

Adapting to Climate Change in the Semi-Arid Northern Kenya

Julius M. Huho^{1*}, Dominic Kioko², Amina A. Maalim³, Rashid Warsame¹, and Abdullahi Musa¹

¹Department of Arts and Social Sciences, Garissa University, Kenya

²Kenya Institute of Curriculum Development

³Kenya Forestry Research Institute – Garissa

*Corresponding Author

DOI: <https://doi.org/10.47772/IJRISS.2023.70508>

Received: 10 March 2023; Revised: 20 April 2023; Accepted: 27 April 2023; Published: 27 May 2023

ABSTRACT

Climate change in the semi-arid northern Kenya is evidenced by increasing frequency and duration of severe droughts. The effects are devastating with the region experiencing massive loss of livestock, total crop failures and increased levels of hunger and starvation resulting in near collapse of livelihood sources which is mainly pastoralism. This study investigated the most appropriate drought adaptive strategies that pastoralists in the semi-arid northern Kenya depend on to subsist. Data was collected from the counties of Garissa, Samburu, Turkana, Isiolo, Marsabit, West Pokot, Laikipia and Baringo where drought is persistent. The study used a cross-sectional design where past and current data was obtained through face-to-face and telephone interviews from purposively sampled respondents and observations. Document information collected supplemented the information obtained from the respondents. The pastoralists embrace adaptive strategies that are easy, accessible and affordable. The traditional adaptive strategies such as food preservation and herd composition and management predominate. These strategies are preferred because of their ease of implementation and also culturally acceptable. With increasing drought severity and other factors like increase in population growth, there has been decline in grazing areas limiting transhumance activities. This has stemmed the adoption of non-pastoral activities such as crop farming, craftwork, poultry keeping, petty trade and dependence on external assistance. The traditional adaptive strategies play a key role in surviving the droughts. Due to their pastoral nature, the non-pastoral sedentary practices do not fit their lifestyles and are less practiced especially by men but taken up much better by women who are left at home. Therefore, efforts to enhance pastoral resilience in the semi-arid areas should strengthen the traditional practices as well as capacity building on the non-pastoral activities.

Key words: Droughts, Pastoralism, Adaptive Strategy, Livelihood Diversification

INTRODUCTION

Rainfall performance determines the livelihoods of over 80% of the population in Sub-Saharan Africa (SSA) who depend on rain-fed agriculture [1]. However, in the past 30 years, increased variability in rainfall have been witnessed in terms of amount and distribution. According to [2], rainfall amount has been decreasing in the greater horn of Africa resulting in recurrent and severe droughts. In the semi-arid northern Kenya, climate change has resulted in prolonged severe droughts and occasional flash floods. Combined with other anthropogenic factors such as destruction of ecosystems, the prolonged droughts have severely compromised the primary productivity in the region resulting in unprecedented human suffering. For instance, the 2010/11 drought affected approximately ten million people in Kenya, Somalia, and Ethiopia

[3]. The current drought that begun in the year 2022 have left over 22 million people suffering from acute food shortages and over 5 million children acutely malnourished [4]. Nevertheless, inhabitants of these drought-stricken areas still subsists through various adaptive strategies though with difficulties. A tag of war between the conventional and traditional adaptation strategies exists. On one hand, the governments and other stakeholders' advocates for and promotes the conventional strategies while on the other hand the inhabitants lean more on the traditional strategies. Which way to go then? This paper highlights on the most appropriate drought adaptive strategies that sustains the livelihoods of the pastoralist amidst climate change.

Objective Of The Study

The objective of the study was to examine the pastoralists drought adaptive strategies in the semi-arid northern Kenya in the advent of climate change.

METHODOLOGY

Data was collected from some ASAL Counties in northern parts of Kenya namely Garissa, Samburu, Turkana, Isiolo, West Pokot, Marsabit, Laikipia and Baringo. Other than these counties being severely affected by droughts, the inhabitants incline more to traditional than conventional strategies resulting in a tag of war between the two. To understand which strategies were working and most appropriate, pastoralists and key informants who included opinion leaders from the selected pastoral communities, agriculture and livestock officers in the study areas and officers working with NGOs in the region were interviewed and observations made. Face-to-face and telephone unstructured interviews from purposively sampled respondents were done. Information obtained from the pastoralists and the key informants was supplemented with available literature from books, journals and internet sources.

