

Assessment of vulnerability levels and coping strategies of pastoral communities to climate variability and change: A case study of the West Pokot, Kenya

G M Muriithi, E Mutuma, J M Kinyua¹, A S Kaptalai² and K A Kipronoh

Beef Research Institute-Lanet, Kenya Agricultural and Livestock Research Organization (KALRO). PO Box 9657-20100 Nakuru, Kenya

muriithigm@gmail.com

¹ **Chuka University, Kenya**

² **Ministry of Livestock, West Pokot, Kenya**

Abstract

The study was conducted to assess the vulnerability levels and coping strategies of the West Pokot communities with a view to recommending appropriate adaptation measures. Both case study and cross sectional research designs were used. Interview schedules, guides and livelihood indicators were the tools used in the assessment of vulnerability and adaptation to climate change and variability. The sample size of respondents was 106. Statistical evidence of climate change was computed from historical climatic data of West Pokot County. It included daily rainfall, number of rain days and maximum and minimum temperatures for 31 years. Majority (62%) of the household respondents were highly vulnerable to adverse effects of climate change and variability. Households headed by women showed highest (63%) vulnerability levels and the poorest coping strategies to the adverse effects of climate change and variability against 53% for men.

Key words: *adaptation, rainfall, socio-economics, temperature, vulnerability*

Introduction

The study by Kibria et al (2017) reported that climate change [the rise in temperatures ($T^{\Delta^{\circ}}C$), ocean acidification (OA), sea-level rise (SLR) and extreme events (EE)] is an additional threat and risk to world fisheries, aquaculture, and seafood security, in addition, to existing threats posed by other stressors. The Sub-Saharan Africa (SSA) is not exceptional to the adverse impacts of climate change, pastoralist communities live in arid and semi-arid lands (ASALs). Their livelihood is highly dependent on natural resources, which are sensitive to even slight changes in climatic conditions. Thus, the current trend of changing climate poses a threat to their livelihood. Briefing by IIED (2015) reported that climate-vulnerable communities often live in, and rely on, harsh natural environments such as drylands and mountains. According to Arnell (2007) climate change is not just a problem for the end of the century. It is a problem that we are experiencing here and now. It is posing a real threat to society.

Natural variations in climate, which occur even without human interference, also have a profound impact. According to Hoven et al (2010) climate change is a global phenomenon; its negative impact

is severely felt by poor people and poor countries. Oxfam et al (2008) pointed out that it has become common knowledge that vulnerability to climate change is closely related to poverty and therefore vulnerability and adaptation to climate change are urgent issues among many developing countries. Sub-Saharan Africa (SSA) countries are heavily dependent on agriculture. These countries lack resources or other necessities to fully deal with the social and economic effects of the natural disasters associated with climate change.

From the early 1960s, Kenya has generally experienced increasing temperatures over vast areas. The key sectors affected by climate change include agriculture and rangelands. Rangelands are the backbone of Kenya's pastoralism. How vulnerability varies across Kenya is something that is yet to be determined (Mutimbas 2010). Mude (2007) argued that whatever climate change and variability impacts, it is widely acknowledged that poor communities, already vulnerable to a set of existing risks and endowed with meager resources will be the most adversely affected as climate change is superimposed on their already serious situation.

According to the World Meteorological Organisation (2011), socio-economic information is needed in the climate arena for two main reasons: firstly, human and their economic systems are the source and drivers of environmental change, including climate change; secondly, they are impacted by climate and are the users of climate information.

To be able to adequately address climate change in a sustainable development context, one must begin by carrying out vulnerability and adaptation assessments (Olmos et al 2001). According to Winograd (2004) in the case of climate change, vulnerability may be defined as the degree to which a system is likely to cope or be incapable of coping with the adverse effects of climate change, given the extent of the impact and adaptive capacity. Downing et al (2004) adaptation involves the management of risks posed by climate change, including variability.

Methodology

Study area for Assessment of Vulnerability and coping strategies Survey

West Pokot County is located in the Rift Valley region of Kenya and borders Turkana County to the North, Baringo County to the East, Elgeyo Marakwet County and Trans Nzoia County to the South and Uganda to the West. It covers an area of 8,418.20 Km² and has a population of 512,690 people. Although the agriculture is the major economy, nomadic pastoralism is practiced with beef and dairy cattle, sheep, goats, camels and chicken being reared. The County has an ASAL experience food deficient and is food insecure. Also, it is situated where extremes of climate variation such as drought and unpredictable rainfall patterns, coupled with famine and related humanitarian disasters, are being experienced. The study was narrowed to Kongelia and Sigor divisions in Central and West Pokot Sub-counties respectively as shown in Figure 1 below;

