The Impacts of Climate Change and Variability on Food Security among the Rendille Pastoralist Households

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ABSTRACT

Climate change is the most serious threat to Sub-Saharan Africa's food security with consequences particularly extreme in arid and semi-arid areas where pastoralists-based livestock systems are an important source of income. Drought has resulted in massive livestock losses in recent years with dramatic impacts on pastoral lives. The primary source of food insecurity in Marsabit County is climate change and variability. It affects the livelihoods and revenue streams of small-scale food producers by raising food prices and restricting access to food. This paper examines the impacts of climate change and variability on food security among the Rendille pastoralists in Marsabit with focus on food availability, accessibility, utilization and stability. Climate variability in Marsabit County has led to changes in the nutritional quality of some foods. Moreover, climate change and variabilities hinder the ability of pastoralists to feed their livestock leading to loss of their means of support and food insecurity.

Keywords: Food Security, Climate change, Kenya, Pastoralism, Rendille, Variability

INTRODUCTION

The pastoralists from Rendille community in Marsabit county continue to struggle with the impacts of climate change and variability. The challenge is compounded by limited adaptation capacity especially among the pastoralists in Sub-Saharan Africa. This study explores four main dimensions of food security including; Food availability, accessibility, utilization and stability.

According to Food and Agriculture Organization (2009), food security exists when all people have physical, social, and economic access to enough, safe, and nutritious food at all times to meet their dietary needs and food preferences for an active and healthy life. The four pillars of food security are Availability, Access, Utilization, and Stability (Committee of World Food Security, 2012). Food security has been central to discussions about sustainable development, and it is one of the first Millennium Development Goals (MDG). Despite the efforts made by different organizations and institutions, many countries continue to be concerned about food security (Zougmore, 2018). For example, climate change and variability are threatening the livestock industry, due to its impact on the reduction of soil moisture, destruction of soil organic matter, pre-mature death of fodder and increased heat stress (Mekonnen, Tessema, Ganewo & Haile, 2021).

Food availability is determined by the physical amount of food being produced, stored, processed and exchanged. Climate variability has an impact on food availability through its negative effects on crop yield and livestock production (Zougmore, 2018). Famine Early Warning System Network, (2022) state that 2021-2022 drought in Kenya led to reduction of milk production by 12-59 per cent below the three-year average. Moreover, some of the households in Turkana and parts of Marsabit County reported no milk being produced due to livestock body conditions which impacted food productivity. Climate change and variability affect livestock productivity through its impact on forage quality and quantity (Hidosa & Guyo, 2017). It has

a significant effect on the growth period of pasture and significant vegetation species in arid and semi-arid areas (Thornton, 2006). Almost 60,000 animals died in Kenya due to starvation and milk production reduced by 80 per cent below average levels (Famine Early Warning Systems Network, 2021).

Drought affects the natural resources like water, pasture and the edible fruits that pastoralists depend on. Conflicts of water resources during the drought have implications on food production and availability in conflict zones. Drought in the ASALs affects vegetative cover needed by the pastoralists for grazing. It also leads to decline in yield and productivity, which can have serious impact on other pillars of food security (Bilali et al., 2020).

Food accessibility is a measure of a person's ability to obtain benefits, which are defined as the set of resources available to them (including political, social, legal and economic resources) that individuals require to obtain food access. People's access to food is determined by the allocation mechanism, affordability, personal and cultural preferences for specific food. Climate variability decreases food access through its negative impact on food prices. Drought in arid and semi-arid areas may reduce availability of different types of foods to the point that allocation of food is made within the family. Moreover, during drought, a family's daily food consumption may be reduced for everyone in the household or start preferential food allocation to people within certain age or gender due to unavailability of food (Bilali et al., 2020).

Most of the food that pastoralists consume are not produced at the individual household level but they acquire them through borrowing, buying and trading (Du Toit & Ziervogel, 2004). Climate variability may affect possibility of earning money thus affecting their ability to buy food. Moreover, climate variability such as drought may affect food availability, which may influence price of certain food products such as livestock products. High prices may make certain food products unaffordable.

