

Impact of Climate Variability on Pastoral Households and Adaptation Strategies in Garissa County, Northern Kenya

M. Okoti¹, J. Kung'u² and J. Obando²

¹*Kenya Agricultural Research Institute, National Agricultural Research Laboratories (Waiyaki Way), P.O. Box 14733-00800, Nairobi, Kenya*

²*Kenyatta University, School of Environment, P.O Box 43844, Nairobi, Kenya*

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ABSTRACT This study documented the impacts of climate change in the pastoralist communities of northern Kenya and their adaptation strategies. A sample of 350 households was used and data collected using household questionnaires, focused group discussions and key informant interviews. Other information was collected from grey literature. From the study the households understand the changes in climate and its impacts of their key livelihood source, that is, livestock. Chi square tests show a highly significant relationship between climate variability and impacts on livestock production and adaptation strategies. The impacts documented include weakened animals due to trekking long distances in search for pasture and water; loss of livestock due to lack of feed and water; limited/lack of suitable feed and water; increase of pests and diseases and increased livestock-wildlife conflicts. Under climatic variability impacts, the community has over the years been practicing various adaptation options. These include investments in livestock species resilient to drought (there was a general shift towards camels); migration in search of pastures and water; livelihood diversification; livestock off take before a major drought; restocking and increase in the watering interval for all livestock. Diversification of livelihoods included arable/crop agriculture; business; remittances; relief supplies; informal employment and selling wood fuel. This was undertaken according to household's adaptive capacity. This information on livelihood diversification is critical and informs the national policy and planning sectors on climate change adaptation strategies in pastoral areas in arid and semi-arid lands in Kenya.

INTRODUCTION

Kenya is one of the developing countries in Africa experiencing impacts of climate change. This is affecting many socio-economic sectors namely agriculture, water resources, forestry, fisheries, ecological systems, human settlements, health and with significant effect on the national food security (Thornton et al. 2008; Brown 2007). Mean annual temperature in Kenya has increased by 1.0°C since 1960 representing an average rate of 0.21°C per decade. It is projected to increase by 1.0 to 2.8°C by the 2060s and 4°C by the year 2100, causing variability of rainfall by up to 20 per cent (Kabubo-Mariara 2007). Evidence of changing annual and seasonal precipitation patterns, including shifts in timing and duration of rainy seasons, decreased crop yields, increased temperatures and frequency of extreme weather events mainly droughts and floods has been documented (GoK 2010; Maitima et al. 2009; Orindi 2005; Osbahr and Viner 2006). These changes have increased the vul-

nerability of many communities and regions. Vulnerable groups include more than five million smallholder farmers engaged in different types of agricultural practices such as subsistence crop/livestock production, pastoralists and agro-pastoralists (Heath et al. 2010).

Impact of Climate Variability on Pastoralists

Pastoralism is a complex livelihood system seeking to maintain an optimal balance between pastures, livestock and people in uncertain and variable environments. Despite the important role pastoralism plays in supporting local livelihoods, in contributing to national and regional economies in some of the world's poorest countries, and in providing diverse ecological services, its capacity to adapt to change is facing many challenges, including those posed by climate change (Nori et al., 2008). The quality, quantity and spatial distribution of natural pastures are mainly shaped by rainfall. Predicted changes in rainfall patterns are bound to result in increasingly scarce, scattered and unpredictable pastures (Bai and Bent 2006). There are also significant negative consequences including loss of livestock through heat stress or colder seasons; increase

¹Address for correspondence:

Telephone: 0710696251

E-mail: michaeldominion@gmail.com

in animal pests and diseases; loss of land to agricultural encroachment as the rise in rainfall raises the productive potential of the dryland areas; an increase in frequency of flooding, and the spread of human and livestock diseases that thrive during the wet season; declined animal performance such as growth, milk production, and reproduction (Oxfam 2008; Elasha et al. 2007; Seo and Mendelsohn 2008; McDermott 2001; McCarthy et al. 2001; Thornton et al. 2006; Osbahr and Viner 2006). The results have been food insecurity in the most parts of Arid and Semi Arid Lands (ASALs).

Adaptation to climate change and risks takes place in a dynamic social, economic, technological, biophysical, and political context that varies over time, location, and sector. This complex mix of conditions determines the capacity of systems to adapt. Adaptation has been defined by the IPCC (2001) as adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Initial attempts at adaptation appear to have mainly been anticipatory and planned, using large-scale modelling of primary and secondary impacts to inform policy choices and expenditure decisions. Such an *ex ante*, top-down approach lends itself to large-scale, technological solutions to climate change (such as improved infrastructure, flood protection, or improved seed varieties). A more recent approach to adaptation appears more inductive in nature, based on the existing coping strategies of communities and individuals at risk (Huq and Reid 2007). This approach builds on the substantial literatures on indigenous technical knowledge and coping strategies.