RESULTS AND DISCUSSION

1. Traditional Adaptive Strategies

Traditional adaptive strategies are passed from one generation to the other. The development of these strategies relied on both physical and socioeconomic dynamics of the pastoralists. Thus slight variations on the strategies among pastoralists living in different environments and with different sociocultural and economics backgrounds exists. Taking cognizant of the uniqueness from one pastoral community to another, this study also refers to them as *pastoralists strategies*. However, most of them are similar. The strategies are as outlined.

Food Preservation Techniques

Indigenous knowledge (IK) on food preservation has been passed from one generation to the other. Even with modern technology on food preservation, traditional methods dominated among pastoralists because of lack of preservation facilities and associated infrastructure such as electricity. Despite their declining effectiveness due to increasing temperatures associated with changes in climate, the traditional methods of food preservation helped the pastoralists subsist in time of meagre availability of food. The strategies were easy and affordable hence the most preferred. Reference [5] identifies five factors that determine the preservation method adopted by pastoralists. They include food availability; climate; traditions and culture; foodborne diseases present in the area; and available preservation technologies. Although different pastoral communities have distinct cultures that influence the preservation methods, the study established a commonality in the preservation techniques. Salting, drying, deep-frying and use of herbs were the main methods used to prolong the shelf life of various food products and for adding flavour and taste.

Salting and Drying

Salting and drying of meat were the most prevalent methods of food preservation. These methods serve to remove as much moisture activity as possible from the food since the growth of microorganism and chemical or enzymatic reactions depends on the amount of water activity (a_w) [6]; [7]; [5]. While foodborne pathogens, halophilic bacteria, xerophilic moulds and osmophilic yeasts occur at a_w values of 0.61 – 0.95, no microbial growth occur when the moisture content is low at a_w values of < 0.61 [8]. Salting, which was done before drying the meat, also added flavour.

Through salting and drying, pastoralists preserved meat in the following three techniques. In the first one, meat is sliced into narrow strips, salted and sundried to completely get rid of water and blood. The hard-sundried strips of meat are then kept in special containers (*karbat* or *karirat* in Somali). Meat preserved in this manner would last up to one year if not exposed to water and rodents. To cook the meat preserved in this manner, it involves chopping the meat strips into small pieces and then moistening the chopped pieces by soaking in water until ready for cooking.

In the second technique, meat is cut in narrow strips, salted and sundried. The sundried meat strips are chopped into very small pieces which are deep-fried until cooked. The meat is then cooled and stored in a container filled with liquidated animal fats to keep off flies which are the main meat contaminants in the ASALs (Fig 1). The meat preserved in this manner is known in different local names among pastoralists. For example, it is called *nyirinyiri* (Somalis), *koche* (Borana). The meat preserved in this manner lasts up to 3 months.

The third technique of meat preservation involves boiling too. Meat is cut into big chunks, boiled, salted and sundried. This method is used when the preserved meat is to be consumed after a short duration of not more than a week.



Fig 1: Processing and preservation of meat (*nyirinyiri*) through sun drying and deep-frying by Somali pastoralist in Garissa County ((Field observation, 2022)

Decantation of Milk

Milk constitutes the most principal part of the pastoralist diet. However, it is highly perishable requiring the application of preservation immediately. While milk preservation is an ordinary practice for milk storage applicable in day-to-day lives, pastoralists indicated that when there is surplus, they preserved for the use during drought. In this case, the process of preservation involved fermentation and decantation. During the fermentation process, the watery part of the fermented milk is decanted for 3-4 days until a semi-solid of fermented milk is produced with no liquid at all.

Milk in this form lasts for several months and is used as food or as a drink during droughts by the

pastoralists as they migrate. Pastoralists eat the semi-solid of fermented milk as food or mix with clean water to form a drink.

