilemi Triangle that is prone to conflicts and drought, the livestock populations play a key role to advocate for change of livelihood option or strengthen the existing ones and their coping strategies.

Findings in table 4 illustrate the number of Shoats (sheep and goats) that remain always largely reared animal by the pastoralists unlike camels, donkeys and cows. The key informants in the ministry of livestock in Turkana County mentioned that these Shoats are typically reared because they are easy to be sold for food and exchanged for money to complement food received from humanitarian originations during drought period. However, the researcher argues that pastoralists do keep huge number of livestock as a sign of power and wealth. Moreover, the table 4 provided no evidence or records documented by the Turkana County ministry of Livestock for the census of livestock loss or numbers of livestock lost in each household during different droughts. It will, therefore, be sound; the researcher argues to ensure a good record of such loss during drought to understand and compare the dynamics during drought of different nomadic pastoralist population in the northern Kenya.

Year	Local (Turkana) name	Local description	Approximate mortality rate of animals
1925	Ekwakoit	Bad hunger.	60%
1930	Abrikae	Drought and bad hunger.	70%
1942	Lolewo	Bad animal disease and all people were starving	80%
1943	Ekuwan Loyang	Drought and famine.	70%
1947	Ata Nachoke	Animal disease and famine.	70%
1949	Ngilowi	Animal disease.	70%
1952	Lotira	Animal disease, drought and famine.	61 %
1953	Lokulit	Bad years, famine continued.	65%
1954	-	-	-
1960	Namotor	Drought and famine	55 %
1966	Etop	Serious but short drought.	65%
1970	Kimududu / Kibebek	Drought	54%
1971	Lolewo	Cholera epidemic, many deaths.	60%
1979	Loukoi, Lopiari, At anayanaye	Animal disease (CCPP, anthrax), security problems, famine.	70%
1981	-	-	-
1984	Kilejok, Kidirik	Minimal rain, animal raiding.	70%
1990-1992	Lokwakoyo / Akalkal	Skins everywhere, many livestock bones everywhere	53 %
1994	Ngakalalio/Nanyeye	South Sudanese migrated to Ilemi after drought , serious but short	60%

1997	Etop	Serious but short drought.	80%
1998	Itaok ka Akimiet and akisikiniet	Small drought as milk was available , minimal rain	50%
2000	Erupe a Munyes Logara / Epompo	Very serious with a lot of animal death	85%
2001	Kidirik	Drought making people move straight to other land	65%
2004	Kanyangiro	Migration to Kanyangiro in Uganda after drought	60%
2005	Kumando	Drought and bad hunger. Drought, which terminated everything.	60%
2006	Lomoo	Named after animal disease PPR in Turkana	65%
2007	Ngasaja	Donkey with harness. People migrating with donkey far looking for grass and water for livestock after drought effect	70%
2008			
2009	Lopiar, Epoo Lokwarasmoe	Skins everywhere, many livestock death, dry grass of animals	75%

Source: Researcher compilation (2016) and Turkana Drought Contingency Unit (1992).

Table 5: Drought Occurrences in the two Study areas presented by the respondents since 1925

Number	Identified impacts by 10 people in Loruth	Total Score	Mean	Rank
1	Fall in Fodder availability	272	27.2	1
2	Fall in herd's productivity , Fertility of the herd falls, Milk output falls ,Weight of animal's falls and Death rate rises	265	26.5	2
3	Long distance Movement Conflicts with other neighbouring headers and ethnic groups Increased death due to change in diet and exposure to diseases	265	26.5	2
4	Increased demands for grains and Sale of stock and livestock in and out of Ilemi Triangle belt	248	24.8	4
5	Change in wealth distribution	212	21.2	5
6	Out migration of Labour and Fall in efficiency of herds management	80	8.0	6

Source: Researcher compilation (2017)

Table 6: Ranking of the effects of Drought on Pasture in Loruth by FGD, Ilemi Triangle, Turkana County Kenya

Number	Identified impacts by 12 people in Napak	Total Score	Mean	Rank
1	Fall in Fodder availability	285	23.75	1
2	Long distance Movement Conflicts with other neighbouring headers and ethnic groups Increased death due to change in diet and exposure to diseases	270	22.5	2
3	Fall in herd's productivity , Fertility of the herd falls, Milk output falls ,Weight of	268	22.3	3

	animal's falls and Death rate rises			
4	Increased demands for grains and Sale of stock and livestock in and out of Ilemi Triangle belt	252	21.0	4
5	Out migration of Labour and Fall in efficiency of herds management	62	5.1	5