Figure 1. Map of Kenya and extract of West Pokot County showing areas surveyed;
Part of Kongelia and Sigor divisions as labeled in the map

(Source: <https://www.google.com/search?q=West+pokot+county+maps&tbm>)

Both quantitative and qualitative data were collected in this study. Case study and cross sectional design were used for data collection. Stratified random sampling was employed to draw sample size of 106 pastoral households. For a more complete sampling frame of pastoral households, we adopted the snowball sampling technique (Mugenda 1999). According Downing et al (2004) interview schedules, guides and livelihood indicator tools can be used in the assessment of vulnerability and

adaptation to climate change and variability. This study adopted the aforementioned tools in collecting the quantitative and qualitative data.

Historical climatic data on daily rainfall and maximum and minimum temperatures for 31 years were obtained from the Kenya Metrological Department (KMD). The data were analysed using Instat and Genstat software respectively. The survey data were collected and analysed by use of the statistics package for social scientists version 17 (SPSS). Focus group discussions (FGDs) were taped and eventually transcribed

Results

The findings presented were generated out of the specific objective to examine the effects of climate change on the socio-economic conditions of the pastoralist life community due to climate change and variability. Human voices derived from the FGDs are also presented to enhance explanation of the findings. Below is the summarized profile (Table 1), indicating the scores allocated to categories of vulnerability level to adverse effects of climate change among the pastoralist community.

Table 1. Summarized profile of the pastoralist community vulnerability levels

Vulnerability level types	Summarized profile
High Vulnerability	Household whose household head had no education at all, was not living in own house, was earning less than a dollar a day, and had lost all the livestock through drought. Based on the above criteria, respondent was awarded 25 points.
Medium Vulnerability	Household which had livestock as the sole source of livelihood. Occupation for head of household was subsistence farming and casual employment on farms. Respondents in this category were awarded 15 points each.
Low Vulnerability	Household head with high, reliable income and living in own, permanent house. Had education above primary school level and owned large head of livestock. Respondents were awarded 5 points.

Source: Household Survey data (2011)

Figure 2. Rainfall trend over 31-year study period

Figure 2 shows that there was a rising trend in the amount of rainfall received over the 31-year study period. This rising trend is coupled with rainfall variability observed in the rainfall pattern. Figure 3 reveals variability in the number of rain days with a decreasing trend over the period under study. The highest number of rain days observed was 43 in 1982 while the lowest was 11 days in 1984 and 2000.

Figure 3. Number of rain days per year during the study period

The Figure 4 below shows mean of monthly temperatures for maximum and monthly maximum and minimum during the study period. In all the trends, variation is observed. This confirms that, variability in temperature has been witnessed within the study period.

Figure 4. Means of monthly temperatures, maximum monthly temperatures and minimum monthly temperatures during the study period

Figure 5. General vulnerability level of pastorals' households *Source: Household Survey data (2011)*

The findings in Figure 5 above demonstrate that the levels of vulnerability of the household respondents. The majority 62% were categorized as high relative to the respondent categorized as low in vulnerability were on 8%. This implies that majority are highly vulnerable.

Table 2. Vulnerability to Adverse Effects of Climate Change and Gender of Household Head

Vulnerability level	Gender of household head (%)	
	Men	Women
High	56	63
Medium	28	44
Low	9	0
Total (n)	90	16

Source: Household Survey data (2011)

Further, the research findings showed that majority 63% in Table 2 above who are in high vulnerable level are women headed household.

Table 3. Vulnerability to Adverse Effects of Climate Change as Influenced by Marital Status

Vulnerability level	Marital status of the respondent (%)		
	Married monogamous	Married polygamous	Separated/divorced
High	60	65	50
Medium	31	28	50
Low	9	7	0
Total(n)	58	46	2

Source: Household Survey data (2011)

Table 3 above shows majority 65% of the interviewed household respondents were headed by polygamous men. This implies that they were the most vulnerable to the adverse effects of climate change and variability. It is most likely in a polygamous household; there are more demand of resources which can be constrained by the context of climate change and variability in the ASAL.

Table 4 below summarizes information on the highest levels of education attained by the respondents and reasons for not completing primary school education. The majority 36% attempted the primary level but did not complete. However, majority 43% claimed that they did not complete their primary level due to drought/famine.