Herd Composition

Pastoralists herds comprised of a mix of two or more livestock types, grazers and browsers. Although the predominant type of animals in a herd varied depending on socio-cultural factors, each herd comprised of cattle and shoats (sheep and goats). Camels dominated in the Turkana and Somali pastoralists' herds while cattle were the predominant livestock among other pastoralists. Pastoralist indicated that mixing of grazers and browsers ensured maximum use of available pasture than a single species since the ecological adaptations of different livestock were different. For instance, while the grazers (cattle and sheep) are severely affected by droughts due to lack of pasture, the browsers (goats, camels, and donkeys) feed on shrubs available during droughts. The practice minimizes the risk of livestock loss. Herds comprised of indigenous breeds which included the Black Headed Maasai sheep, the East African Zebu cattle and the East African goat. Although these breeds have low milk and meat production capability, they are resistant to diseases and tolerate droughts. Nearly all the livestock kept were characterized by white hides or skins (Figure 2). The white colour was an adaptive mechanism as it reflected much of heat from the sun.



Fig 2: White coloured goats migrating in Isiolo (Field observation, 2022)

The introduction of cross breeds such as the Sahiwal, the Improved Red Maasai sheep and the improved Galla goat to the pastoralists by the Government and NGOs was slow in taking off. Pastoralists argued that they were less adapted to the drought conditions, needed more care and that the taste and preference of their milk and meat was low. Very few pastoralists reared the crossbreeds.

In any pastoralist herd, there were more female than heifers and male livestock. The preference of female livestock was because of their ability to reproduce acting as nuclei for herd replacement during calamities. Reference [9] points out that the ratio of male to female animals in Somali pastoralist herds are: camels 1:3, cattle 1:8, sheep 1:3, goats 1:4.

Herd Management

Different livestock species support livelihoods in diverse ways. Shoats, which chiefly provided households with milk and meat, were kept within or near to the homesteads. They adequately subsist on the available pasture close to homesteads. Besides they were the most sold livestock in order to meet household financial requirements. The availability of the key forage species determined the aptness for particular livestock species in a given grazing area. Shoats were generally non-selective and were suitable in any of the grazing fields. Cattle and donkeys grazed or browsed in areas with palatable grass species while camels are browsed to areas with shrubs and trees that were droughts resilient. Therefore, herds were split and grazed in different areas depending on feed requirements of each livestock species. In addition, livestock were separated into productive and non-productive stock during droughts. The nonproductive stock such as dry

cows, young and male animals and productive stock such as lactating cows and shoats were moved in far grazing fields while the productive livestock grazes near the homesteads. This separation served two purposes: first, to safeguard the availability of food in families and secondly, it ensured maximum utilization of available rangeland foliage. This dual herding system ensured uniform use of rangeland resources [10].

As climate changes, the pasture has progressively become less palatable especially for grazers. The perennial grasses in the rangelands are being replaced by annual grasses and other non-palatable species. The emergence and spread of non-palatable species such as *Sansavellia sp*, *Opuntia megacantha* (prickly pear) and *Prosopis juliflora* which do not co-exist with grass were observed. To cope with this challenge, the pastoralists were changing the composition of their livestock to more adaptable species. This had led to increase in the number of shoats, donkeys and camels due to their resilience to droughts. In Laikipia County, for example, over 80 per cent of the pastoralists had increased the number of shoats replacing the cattle-dominated herds. Camels had also been introduced in the herds. Data from the Ministry of Agriculture showed that the number of camels rose from 25 in 1983 to 3500 in 1998 and by 2010, 12 per cent of the pastoralists had introduced camels in their herds. Twenty-two per cent of the pastoralists had introduced poultry [11]. The Somali Abdalla clan in Garissa County had shifted to camel production (which used to be a taboo cultural) replacing cattle and shoats. Pastoralists, one from Turkana and another from Wajir, stated the following respectively:

“I have now resorted to keeping camel and a small number of goats as they are harder than cattle” [12:10].