Source: Researcher compilation (2017)

Table 7: Ranking of the effects of Drought on Pasture in Napak by FGD, Ilemi Triangle, Turkana County Kenya

Year	Total Annual Rain (mm)	Standard Deviation ( $\sigma$ )	Drought severity index (SPI-Standardized Precipitation Index)	Drought Category
1950	143.1	24.7	- 2.86	Extreme
1955	163.3	20.2	- 1.94	Severe
1960	124.7	15.4	- 3.37	Extreme
1965	184.2	31.0	- 1.16	Moderate
1970	182.7	26.2	- 1.22	Moderate
1975	286.6	35.7	2.62	Normal
1980	129.3	22.5	- 3.19	Extreme
1985	202.5	26.2	- 0.49	Mild
1990	80.2	8.10	- 5.01	Extreme
1995	74.1	8.60	- 5.24	Extreme
2000	75.9	12.7	- 5.27	Extreme
2005	176.6	24.3	- 0.18	Moderate
2006	369.8	44.0	5.70	Normal
2007	388	31.1	6.37	Normal
2008	130.2	16.7	- 3.16	Extreme
2009	160.8	30.5	- 2.03	Extreme
2010	261.2	29.0	1.68	Normal
2011	77.3	8.80	- 1.00	Moderate
2012	420	38.2	7.60	Normal
2013	304.4	33.9	2.62	Normal
2014	177.2	13.8	- 0.64	Mild
2015	178	28.6	- 0.28	Mild
2016	239	44.2	1.12	Normal

Source: Researcher compilation (2016)

Table 8: Drought Severity in Turkana between 1950 and 2016 and calculation using Standardized precipitation index

From table 8, it is evident that drought was frequent and severe in the period 1950 to 1960 and from 1990 to 2000 and period between 2008 to 2009. These periods were characterized by excessive livestock loss and the category of drought was generally severe and extreme.

## B. DISCUSSIONS OF THE FINDINGS

Drought survival among pastoralists in Africa is increasingly becoming arduous. Each drought episode when it happens, results in excessive disruption of the poor survival strategies even in areas where massive handouts of famine relief by governments and donors is present. The negative effects of drought are threatening to inverse the development gains in many parts of the world especially in sub-Sahara Africa according to Davidson *et. al.* (2003) and is undermine efforts to protect livelihoods in Africa (Simatele, 2012). Oberg and Holmgren (2006) suggests that the rainfall patterns in Sub-Sahara Africa region where Kenya and Ilemi Triangle belong is becoming unpredictable and the precipitation has decreased tremendously with the temperatures rising. This increase in temperature and reduced rain precipitation due to drought effect has reduced the livestock production in many parts of Sub-Saharan African Countries (Biggs *et al.*2008). As the Turkana nomadic community in Ilemi triangle have to survive and the researcher wished to understand what major droughts impacts are realized by the Turkana nomadic pastoralists of Ilemi Triangle region. Impacts of drought on the pastoral system according to Wabwoba and Wakhungu

(2013) and Mureithi (2012) are long lasting and create not only long-term economic and ecological disaster but also a widespread migration even to the urban centres. Moreover, because many countries experiencing drought episodes do lack a clear defined long-term drought contingency and emergency preparedness plans especially for nomadic pastoral lands and in general, development has not been a national priority of such arid and semi-arid areas.