Table 4. Highest Level of Education of Respondent and Reasons for not Completing Primary School

Education level of the respondent	Frequency	Percentage
Highest level of education		
Pre-Primary	6	6%
Illiterate	22	21%
Primary(not completed)	38	36%
Kenya Certificate Primary Education (KCPE)	28	27%
Kenya Certificate Secondary Education (KCSE)	4	4%
Diploma	7	7%
University degree and above	1	1%
Total	106	100%
Reasons for not completing primary school education		
Drought/Famine	46	43%
Forced marriage	14	13%
Culture	19	18%
Lack of School Fess	27	25%

Source: Household Survey Data (2011)

Table 5 below shows the relationship between the highest level of education attained and vulnerability to climate change and variability. The majority 100% of those who were dropouts at pre-primary and also who are illiterate are highly vulnerable. It is also noted that, those who hold diploma university degree and above the lowest vulnerable to climate change adverse effects.

The occupations of the respondents are summarised in Figure 5. The majority 76% of the interviewed household respondents were farmers. Based on this finding, it is most likely that majority are affected by the adverse effects of the climate change and variability. This particular finding corroborate the Adger et al (2003) findings, that the societal vulnerability to the risks associated with climate change may exacerbate ongoing social and economic challenges, particularly for those parts of societies dependent on resources that are sensitive to changes in climate. It is further evidenced by Serdeczny et al (2015) findings that, the repercussions of climate change will be felt in various ways throughout both natural and human systems in Sub-Saharan Africa particularly vulnerable to these climatic changes are the rain-fed agricultural systems on which the livelihoods of a large proportion of the region's population currently depend

Figure 6. Main occupation/source of income for the household head (Source: Household Survey data (2011))

Discussion

The data shown in Figures 1 and 2 imply that torrential rainfall has been a common scenario. The rainfall leads to flooding, affecting the socio-economic condition of pastoralists' lives and eventually causing environmental degradation. This finding is in agreement with that reported by FAO (2006), which stated that the precipitation pattern has changed as a result of human-induced climate change, representing one of the most serious global environmental problems.

The observation that the majority of the household respondents were highly vulnerable to the adverse effects of climate change and variability is in agreement with that made by Kulkarni et al (2007). They noted that vulnerability to climate change is considered to be high in developing countries due to social, economic and environmental conditions that amplify susceptibility to negative impacts and contribute to low capacity to cope with and adapt to climate hazards. It also supports the findings by Olmos et al (2001) that pastoralist communities are hit hardest by the adverse effects of climate change since they rely entirely on natural resources for their livelihood. This came out clearly in focus group discussions, during which a participant stated as follows:

"Since 1965 the climate changed, hence peoples' lives also changed. The government stepped in and started giving aids like tinned foods up to date. There were fortune tellers who predicted the absence of rains and famine so people prepared to harvest forest fruits during that time. Many weak people and livestock died, said James, an old Pokot man of 85years in a focus group discussion".

The United Nations (2010) attributed the following statement to an old man: “In my 80 years living as a pastoralist it has never been like this. The rainfall pattern has been unpredictable and there is a migration of pastoralist from this country to the urban centers’ of Nairobi, Uganda, others. The few animals we have that have survived the drought are plagued by new diseases that we do not know. Our livestock is dying and we fear disease might be transferred to human”

In this study, households headed by women were more vulnerable to the adverse effects of climate change than those headed by men may be attributed to the African traditional culture, where men control most of the resources. Thus, households headed by women fail to develop sufficient resilience to cushion them from such effects. Thanh et al (2008) argued that more women than men work in household/micro and small enterprises, they are often worst hit and least able to recover as a result of disaster. Further, the 52nd Session of the Commission on the Status of Women (2008) found that women make up a large number of the poor in the communities that are highly dependent on local natural resources for their livelihood and are disproportionately vulnerable to and affected by climate change.

Women’s limited access to resources and decision-making processes increase their vulnerability to climate change. Further, the current study confirmed the finding by Chagutah et al (2010) that children, orphans, and elderly populations, especially women, were more vulnerable to the adverse effects of climate change such as floods and drought. Majority of the house respondents who practiced polygamous marriage exhibited higher vulnerability levels than those from monogamous families. This is obviously due to the fact that they have more dependants hence a greater burden.

It the current study, majority of the household respondents reported to have attempted primary school and never completed schooling due to occurrence of drought/famine associated with climate change and variability. This observation is explainable by the pastoralists’ nomadic mode of life which frequently interrupts school work.

Conclusion

- Whereas most of the households in West Pokot are vulnerable to the adverse effects of climate change and variability, the effects are most severe on women and children.
- The effects have adversely impacted negatively on the socio-economic drivers such as education, sources of income such as livestock keeping, health of the community and generally food security.
- Water shortage also has a major effect.
- Majority of the pastoralists have become dependent on relief food.