“...most of us have taken to keeping hardy animals like goats” [12:8]

With the negative impacts of climate change, possession of large herds is thought to guarantee pastoralists subsistence as well as provide insurance against the impact of droughts. Therefore, efforts to improve pastoral livelihood revolved around herd maximization. It was a common practice for pastoralists, regardless of the social status, to increase their herd sizes during inter-drought periods by restricting commercial sales and slaughtering, livestock purchases, raiding from neighboring communities and also allowing natural reproduction which is normally restricted during droughts. However, the severity and frequency of droughts have thwarted this strategy. Interviews with pastoralist revealed that the inter-drought periods had become shorter reducing their capability of increasing the herd sizes. This practice, although still practiced, it is no longer in the ASALs of northern Kenya with the current climate change.

Migration

Migration has remained the main coping strategies employed by all pastoralists during calamities. This practice helps in reducing degradation of rangelands as well as managing the whims of harsh climate. Reference [13] indicate that pastoralists in northern Kenya move with livestock to a mean distance of 46 kilometres during severe droughts. The migration distance, however, varies between 9 and 22 kilometres during mild and moderate droughts respectively. In southern Kenya, [13] observe that the migration distance ranges from a mean of 4 kilometres during mild; 7 kilometres during moderate and 9 kilometres during severe droughts. Migration makes pastoralists less susceptible to changes in climate than sedentary land uses.

As a risk-management strategy, it was noted that migration faced a myriad of challenges due to current land governance, which restricts mobility. Large-scale land-use conversion and the increasing subdivision of land either into group ranches or private property hindered livestock mobility either by blocking migratory routes or reducing accessible rangeland resources. The group ranch system in Samburu County had altered the traditional pastoralism since they restrict the movement of livestock. Similar changes in pastoral systems had been occasioned by enclosures by ranchers and conservationists in Laikipia County. In Chepareria in West Pokot, pastoralists had become less dependent on livestock mobility to access pasture [14]. In the

Maasai rangelands, fragmentation and privatization have led to loss of options and selectivity in forage, hence altering seasonal use of rangelands and ultimately decreasing the ability to meet livestock needs adequately.

Dry Season Feeding Reserves

Pastoralists isolated certain grazing areas where grazing was restricted to allow regeneration of pasture during rainy seasons. Grazing in the isolated areas was permitted during the dry seasons only hence referred to as the dry season feeding zones. Grazing was permitted by a committee of elders but the management of the grazing zones was carried out by community stewards. Interviews with pastoralist revealed that each pastoral community had well established dry season feeding reserves. For example, among the Borana pastoralists in Isiolo and Marsabit Counties, the feeding reserves were subdivided into three zones: (a) rainy seasons feeding reserves, (b) moderate dryness feeding reserves and (c) extreme dryness feeding reserves. Some of the feeding reserves included *Kubi Dimtu*, *Marado*, *Kubi Haqe*, *Mogore*, *Kubi Roba*, *Diuo Wara*, *Baqasa* and *Kuku*. Dry season grazing zones preserved by the Turkana Patoralists in Turkana County were *Todonyang*, *Loteere*, *Suguta/Loriu rangelands*, *Oropoi*, *Karach I & II* and *Nakwamoru*. In Laikipia County, the Maasai had isolated *Mt. Oldonyo Ng'iro*, *Tambarua*, *Norpanga*, *Kopiyo*, *Siol*, *Naserian*, *Mukogodo forest reserve*, *Ngarendare*, *Sieku* and *Kipsing*. The Samburu County, pastoralists identified *Nasicho*, *Losesia*, *Kom*, *Marti*, *Suyan*, *Lkotikal*, *Sikira*, and *Loruko* as dry season feeding reserves. Supplemented with the community's range management by-laws, the isolation of feeding reserves was identified as an appropriate adaptive strategy that still work even with recurrent severe droughts. The strategy worked exemplary well in Isiolo County but performed minimally in Garissa County. The variation was occasioned by the enforcement of range management by-laws.

2. Non-Pastoralist Adaptive Strategies

These were nontraditional adaptive strategies that were adopted as the effects of climate change becomes more severe. These strategies were largely promoted or enhanced by the government and NGOs.