Whereas in the past there was, in certain areas, a degree of livelihood specialization in the drylands of Kenya, this is no longer the case with the changing climatic scenarios. This process of diversification represents a major adaptation not exclusively to climate change but to economic pressures as well as policy influences. These strategies include: building up herd size as insurance against times of hardship; splitting herds across different locations and movement; keeping different species and breeds to make use of different ecological niches; selecting animals for different traits that enable survival in prevalent conditions; loaning surplus animals to family and friends for their subsis-

tence requirements and building of their herd, to develop and strengthen social relations as a form of social capital; crop diversification; mixed crop livestock farming systems; using different crop varieties; changing planting and harvesting dates; and mixing less productive, drought-resistant varieties and high-yielding water sensitive crops; use of irrigation; exchanges and resource management; agricultural extensification (bringing new units of land under cultivation); livelihood diversification (creating a portfolio of natural resource base and other livelihood activities) and matching the number of animals to the availability of natural pastures and water, which is partly achieved through mobility (Orindi and Murray 2005; Adger 2003; IIED 2008; Pavoola 2004; Salick and Byg 2007; Scoones 1998; Hesse and MacGregor 2006). These strategies ensure the rational use of the natural resource base on which the pastoral livelihoods depend. The main objective of this study was to document the pastoralists perceptions about climate variability, its impacts on their livelihoods and how they have been adapting to the same.

MATERIAL AND METHODS

Study Area

Garissa district in Garissa county covers an area of 33,620 square kilometres and lies between latitude 0°58'N and 2°1'S and Longitudes 38°34'E and 41°32'E. The district is low-lying, with an altitude ranging between 70m and 400m A.S.L. Tana River, running along the Western boundary of the district, is the only permanent river and has a tremendous effect on the climate, settlement patterns and economic activities within the district. Rain falls in two seasons, the long rains in March to April and the short rains in October to December. Because of the low altitudes, temperatures are high ranging from 20 degrees centigrade to 38 degrees centigrade. The population of the district is concentrated in small pockets surrounding water points and market centres.

Data Collection

Primary data collection involved conducting household interviews for 350 households among the pastoral communities in Garissa and Tana river district indicate data collected. During the household interviews data on perceptions about

climate variability, livelihoods, impact of climate variability on livelihoods and adaptation strategies was collected. There were six focused group discussions (FGD), to discuss issues of climate change and livelihoods. Secondary data included information from government reports and other reports from projects carried out within the study areas. The data was analyzed using descriptive statistics in the SPSS software.

RESULTS AND DISCUSSION

Perceptions about Climate Change

About 98.6% of the respondents (n = 357) in the study area indicated that they had observed climatic variability over the years. From the results, the community indicated that the greatest cause of climate variability was God – 63.5% of the respondents (n = 357). During the focused group discussions it was observed that this was a punishment in response to man's disobedience to Gods ways. Studies by Johnsen et al. (2011) in Zambia and Yohannes and Kifle (2009) in Ethiopia recorded the same perceptions from the households surveys. The second factor given as a cause of climatic variability was man (44.2% of the respondents), thirdly natural causes (21.8%) and lastly others (2.3%). Man was seen to cause climatic variability indirectly or contribute by his negative actions on the environment, for example, clearing of vegetation for settlement and farming in the fragile environment. The exposed land becomes hot and increases evaporation of the little moisture in the soil, exacerbating the impacts of the natural climatic changes. Responses for indicators given for observed climatic variability are summarized in Table 1.

Table 1: Indicators of observed climatic variability

Indicator	Frequency	%
Increase in temperatures	252	73.0
Reduction in rainfall levels in all seasons	236	68.4
Change in wind patterns	211	61.2
Increase in the incidences of floods	53	15.4
Prolonged cold season	29	8.4

Climate Variability and Livestock Production

All the respondents keeping livestock (n = 281) indicated that climate variability and change

had an impact on livestock production. The impacts are recorded in Table 2 with poor body condition score being the greatest impact. The FGDs indicated that increasing poor rainfall patterns resulted in a decline in fodder production and scarce water resources greatly affecting livestock productivity. With dwindling resources, most households are forced to migrate far and wide or trek long distances and more often with the direct negative impacts on the weak livestock. In extreme cases, there are great losses of livestock due to death occasioned by lack of feed and water. Livestock-wildlife conflicts were amplified by the migration of livestock into wildlife prone areas and the reduction of feed for wildlife, especially the predators thus making livestock the main target for predation. The impact of climate variability on livestock production was highly significant as summarized in Table 2.