Nomadic pastoral diets are typically protein-rich and calorie-poor. based on three food groups: milk, meat products (meat, bone, fat, blood), and cereals acquired by trade or cultivation. Meat products are rarely consumed, where animals are slaughtered for ritual occasions or social obligations. Milk accounts for 66% of diets of pastoral Turkana, Maasai, and Rendille, and 30% of diets of Tuareg, Fulani, and Ethiopian Boran (Galvin & Little, 1999). There is marked seasonal variation in consumption of these products, where milk is consumed mainly in the short-wet seasons and people turn to cereals as pastoralists sell livestock (usually goats and sheep) to purchase maize meal (posho in Kenya), sugar, tea, and tobacco, which yield little more than immediate calories and stimulant to avoid hunger (Galvin & Little, 1999).

Food utilization entails the nutrient content of food such as food composition, preparation methods, the cultural values of food that dictate which, when and how different types of food should be eaten. Climate variability affects food utilization through its impact on nutrition status of the pastoralists (Fanzo, 2021). For example, increase in temperature may favor the growth and development of some pathogens, whereas water scarcity (caused by drought) directly impacts quality of water and good sanitation (Belesova et al., 2019).

Climatic variability such as increase in temperature may cause quality of food to deteriorate. Heat stress can reduce the quality and composition of milk. Heat stress alters the mammary gland and components of milk like percentage of milk, solid-non-fat, casein, protein, and lactose. It affects somatic cell count in livestock thus affecting the quality of milk. It also causes hormonal imbalance thus affecting the quality and quantity of milk (Moore et al., 2023).

Food supply stability refers to food availability and accessibility in the short term. Many crops have annual cycle and climate variability such as rainfall and temperature may negatively or positively affect their yield. Climate variability makes it difficult to maintain continuity of food supply. Drought and flood can cause both chronic and transitory food insecurity (Schnitter & Berry, 2019). Climate variability affects food system through increasing or reducing food supply from agriculture and fisheries. It also affects importation of food by the country, food distribution and ability of households to purchase and consume food.

Research area

The research was conducted in Marsabit County. The Northern boundary of the County is marked by the Chalbi desert while the western boundary is marked by Mt. Kulal. Ndoto Mountains and Mathews Range mark the southwestern boundary. The study was conducted among the Rendille community. The Cushitic-speaking Rendille are linguistically, physically, and culturally related to Somali populations, from whom they claim descent (Roth 1991, 1996).

In pre-colonial times, Rendille featured a subsistence base of nomadic mixed-species pastoralism, herding camels, goats, and sheep in the arid lowlands of the Kaisut and Chalbi Desert, in what today is Marsabit County, northern Kenya.

Severe droughts from the 1970s to the present resulted in large livestock losses (Roth 1991, 1996) and led to increased sedentarization for the Rendille (Nathan, Fratkin, and Roth 1996; Fratkin, Roth, and Nathan 1999). The Rendille were first described as a non-contracepting population regulating their fertility by means of cultural practices by Douglas (1966), who listed the Rendille, along with three other cultures, the Pelly Bay Eskimo, Tikopian Islanders, and Nambudiri Brahmins, as exemplifying "population control in primitive groups" (Douglas 1966:271). She ascribed population control to the Rendille's dependence on their slow-growing camel herds. Rendille believe their population to be a fixed resource. A static stock population cannot support an increasing human population. Rendille have a problem of over-population in relation to camels.

METHODS

The descriptive study design enabled the generation of detailed information that adds to existing knowledge on the impact of climate change and variability on food security among pastoralists in Marsabit County. The Sub-county was first purposefully sampled according to its geography, economic activity and susceptibility to drought. Afterwards the villages were enumerated and categorized according to their economic activity, accessibility and perceived susceptibility to harsh weather events. This was then followed by random selection of three manyattas; Manyatta Lemara, Manyatta Lorokushu and Manyatta Ntiliya. Purposive sampling was used to select thirty sample households within these villages. In each village, a list of the household owners was carefully chosen based on gender, with sixteen (53%) men and fourteen (47%) women. Six out of fourteen women who had participated in the study were between the ages of 31-40 years while eight were above/below that range. On the other hand, six out of sixteen men who participated were aged sixty and above.