Livelihood Diversification

A significant decline in rangeland resources due to climate change, human influx and land degradation can no longer sustain a purely pastoral system. Out of necessity and need to survive, pastoralists, with support of the government and NGOs, have been pushed into the diversification of their livelihood sources [15], [7] so as to supplement pastoralism. Diversification refers to engagement in non-pastoral income-generating activities in both urban and rural environments [16]. In all pastoral regions of Kenya, diversification is basically for survival and not always profitable. Reference [7] observes that diversification occurs to compensate for the loss of livestock during calamities, avoidance of selling livestock to pay for petty expenses and supplementing decreasing income from livestock. Off-farm activities such as formal employment earned pastoral households the bulk of the income and are practiced by relatively younger people. In most cases, these practices in the study area were supported or enhanced by the government and NGOs.

The non-pastoral activities chosen varied considerably from one location to the other. The socio-cultural landscape and the physical environment determined the activities undertaken. Besides, the activities varied across gender, households' wealth and access to credit. References [15], [16] observe that younger and relatively well-educated individuals were attracted to off-farm strategies. The study established that among the poor pastoral households, diversification was a strategy for risk reduction and survival. They were limited from engaging in high remunerative activities by education, age and sex. The medium-wealth pastoral households diversified their activities for risk management (buffer against food shortages and price fluctuations) than survival while wealthiest pastoral diversify as a business venture for profit maximization.

These study findings were in concurrence with [17], [16] assertion. Regardless of wealth status, diversification served two purposes: coping with environmental shocks and risk mitigation. The justification for diversity was, therefore, to search for cash to supplement economic and social needs that pastoralism was unable to meet.

Gender was central to the choice of non-pastoral activities undertaken. Although men engaged in high-value non-pastoral activities than women, the latter had greater diversity (Table 1). Craftwork (bead making, mats and basket weaving); sale of small ruminants (shoats); poultry keeping; petty trade such as house-to-house hawking of home items, sale of milk, sale of alcohol, miraa (*khat*), wild fruits and vegetables; small-scale irrigation agriculture, processing and sale of hides and skin were common activities practiced by women. For example, women engaged in the collection of wild fruits for home consumption and sale. The Maasai women pastoralists collected wild fruits such as *Eluai* (*Acacia drepanolobium*), *sagararam* (*Acacia tortilis*), *ilokua* (*Balanites aegyptiaca*), *lamuriak* (*Carissa edulis*), *ositeti* (*Grewia bicolor*) and *olmisigiyo* (*Rhus natalensis*). The Turkana women pastoralists collected wild fruits from *doum palm* (*Hyphaenecompressa*), *Dobera glabra*, *Hyphaene compressa*, *Ziziphus mauritiana* and *Balanites rotundifolia*. In most cases, women were organized in groups but worked individually within the groups.

Interviews revealed that pastoralist men engaged in high-value non-pastoral activities and therefore, their economic status influenced the type of activities they engaged in. The poor male pastoralists engaged in low-value activities compared to the wealthy, who diversified their activities for profit maximization. The poor engage in the selling of firewood/charcoal; sand harvesting; selling of ethnomedicine, long-distance hawking, provision of security services and casual labour. The medium-wealth men engage in activities that required some start-up capital. These included: retail shops, leasing out/selling land, rent of a property, and government or business employment; lending draught animals, and taxi transport (*boda boda* and *tuk tuk*). The wealthy engaged in massive capital investment activities with the expected high return on investment (ROI). These included large businesses, formal employment; high yielding irrigation agriculture; transport business; government tenders; sale of livestock, land and rent of the property. With higher levels of formal education, younger pastoralists largely engaged in off-farm activities.

Table 1: Summary of gendered livelihood diversification in different pastoral communities

Pastoral community	Livelihood diversification activities	
	Males	Females
Maasai	Leasing/selling out the land, lending draught animals, selling bracelets, beaded belts, and beaded walking sticks, night watchmen, selling fencing posts, construction poles and rafters	Bead making, cultural dancing for tourists, curio shops, hawking of home items, sale of Maasai shukas
Samburu	cultural dancing ,Leasing/selling out the land, crop farming, mining, energy production, making and selling fodder	Bead making, cultural dancing for tourists, curio shops
Kalenjin	Sand harvesting, Crop farming, participation in sports, retail shops, transports,	Small-scale irrigation agriculture, mats and baskets weaving, sale of aloe, wild fruits, petty trade (alcohol, milk, handicrafts, and vegetables) local waged labour, poultry farming.