Table 2: Impacts of climate variability on livestock production

Impacts	% of cases	N	df	χ^2	P-value
Weakened animals due to trekking long distances	86.8	244	1	207.289	0.000
Death of livestock due to lack of feed and water	68.0	191	1	110.447	0.000
Limited/lack of suitable feed and water	67.6	190	1	109.709	0.000
Increase of pests and diseases	65.1	183	1	102.584	0.000
Livestock-wildlife conflicts	61.6	173	1	90.716	0.000

Livestock Keepers Coping Mechanisms to Climate Variability

There were various adaptive strategies that the households engaged in to counter the effects of climate variability on the livestock as shown in Table 3. Chi-square tests show a significant relationship between the impacts of climate variability and adaptation strategies among the livestock keepers (Table 3).

(a) Livestock Feed Supplementation

Supplementation, which was the most important strategy, entailed feeding the livestock on

purchased or harvested fodder, crop residues and also commercial feeds near the major towns like Garissa. During the FGDs it was revealed that many households were dividing their livestock into weak and strong herds. The weak ones were kept near the permanent homesteads and fed with supplementary feeds and the strong ones were migrated to other parts of north eastern and eastern Kenya for livestock feed and water. The use of water tankers is becoming a common phenomenon among the households. The water tankers transport water to the livestock in satellite camps. This is so because some satellite camps had livestock feed but limited water. Bekele (2008) in a study to evaluate the impact of emergency feed supplementation in Borana pastoralist area in Ethiopia, noted that although supplementary feeding had no place in traditional pastoralism, this was initiated with subsequent droughts. The study documented that 78.3% of the study households purchased livestock feed, and 58.9% of the study cattle population was fed with different types of feed purchased by their owners. In this regard, the supplementary feeding responses aimed to preserve the breeding stock and promote post-drought recovery.

Table 3: Adaptation strategies to climate variability disaggregated according to importance

Adaptation strategy	% of cases	N	df	χ^2	P-value
Livestock feed supplementation	87.2	245	1	212.694	0.000
Investments in livestock species resilient to drought - camels	64.1	180	1	99.202	0.000
Migration in search of pastures and water	60.9	171	1	90.716	0.000
Livelihood diversification	60.5	170	1	88.707	0.000
Livestock off take before a major drought	54.1	152	1	71.561	0.000
Restocking	48.8	137	1	60.097	0.000
Increase the watering interval for all livestock	38.1	107	1	41.264	0.000

(b) Changing Livestock Species

Despite the social significance and prominent economic role that cattle-rearing has tra-

ditionally played in pastoral production systems, recurrent and increasingly intense droughts seem to have prompted pastoralists to diversify their herds. During the FGDs it was revealed that the *Abdalla* clan of the Somali is now embracing camel production which was a cultural taboo within the community. This clan had traditionally only kept cattle, goats and sheep. With the increased drought frequency, the livestock losses experienced were high compared with camels hence the gradual shift to camels. This finding is in line with several recent studies looking at responses to climate change and variability by Michael and Kifre (2009: 19), Riché et al. (2010) and Aklilu and Catley (2010: 11).

(c) Livestock Migration

Traditionally migration was a very critical strategy that ensured survival of livestock during stress periods occasioned by climate variability. This was used to save a core stock of breeding animals that together would be capable of reconstituting the herd after a drought, making the nucleus of their breeding herd as their main capital base. In times of drought pastoralists have to make harsh choices so that they can recover quickly and the more efficient way of conserving the breeding stock is to move it to another area away from drought (Hellen 2010). During the FGDs it was pointed out that with the increased sedenterization, reduction of livestock numbers per household, insecurity and reduced livestock feeding range due to population increase and degradation, seasonal migration is becoming less valued. This is the reason why livestock feed supplementation is becoming a key adaptation strategy.

(d) Livelihood Diversification

From the study 60.5% of the households had diversified their livelihoods to reduce pressure on the use of the limited livestock resources (Table 4). Crop agriculture was seen as a stop-gap measure since climatic conditions greatly affected livestock production. Most households' ultimate goal was to build up their livestock herd to become the main livelihood source. This is explained by the pastoral community's attachment to livestock and the ecological suitability for livestock production. The cultural importance of livestock among the pastoralists is re-

corded by Flintan et al. (2008) in a study done among the Borana pastoralists of northern Kenya. Other factors may include a combination of the labour-intensive nature of agricultural production and negligible returns made from dryland agriculture in recent years as observed by Lars et al. (2010). Remittances are becoming a major livelihood source. From the FGD's the remittances come from family members who were mostly in urban areas, in and outside the district, and in some instances outside the country. It was observed that remittances have been increasing as many young people go to school or advance their career and look for livelihood sources outside pastoralism and crop farming. Some respondents indicated that the current generation of young people is not keen to follow up on pastoralism but are always looking for ways out of the pastoral production system. This is one cause why remittances were becoming a major source of livelihood. On the other hand as livestock numbers per household continue to dwindle and crop farming becomes uncertain, household members sought for other livelihoods and support family members through remittances. Remittances allowed households to take increased risks since they had a safety net hence supporting local adaptation needs (Tiffen 2003; Hoang et al. 2005; Hoang et al. 2008).