Nevertheless, according to UNDP (2005) and Wilhite, *et al.* (2006), the impact of drought essentially depends on societal vulnerability and coping capability at the time and place where drought happens. Therefore, drought-impacted societies, humanitarian organizations, and governments need to put drought near the centre of their sustainable development priorities. This is not only because more pastoralists are seeking outside support than ever before because of drought affect but also many arid and semi-arid regions population remain dispossessed seeking for survival through multiple mechanisms Opiyo (2013). These drought impact findings are consistent with the findings from a similar quantitative study conducted by Williams (2006) in the Hausa and Fulani nomadic pastoralists of Niger after a severe drought of the year 2005, that found out that the prices of commodities, millet and sorghum increased by more than 80% while livestock prices dropped by more than 100%. According to Mekanne (2006), drought is one of the main causes of conflict in the nomadic groups. Therefore, having drought and conflicts together, according to Mekanne (2006) do intensifies the suffering and the vulnerability this nomadic pastoral population is exposed to. From the researcher observation in Loruth, the common basic household's products and food price were too far expensive and generally triple than those in bigger town like Lodwar (the capital of Turkana County) and Kakuma. This increased market products prices cannot be afforded by many nomadic pastoral families that are poor hence, increased poverty.

The study finding corresponds further to the observed livestock condition in research area and those from the discussions with the humanitarian organisation interviewed, working in Ilemi Triangle that mentioned that the major drought impacts included lack of water and pasture for livestock, emaciation for livestock and people that mainly lead to loss and death of live. A study by Mekanne (2006) highlighted that with drought, there is a drop in water levels from the traditional water wells and water acquirers, the loss and drop of milk production from livestock and sudden migration of pastoralist before the next cycle of rain is received while study findings by Adan and Pkalya (2008) confirms these findings by elaborating that when drought intensifies, livestock is lost, hunger spreads and conflict over waters and pasture surges between different warring nomadic pastoral communities.

Additionally, Mekanne (2006) have both elaborated that the common settings where conflict is derived by drought remain the arid and semi-arid regions. These regions according to UNDP (2003) are characterised by inadequate capacities, resources and are usually under significant ecological pressure. Therefore, in already depleted resource setting like Ilemi Triangle, when drought strikes, the living conditions of these nomads and their livelihoods become very

difficult. According to UNDP (2003), drought and other natural disasters do disrupt people's lives through affecting displacements, destruction of livestock livelihoods options and property and bringing in deaths. These disasters do subsequently retard years of development thus posing a major challenge to the achievement of the Millennium Development Goals especially the target of halving extreme poverty by 2015. The cyclic nature of natural disasters in Kenya especially recurrent droughts in Ilemi triangle has constantly eroded the recovery capacity of communities especially in the ASAL region, thus, affecting the economic development year in year out. Below *et al.* (2007) suggests that these frequent droughts destroy property, brings misery to the populations and loss of livestock. Moreover, failure to have the expected amount of rainfall according to OCHA, (2010) has led to several droughts in Kenya during the last 25 years mainly 1975, 1977, 1978, 1984, 1992, 1997, 2005 and lately 2008; 2009. Accordingly, OCHA (2010) suggests that these droughts have been countrywide although some areas in the arid and semi-arid areas have been more severely affected than other parts of Kenya. These periods of reduced rainfall have been followed by widespread famine leading to loss of livestock and evidently loss of lives. The severity of these disasters have gradually increased ranging from estimates of 20,000 in 1977; 10 million in 2009 affected and the trend increases with coming drought disasters which translate to need for more relief (OCHA, 2010). However, if no subsequent vigorous attention and planning to mitigate the effects exist then vulnerability hastens. However, according to Mekanne (2006), people's lack of capacity to respond to natural disasters and lack of early warning systems deteriorates the drought effects.

The above findings further resemble the Huho *et al* (2010) study findings in 2009 that showed that drought has resulted in the loss of Maasai livestock in Mukogondo Division of Laikipia District from starvation. Therefore, since livestock is the main source of livelihood to pastoralists, their decimation disrupts pastoral socioeconomic existence. Lekapana (2013) study on the "socioeconomic impacts of drought on pastoralists, their coping strategies and government interventions in Marsabit County, Kenya" findings correspond to study findings when he mentioned that drought leads to poor health of pastoral households and their livestock. Cases of malnutrition in Ilemi triangle have increased due to drought and a recent nutrition survey conducted in June 2016 by KIRA and the survey clusters of Turkana reported a very critical nutrition situation in Turkana north where Ilemi belong to have Global Acute Malnutrition (GAM) rate of 23.4% which is >20% rate in the WHO classification rates of being in the critical condition. This malnutrition according to Lekapana (2013) does affect mostly children of under 5 years, whereby over 200 of the under five years old children have suffered from acute malnutrition following the year 2011 drought, and there are increased drought episodes owing to food insecurity. ILRI (2006) study in Ethiopia described the Ethiopian disaster of the year 1983-1984 in Borana that it reduced the cattle density to about 60% and death of 42% of all the Borana livestock. This drought according to FAO (2006) and ILRI (2006) reduced 92% of milk production, subsequently reduced the livestock market prices, and increased cereals prices. Thereby, it had forced many Ethiopian households in Borana