Turkana	Fishing, collection and sale of honey, gum arabica, firewood/ charcoal, and hides, ethnomedicine	Small-scale irrigation agriculture, mats and baskets weaving, sale of aloe, wild fruits, petty trade (alcohol, milk, handicrafts, and vegetables) local waged labour, poultry farming, processing and sale of skins
Somali	Retail shops and petty trades, charcoal burning, taxi transport, firewood sale,	Selling of camel and shoat milk, sell of miraa (khat),
Borana	Retail shops, firewood sale, Crop farming, night watchmen, ethno medicine, Sand harvesting	Bead making, cultural dancing for tourists, curio shops, hawking of home items, sale of Maasai shukas.
Rendille	Retail shops, firewood sale, Crop farming, night watchmen, ethno medicine, cultural dancing, Sand harvesting	Hawking of home items, sale of Maasai shukas, Bead making, cultural dancing for tourists, curio shops

The drylands have the highest population density and diversity of wild fauna with 90 per cent of the gazetted national parks, sanctuaries and game reserves in Kenya. Over 70 per cent of wildlife tourism activities are found in the rangelands. This has presented the pastoralists with opportunities to harness tourism potential and invest in the sector. For example, the study found out that there were nine group ranches which engaged in wildlife conservation and tourism activities in Laikipia County. The Tassia Lodge in Lekurruki Group Ranch had 90 per cent of the workers being the members of the Maasai pastoralist community. In Il Motiok Group Ranches, tourism was a major source of income to 36 per cent of its members. The Malka Bisanadi campsite in Isiolo County is a community-based tourism product that is managed by pastoralist women group in the area.

Small-scale agriculture was the most adopted diversification strategies by both the poor and the rich since it provided both food and income. The dwindling pastoral economy caused by loss of grazing lands and drought-related hardship had triggered sedentarization. Pastoralists engaged in sedentary agriculture (Figure 3) where they grew crops through irrigation and also practiced poultry farming.



Fig 3: Somali pastoralists being capacity build on irrigation farming in Dujis Farm in Garissa County. At the background is banana plantation irrigated with water from River Tana (Field observation, 2021)

Being a deviation from the norm, pastoralists took up farming out of desperation and therefore, much of it was supported with farm inputs, irrigation equipment, funds and agronomy advice by government and

NGOs. Regardless of the support, few men engaged in sedentary crop farming since they take great pride in livestock production due its association with social status among peers. However, some of the wealthy pastoralists pursued farming as an investment. The practice was common with women who worked in groups but with each member tilling her plot. An interview with pastoralists in Wajir County by [12] reveals the involvement of women in irrigation agriculture as stated:

“The only long-term solution to drought is the formation of self-help women groups. When we form groups, we can harvest water from seasonal streams here and engage small scale farming to curb food insecurity.” [12:7]

In Turkana and West Pokot Counties, irrigation was carried out along Rivers Turkwel and Kerio. Crops grown included kales, maize, sorghum, bananas, mangoes, oranges and vegetables. In Garissa County, crop farming was done along River Tana where pastoralists grew mango, pawpaw, banana, sweet melon and watermelon, as well as fodder. With good connections to the urban economy and export market, the shift from pure pastoralism to agro-pastoralism among the farming households was becoming permanent [18]. Data from ministry of agriculture indicates that in Il Motiok group ranch in Laikipia County, more than 20 per cent of the pastoralists’ households were involved crop farming. The land under cultivation increased by 73 per cent between 2007 and 2013 [11]. From using River Ewaso Nyiro water for irrigation, almost every household has tuned to crop farming in Bulesa area of Isiolo County with pastoralists harvesting an average of 25 bags of maize against the national average of 19 bags per hectare. In Narok County, 400 pastoralist families grew vegetables in Mosiro Irrigation Scheme while in Garissa County, 203 farmers in Kulan, Dadaab sub-county, benefit from the 20-acre irrigated farm established by the Kenya Red Cross Society [19].