The sample households from the villages were selected based on various factors; whether or not pastoralism was their primary source of income, how long they had been practicing pastoralism and if they have lived in Laisamis Sub-county for more than thirty years. Ten households in each Manyatta were randomly picked from the three Manyattas giving a total of thirty households. The interviews with the household heads were then conducted for a period of one month. Data was collected on socio- demographics of the respondents, climate change and variability, impacts of climate change and variability and the coping strategies adopted. To complement the In-depth Interviews, five individuals were interviewed as key informants. Key Informants were selected from the community, Non-Governmental Organizations and the government. They included a chief, two veterinary officers and two community members. Further, five Focus Group Discussions (FGDs) consisting of three male and two females were conducted from sampled villages to cross check and validate the responses received from in-depth interviews and key informant interviews. The Key informants and discussants were selected based on their understanding of their culture, society and living conditions, as well as awareness of climate change and variability and its impacts.

RESULTS

Twenty four out of the thirty respondents who participated in the study had no form of formal education. Only two respondents had completed primary school education and four had gone beyond secondary school.

A small number (16.7%) of the respondents have been practicing pastoralism for less than twenty years. At the same time, 66.7% of the respondents have been practicing pastoralism between twenty-one to forty years while 16.7% have been practicing pastoralism for more than forty years. All (100%) of the respondents owned goats and sheep, 56.6% own cattle, 90% own camels while 66.7% own donkeys.

The findings of this study show that climate change is the leading cause of food insecurity in the study area. Drought causes more livestock deaths in the pastoral system while surviving livestock are weak due to poor growth and live weight losses, resulting in declining milk yield and meat production and food insecurity in the study area.

Food Availability

Respondents mentioned that food availability is affected by frequent drought (28%), crop and animal diseases (24 %), crop failure (1%), death of livestock (27%), and wasting of animals (20%). A key informant explained that drought impacts food availability through migration and death of livestock thus reducing the number of livestock available in household and community. This was confirmed by one of the informants who stated thus;

"Majority of our animals died during severe droughts of 2018, 2019, 2020, 2021 and 2022 thus reducing food availability. Droughts leads to scarcity of grazing lands and reduction in the amount of water leading to starvation of animals and sometimes death. Due to our higher dependency on various livestock products, decrease in the number of livestock results in decrease in the amount of food available at the household level" **(Community Member).**

Another male discussant had the following to say about climate change and food availability:

"We used to slaughter thin and weak animals and eat them as a way of coping during drought, but due to the increase in frequency and length of droughts, this has changed because in addition to animals losing weight, their numbers have also decreased dramatically. As a result, we have to rely on more expensive and scarce food sources such as grains" **(Male discussant from).**

According to key informants and respondents, household food insecurity is caused by animals migrating in search of water and pasture during drought. When young men move with the livestock in times of drought in search of water and pasture, this reduces the amount of food available at the household level. Since pastoralists are heavily reliant on their livestock, when the animals are away, the family members do not have access to milk and blood. The following statement from a discussant confirms the general consensus of other discussants:

"Due to drought, young men and livestock migrate to distant locations, including the neighboring counties, looking for water and pasture, resulting in lack of food at home because we rely on livestock. Furthermore, due to migration, children and the elderly no longer have access to milk that they used to drink because animals migrate far away from the homestead resulting in lack of milk and other livestock products that we can consume" (**Female discussant).**

Respondents indicated that climate change such as drought causes drop in productivity. Increased temperatures and decreases in rainfall reduce livestock productive yields such as milk and meat. Higher temperatures reduce feed intake and feed conversion rates in animals.

There are four major effects of climate change on livestock production: feed scarcity, water scarcity, decrease in productivity and mature weight. This has resulted in a decrease in milk production per household, resulting in food insecurity as illustrated by one of the key informants as stated below;

"Drought primarily causes lack of water and pasture, both of which are necessary for livestock. During drought, livestock from Wajir, Korr and Samburu always congregate to share scarce resources resulting in

increased pressure and competition for limited pasture and water sources on which livestock rely heavily. Due to lack of adequate water and pasture, most livestock always lose weight and their productivity also drops as a result of not eating enough food required by their body, thus negatively affecting food availability" **(Veterinary Officer).**

Food accessibility

Respondents reported that failure in food accessibility is caused by food shortage during drought (60%) and increase in food prices (30%). The study found that impact of climate change such as drought has forced pastoral communities in the study area to shift away from their traditional food sources. Pastoralists who relied mostly on livestock products and a small amount of kitchen gardening now rely on grains and what is readily accessible and reasonably priced in the market. Due to the scarcity of traditional foods, majority of pastoralists in the study area have altered their diets, specifically changes in meat and animal-sourced food consumption to eating some of the agricultural products such as rice and beans. As reported by one of the discussants;

"The scarcity of traditional foods during drought has led to a rise in food prices, which has forced us to alter our diet. We used to rely on livestock as source of food, but due to climate change, we have changed our diet. We now consume foods that we did not consume previously for example used to cook with butter oil but due to decrease in milk production, we now use cooking oil, eat rice and consume other processed foods" **(Male discussant)**.