Recommendation

From the study findings, it is recommended that pastoralists embrace a community–based adaptation approach. An early warning system for drought in combination with timely market interventions and the establishment of financial institutions can increase the ability of pastoralists to transform those livestock which cannot withstand the stress of the drought into other assets such as cash, fodder or

food grains.

Area for further studies

Based on the current findings, more work is needed on vulnerability and resilience to climate change. More ways on how to educate the communities on the dangers and impacts of not embracing the reality of climate change should be found.

Acknowledgement

We thank the Rockefeller Foundation for funding this study.

References

Adger W N, Katrina S H, Conway B D and Hulme M 2003 Adaptation to Climate Change in the Developing World. Progress in Development Studies, **3** (2003) pp. 179–195.

Arnell N 2007 Solution to your Business Needs. Walker Institute for Climate System Research University of Reading, UK.

Chagutah T 2010 Climate Change Vulnerability and Adaptation Preparedness in Southern Africa, Zimbabwe Country Report, Cape Town , South Africa.

Commission on the Status of Women 2008 Gender Perspectives on Climate Change, 52nd Session Paper. Retrieved July 17, 2012 from www.un.org/womenwatch.

Downing and Zwiervogel 2004 Capacity Strengthening in Climate Change Vulnerability and Adaptation Strategy Assessment.CTA.Columbia.

Downing T E and Patwardhan A 2003 Assessing Vulnerability for Climate Adaptation. Oxford, United Kingdom. Retrieved on 25/12/2011 from www.cckn.net.

Food and Agriculture Organization 2006 Gender: The Missing Component of the Response to Climate Change. Retrieved July 17, 2012 from www.fao.org.

Hoeven A A, Ben H, Brown M M, Chio T, Johnston J D, Kabba J O, Nielson P, Topter K, Zeul HW and Zhang S H 2010 Poverty and Climate Change: Reducing the Vulnerability of Poor through Adaptation, Department for International Development, UK. Retrieved July 17, 2012 from www.oecd.org.

IIED 2015 Vulnerable Communities: Climate Adaptation that Works for the Poor. London, United Kingdom. Retrieved June 16, 2017 from <http://pubs.iied.org/17329IIED>

Kibria G, HaroonA K Y1 and Nugegoda D 2017 Climate Change Impacts on Tropical and Temperate Fisheries, Aquaculture, and Seafood Security And Implications. Journal of Livestock Research for Rural Development 29 (1) 2017. Retrieved January 1, 2017 from <http://www.lrrd.org/lrrd29/1/kibr29012.htm>.

Leary N, Kulkarni J 2007 Climate Change Vulnerability and Adaptation in Developing Country Regions. Final Report of the AIACC project. Washington DC 20009. U.S.A.

Mude A, Ouma R, Van de Steeg J, Opiyo D and Tipilda A 2007 Kenya Adaptation to Climate Change in the Arid Lands: Anticipating to and Coping with Climate Risks in Kenya. ILRI Research Report 18, Nairobi, Kenya.

Mugenda O M, Mugenda A G 1999 Research Methods; Quantitative & Qualitative Approaches, Nairobi, African Centre for Technology Studies Press.

Mutimba S, Mayieko S, Olum P, Wayama K 2010 Climate Change Vulnerability and Adaptation Preparedness in Kenya, Nairobi, Kenya.

Olmos S 2001 Vulnerability and Adaptation to Climate Change: Concepts, Issues, Assessment Methods. University of Guelph, Canada .Retrieved December 27, 2011 from www.cckn.net.

Oxfam 2008 Survival of the Fittest: Pastoralism and Climate Change in East Africa.116 Oxfam Brief Paper.

Serdeczny O, Adams S, Baarsch F, Coumou D, Robinson A, Hare W, Schaeffer M, Perrette M and Reinhardt M 2015 Climate change impacts in Sub-Saharan Africa: from physical changes to their social repercussions. Reg Environ Change DOI 10.1007/10113-015-0910-2. Retrived January 1, 2017 from <https://www.researchgate.net/publication/290194107>.

Thanh L C 2008 Women's Vulnerability and Policy Framework for Climate Change Adaptation. Metro Manila, Philippines.

United Nations 2010 Advocating for Safe Movement as a Climate Change Adaptation Strategy for Pastoralists in Horn and East Africa, Nairobi, Kenya.

Winograd M 2004 Background on Frameworks, Methodologies and Tools for Vulnerability and Adaptation Assessments: How to Move from Reactive to Proactive Approaches. CIAT, Colombia. Retrieved December 28, 2011 from www.c3d-unitar.org.

World Meteorological Organization 2011 Climate Knowledge for Action: A global Framework for Climate Services-Empowering the Most Vulnerable. Geneva, Switzerland.