Investing in formal and informal social networks was vital safety nets during times of devastations. Strong social networks were established prior to any calamity. Pastoralists equated the social networks to savings. The practice involved food sharing; livestock lending and the family support system where distressed families gave some of their children to close family members and relatives to care for. Through reciprocity, pastoralists tapped on the resources invested in the networks during times of devastations. Reciprocity is the practice of exchanging things with others for mutual benefit. Positive actions were responded with other positive actions. Thus, reciprocity ensured recovery assistance by ones networks when an individual suffered losses. Besides, reciprocity facilitated cooperation and collective action because of interdependency that went along with it. The Turkana pastoralists, for instance, invested in social networks by sharing the cash received through the HSNP with their friends and family. The Maasai pastoralists shared food among households and also lend livestock to relatives and friends. In formal social networks, pastoralists joined formalized groups that were governed by accepted rules. Most of these formal groups worked to support alternative livelihood sources. For example, the Nalepo women’s self-help group in Laikipia County engaged in the Ol Gaboli Eco-lodge business. During catastrophes, the pastoralists received relief food and livestock feeds through the Ol Gaboli Eco-lodge. The study found out that declining rangeland resources triggered by climate change negatively affected the social networks activities. For instance, lending of livestock was only possible only where a very small number of livestock was involved due to scarcity of pasture as well as increasing schooling by young herders. Schooling also altered sharing of children with friends and relatives. This practice was becoming less effective.

3. External Assistance

External assistance was given to pastoralists within and outside the calamity periods. The assistance came from government, NGOs, relatives and faith-based organizations. The study found out that most of the assistance was accorded outside the disaster periods. For example, an assisted livestock off-takes took place prior to an impending drought while the assisted restocking were post-drought activities. Provision of social safety nets (cash transfers) to the elderly people and poor households and remittance from relatives occur

throughout the year. At least 58% of the pastoral households were recipients of cash transfers. Under the National Safety Net Programme (NSNP), most of the pastoral households in the four most drought-affected counties of Turkana, Mandera, Wajir, and Marsabit benefited from Hunger Safety Net Programme (HSNP). Plans to support pastoralists in Tana River, Isiolo, Garissa and Samburu Counties were underway. The HSNP aimed at reducing extreme hunger and vulnerability by delivering regular and unconditional cash transfers to targeted households. The study established that as more pastoralists got educated and advanced in their careers, remittance from family members was also becoming a major livelihood source. The younger generation of pastoralists had no keen interest on pastoralism and were seeking alternative forms of livelihoods.

CONCLUSION

The severity of droughts in the semi-arid northern Kenya is increasing with more people being affected. Through various drought adaptive strategies, inhabitants in these region subsisted though with a lot of difficulties. The adaptive strategies practiced in the region were either *traditional or pastoralist* and *non-pastoralist* strategies. From the pastoralists perspective, the traditional adaptive strategies were more efficient. These strategies allowed free movement with their livestock. These strategies included food preservation techniques, migration and establishment of feeding reserves. The non-pastoralist strategies were largely adopted by women compared to men because of their sedentary nature. As a result, they were less popular and received less attention by men. In addition, being new strategies alien to the pastoralists, the were largely supported by the government and NGOs to survive. Most of the, failed with withdrawal of support. The study concluded that neither the pastoralists and non-pastoralists adaptive strategies would be effective in enhancing drought resilience on its own. Due to declining grazing areas owing to population growth and impacts of climate change, the pastoralists strategies were gradually being blended with non-pastoralist strategies. The synergy between the two forms of strategies thrusts the pastoralists resilience against droughts. Therefore, any efforts geared to enhancing pastoralist resilience should take into consideration both the traditional and the emerging non-pastoralist adaptive strategies.