According to a key informant, due to the scarcity of food during the drought period, the prices of various staple foods have risen, limiting poor households' access to a variety of food in the area. One of the informants from Laisamis reported:

"Due to the severe effects of drought on the essential resources animals need to thrive, productivity has been reduced. The costs of food also rise as a result of the decrease in supply of many local staple foods such as grains which is normally very expensive during drought, thus not all the low-income families can afford them on daily basis" **(Community Member).**

According to the respondents, food shortage makes some families to reduce the amount of food consumed daily by a family as a whole or begin giving preference to members of a particular age group or gender. As reported by female discussant from Manyatta Lorokushu;

"As a result, food allocation is dependent on preferences in some of the households. When food is scarce, some families prefer to consume one or two meals per day to conserve it for later use, with special consideration given to the elderly, lactating mothers, pregnant women and children because of their great nutritional needs" **(Female discussant**).

Food utilization

The respondents reported that underutilization of food during drought is caused by a decrease in the quality of food being consumed (80%) and poor dietary diversity due to food shortage (20%). According to the discussants, drought has resulted in low consumption of milk and meat products, and poor dietary diversity, which has increased the malnutrition rate in the research area. Key informants stated that children and the elderly were normally being given milk as an important part of their diets but due to low milk production, they are only being given one type of food such as carbohydrates, resulting in malnutrition in children. In the following statement, one of the informants elaborated on how drought has led to an increase in malnutrition:

"Traditionally, children and the elderly were constantly given milk, but as the frequency of drought increases, livestock migrate away and some die, leaving little or no milk for children and the elderly. As a result, they are only being given one type of food group, particularly carbohydrates, which has increased the rate of malnutrition in the area, particularly among children.

Moreover, due to drought, pregnant mothers and lactating women are forced to eat less nutritious foods to maintain a healthy diet for birth and breastfeeding" **(Key Informant).**

Results from FGDs show that climate change and variability have a substantial impact on livestock diseases thus affecting the quality of food being consumed by pastoralists. Brucellosis, anthrax, pox, enterotoxaemia, foot and mouth disease, babesiosis, trypanosomiasis, worm infestation, blue tongue, and mastitis were the most common livestock diseases in the study area which negatively impacted the quality and quantity of livestock products. Discussants in FGDs observed that high temperatures cause an increase in the distribution of livestock diseases such as Trypanosomiasis, whereas prolonged dryness creates a favorable environment for diseases such as anthrax. Moreover, the high mobility of pastoralists during drought exacerbates the spread of some of the contagious diseases such as Bovine pleuropneumonia pasteurellosis which is spread through contact with animals from various regions. Livestock diseases affect food utilization through their impacts on not only the quality but also the quantity of livestock products like milk and meat. An interview with a key informant revealed the following results;

"During drought, livestock migrate to other areas looking for pasture and water; however, due to differences in temperature, they are affected by different diseases resulting in decrease in livestock productivity. For example, livestock are currently in Samburu. Because of the temperature difference between Laisamis and Samburu, they are occasionally affected by new diseases that are not found in Laisamis Sub-County. These have had an impact on the quality and quantity of meat and other livestock products, resulting in a reduction in food availability and utilization" **(Community Member).**

DISCUSSION

In Marsabit County, 81% of the population relies on pastoral livelihoods as most parts of the county are arid and unsuitable for crop production. Additionally, 75% of its population is impoverished, thus are already vulnerable to environmental shocks (Famine Early Warning System Network, 2022). Drought, in particular, is the primary cause of food insecurity among pastoralists. It contributes to food insecurity by reducing livestock productivity and the number of animals, introducing new diseases and decreasing in quality and quantity of pasture and water. Drought has had a devastating impact on the pastoralists, resulting in massive livestock losses (up to 60% of the county's livestock) in recent years with dramatic impacts on pastoral lives (Wanyoike et al., 2018).