according to the author to ILRI (2006) to change their diet composition from more milk to more grain and daily food consumption ratios. However, as Lind and Scoones (2013) argues, meteorological type of drought cannot be avoided, nevertheless, its impact to include famines and poverty, can greatly be prejudiced by a timely and effective intervention of institutions and both national governments and humanitarian organisations.

The above findings correspond to a study conclusion by Griffins (2016) that suggested that because of drought, water shortage and depletion of boreholes led to a mass migration of pastoralist families from Somalia to Ethiopia, loss of water and increase in staple food prices. In addition to that, mass migration of pastoralists with their livestock according to the key respondents interviewed in Napak have led to a shortage of animals in local available markets, triggering a price increase of basic commodities and a loss of income for those whose livelihoods depend on the trade. This migration consequently triggers their vulnerability. Moreover, the above drought impacts correspond to study findings by according to Ebei, Oba and Akuja (2007) who suggested that drought brought increased livestock mortality, poverty, urban migration and weakened social security institutions and over dependency on food relief.

The drought impacts causes populations in Ilemi triangle to migrate, get exposed to volatile neighbouring ethnic groups and lack of sustainable approaches to drought management in Ilemi forms a backbone of problems this mobile population receive as drought keeps on recurring and huge impacts remain unmanaged. Weaker coordinated drought management information in Turkana County have worsened the effects of drought. One of the most important components of reducing effects of drought, managing drought and protecting communities from disasters impacts is supporting and making their traditional coping mechanisms strong to counter drought impacts. 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

m 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.

This has study revealed that the huge impacts drought has brought to the Turkana nomadic population of the Ilemi triangle with impacts ranging from loss of water for both human and livestock usage; excessive migration leading to conflicts and cattle rustling between the Turkana nomadic population with other neighbouring tribes in Ilemi triangle to include Toposa, Dasanach, and Nyangatom because these pastoralists have to frequently move in search of these commodities and replace the lost livestock through rustling ; loss of pasture and ensuring land is dry; reduction of forage; food insecurity; livestock diseases and poverty. Pastoralists have to depend then on relief food assistance provided by the government, humanitarian organisation, and the County government. Increase cattle rustling in Ilemi triangle in other way leave the households impoverished. However, the Ilemi triangle mobile population immediately with information on impending drought migrate immediately to other areas, sell livestock especially in Loruth that is not far from other major centres outside Ilemi triangle, population wait and rely on humanitarian relief aid or hand-outs, sending part of the family to other relatives to reduce food consumption in the household; liquidity the assists and livestock and livestock products and start small business in order to earn more money to counteract drought effect .Therefore, drought affects pastoral livestock systems essentially by reducing the amount of forage available and thereby leading to the death of livestock because of starvation.

#### IV. CONCLUSIONS

The study findings showed that the reduction of forage and water for human and livestock usage, excessive migration leading to increased cattle rustling, loss of pasture, food insecurity, livestock diseases and poverty remained the top most impacts of drought seen in Ilemi triangle. There is an urgent need to provide a proactive functioning approach that will reenergise the disaster management system in pastoral environment.

## V. RECOMMENDATION

To lessen drought impacts, the pastoralist's need to be supported in reducing the causes of vulnerability and roll out programs that target the prevention of drought impacts to include provision of relief pasture, contingency funding and obligating hay mitigation stocks that can be used in critical periods, endorsement of adequate water supply mechanisms in Ilemi Triangle and around migratory routes. This water can further be used to germinate drought resistant pasture species to be utilized during drought. There is need not only to invest on research to explore other suitable and sustainable economic empowerment options for mobile but also support in encouraging destocking of larger livestock before drought begins, provide preventative livestock health measures and vaccination, cash for work programs initiation, support to markets and livestock traders, and scale up safety net programming and a well-coordinated multi-purpose cash transfers to the nomadic pastoralists.

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