REFERENCES

1. OECD/FAO (2016). Agriculture in Sub-Saharan Africa: Prospects and challenges for the next decade. OECD-FAO agricultural outlook 2016–2025, 59-95.
2. WMO (2015) The Climate in Africa: 2013. World Meteorological Organization (WMO) Geneva, Switzerland
3. Wang, Y., Shilenje, Z. W., Sagero, P. O., Nyongesa, A. M., & Banda, N. (2017). Rainfall variability and meteorological drought in the Horn of Africa. *Mausam*, 68(3), 463-474.
4. WFP (2023) Regional Drought Response Plan for the Horn of Africa: 2023. 23Januray 2023 Issue. Available online at: <https://www.wfp.org/publications/regional-drought-response-plan-horn-africa-2023>
5. Huho, J. M. (2020). Reducing food loss and waste through innovative food preservation technologies applied by women in rural areas in Kenya. *International Journal of Latest Research in Humanities and Social Science (IJLRHSS)* Vol, 3(1), 76-82.
6. Ibeanu, V., Onuoha, N., Ezeugwu, E., & Ayogu, R. (2010). Food preservation and security at household level in rural Nsukka, Enugu State, Nigeria. *Agro-Science*, 9(2).
7. Achiba, G. A. (2018). Managing livelihood risks: Income diversification and the livelihood strategies of households in pastoral settlements in Isiolo County, Kenya. *Pastoralism*, 8(1), 20. <https://doi.org/10.1186/s13570-018-0120->
8. Jans, C., Mulwa Kaindi, D. W., & Meile, L. (2016). Innovations in food preservation in pastoral zones. *Rev Sci Tech*, 35(2), 597-610.
9. Mwanyumba, P. M., Wahome, R. W., MacOpiyo, L., & Kanyari, P. (2015). Livestock herd structures

- and dynamics in Garissa County, Kenya. *Pastoralism*, 5, 1-7. DOI 10.1186/s13570-015-0045-6
10. Ethiopia, C. A. R. E. (2009). Value chain analysis of milk and milk products in Borana pastoralist area: regional resilience enhancement against drought project. Yonad Business Promotion and Consultancy PLC Addis Ababa, Ethiopia.
 11. MoLD (2013) Unpublished reports on livestock production and extension services for Mukogodo division. Ministry of Livestock Development.
 12. Oxfam GB (2011) Hear our call: climate change testimonies from Kenya's dry regions of Wajir and Turkana. Available online at: <https://www.oxfamblogs.org/eastafrica/wp-content/uploads/2010/09/Hear-our-call.pdf>
 13. Ndikumana, J., Stuth, J., Kamidi, R., Ossiya, S., Marambii, R., & Hamlett, P. (2000). Coping mechanisms and their efficacy in disaster-prone pastoral systems of the Greater Horn of Africa
 14. Nyberg, G., Knutsson, P., Ostwald, M., Öborn, I., Wredle, E., Otieno, D. J., & Malmer, A. (2015). Enclosures in West Pokot, Kenya: Transforming land, livestock and livelihoods in drylands. *Pastoralism*, 5(1), 1-12. DOI 10.1186/s13570-015-0044-7
 15. Watete, P. W., Makau, W. K., Njoka, J. T., AderoMacOpiyo, L., & Mureithi, S. M. (2016). Are there options outside livestock economy? Diversification among households of northern Kenya. *Pastoralism*, 6(1), 1-13.
 16. Watson, D. J. (2008). Livelihood diversification opportunities for pastoralists in Turkana, Kenya ILRI Research Report 5. ILRI (International Livestock Research Institute), Nairobi, Kenya. 43 pp.
 17. Homewood, K., Trench, P. C., & Kristjanson, P. (2009). Staying Maasai? Pastoral livelihoods, diversification and the role of wildlife in development. *Staying Maasai? Livelihoods, conservation and development in East African rangelands*, 369-408.
 18. Hussein A.M. (2016) Resilience and risk in pastoralist areas: recent trends in Diversified and alternative livelihoods in Garissa, Kenya. In USAID resilience and risk in pastoralist areas: recent trends in diversified and alternative livelihoods. February, 2016
 19. Songok, J. (2019) Pastoralists Embracing Irrigation Farming. RATIN. Available online at RATIN https://ratin.net/site/news_article/7143