Table 4: Livelihood diversification options among the pastoral households

Livelihood	N	% number of households
Crop agriculture	191	54.5
Business	174	49.7
Remittances	139	39.6
Relief supplies	77	21.9
Informal employment	71	20.2
Selling wood fuel	25	7.3
Formal employment	23	6.7

Businesses were mostly run by households that were termed as middle income and those that took advantage of the growing sedenterization among the pastoralists within the study area. Sedentary households were those that had lost most of their livestock during droughts and households that remained behind when the livestock had migrated in the dry seasons. Most businesses centred on selling of livestock; livestock products like milk, meat, hides and skins; household goods and food stuffs and farm prod-

ucts. During the field interviews and FGDs, most businesses were low scale and the returns were mainly used for household use or purchase of daily household needs. Relief supplies were mostly important for many households during the drought seasons. However, it was indicated that even during the normal years, many development agents still give support to destitute households who have lost their livelihood sources to drought or floods, an observation that was also made by OCHA (2010) in a study report on the increased humanitarian assistance to the pastoral communities. This makes relief supplies an important livelihood source to many households.

Informal employment (20.2%) was an important livelihood source for the households near the major towns like Garissa. This included part time jobs in farming enterprises and livestock herding. It was indicated that the returns from the informal employment were seasonal.

The sale of charcoal and firewood or wood fuel, was a livelihood activity mainly for poorer households, as indicated during the FGDs. It was revealed that it is labor intensive and environmentally destructive. Households engaging in this activity are those that are settled near the urban areas with market for wood fuel. WISP (2007) noted that sale of charcoal was one of the ways pastoralists diversify incomes and pool resources, although it's not the best strategy among many households and depends on the availability of ready market. Formal employment (6.7%) was mainly in the civil service and the development organizations within the study areas.

e) Livestock Off-take

Though reportedly done by 54.1% of the households, livestock off take before a drought is one of the strategies that the pastoralists are embracing. It was noted through the field interviews that capacity building from the government and various development organizations had over the years made a section of the households embrace livestock off take. The increased market for livestock, locally and the Middle East countries like Yemen and Saudi Arabia, was also a factor for increased off-take. Those households that didn't practice off-take indicate the disparity between the low prices offered during the drought periods and the high prices of livestock

when one wants to buy livestock for restocking as the reason for not doing so. The households incurred a loss if they had to reinvest the funds in restocking after a drought. This observation is also captured by Practical Action in the Livestock Emergency Guidelines and Standards book (2009). The book notes that accelerated off-take during climatic shocks cannot provide assistance to crisis-affected households since the normal marketing system is not operating.

(f) *Increase in the Livestock Watering Interval*

Traditionally the pastoral households used to water their cattle, sheep and goats after every two days and camels after five days during periods of water stress. But with increasing changes in climatic conditions, many traditional water sources like seasonal rivers, wells and natural water pans were no more. This has left the Tana river as the main source of water throughout the year. With increased sedentization along the Tana river and the emergence of crop agriculture, accessibility to the river had greatly been constrained. This has forced many households to extend the watering intervals for their livestock. Cattle, goats and sheep were watered after every four to five days and camels could even go for ten days without water. Elbashir et al. (2004), in a study done in Sudan, report that though prolonged watering intervals constitute a survival strategy, the practice often leads to animal dehydration, haemoconcentration, weakness and eventual death. Lucky animals if survived the stage, will suffer from emaciation, stunted growth and abortions.

CONCLUSION

The impacts of climate change within the livestock sector among pastoral communities have been devastating over the years but nonetheless the adaptation options have been robust. The dynamic changes observed among the households over the years show the adaptation potential of the society with the changing climatic stimuli. Though the adaptation potential or adaptive capacity of the various households and regions is different, the information generated is important for national policy and planning sectors.

RECOMMENDATIONS

Though the impacts of climate change have been devastating in the ASALs of Kenya, the

study shows a trend towards diversification of livelihoods by households as part of adaptation initiatives by the households, though with different adaptive capacities. Since the impacts or the vagaries of climate change may be persistent, the national government in setting in place the National Adaptation Plan, should consider support to the ongoing adaptation efforts at the household level as an entry point.

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