Climate variability has an impact on food availability through its negative effects on crop yield and livestock production (Zougmore, 2018). Famine Early Warning System Network, (2022) states that 2021-2022 drought in Kenya led to reduction of milk production by 12-59 per cent below the three-year average. Moreover, some of the households in Turkana and parts of Marsabit County reported no milk being produced due to livestock body conditions which impacted food productivity.

The findings of this study established that climate change has resulted in livestock mortality and a reduction in the number of animals which negatively impact food availability. Livestock mortality is mostly linked to drought and the combined effects of rainfall and surface temperature variability. According to Thorton et al. (2011), climate change affects forage species niches and may alter livestock feed resources, for example, an increase in temperature may increase the productivity of fodder and pasture for browsing animals while decreasing the productivity of grassland.

The study findings show that, water is critical to food security. Water is required for the growth of livestock, humans and crops. The study area's recurring drought has resulted in the drying of major water sources; boreholes, shallow wells, and water pans. Ringer et al, (2023) states that, water scarcity has had an impact on livestock productivity, fertility rate, dehydration and feed conversion rate in animals thus affecting food availability. Furthermore, climate change, in conjunction with ethnic conflict and a scarcity of water for food production, including irrigation for fruit and vegetable production, result in unaffordable diets and overall levels of malnutrition due to food scarcity and price increases.

Pastoralists from Laisamis, Korr, Wajir and Samburu share grazing lands and permanent water sources during drought. Competition for limited resources among the pastoralists has resulted in ethnic conflict, resulting in food insecurity in the area. Ethnic conflict increases food insecurity by raising food prices, reducing food diversification, destroying livestock and stealing from neighboring communities. According to International Food Policy Research Institute (2015), many people are always displaced as a result of ethnic conflict leaving them in dangerously short supply of food. Ethnic conflict and mass migration have resulted in food supply from food-producing areas has been reduced, while food demand in safe areas has increased. Conflict leads to limited market activity and reduced trade flows caused by increased road checkpoints, curfews and vehicle restrictions and trades' fear of entering the market. High food prices in affected areas have an impact on household and community food access. It also impacts access to the market thus reducing food diversification.

The study shows that drought has resulted in low consumption of milk and meat production as well as lack of dietary diversity has increased malnutrition rate in the study area. According to Save the Children (2019), pastoralists prefer to give children milk because of its health benefits. During drought, milk production always drops, forcing pastoralists to change their diet and begin feeding grains to their children. These have an impact on dietary quality because the quality of proteins, fatty acids and micronutrients being consumed by children has decreased, resulting in malnutrition.

The study shows that climate change and variability have a significant impact on livestock diseases thus lowering the quality of food consumed by pastoralists, especially milk and meat. According to a study in Masvingo, Zimbabwe by Chari, et al., (2022), some livestock diseases are extremely sensitive to temperature and rainfall changes. High temperatures can lead to the spread of various livestock diseases such as Trypanosomiasis. Mobility has resulted in the transmission and spread of various livestock diseases. During migration, pastoralists from various regions share grazing lands and water sources, resulting in disease transmission from other regions. Livestock diseases have an impact on food utilization because they affect the quantity and quality of milk and meat production making livestock products unfit for human consumption.

Climate change and variability have affected the steady supply of livestock products such as meat, milk and blood. Drought has hampered poor households' ability to access and afford different types of food due to their physical scarcity and rising of food prices. The study shows that drought events have had a cumulatively devastating effect on livestock performance in terms of their ability to provide constant supply of livestock products that are essential for household food security in the study area since they are highly dependent on livestock.

CONCLUSION

The primary source of food insecurity in Marsabit County is climate change and variability. It affects the livelihoods and revenue streams of small-scale food producers by raising food prices and restricting access to food. Climate variability in Marsabit County has led to changes in the nutritional quality of some foods. Moreover, climate change and variabilities hinder the ability of pastoralists to feed their livestock leading to loss of their means of support and food insecurity. Drought has become a persistent climate variability problem that has severely impacted pastoral communities' livelihoods over the last several decades, making it one of the major indicators of climate change. The loss of livestock due to prolonged droughts is a difficult problem that erodes pastoralist communities' adaptive capacity. As a result, context-based scientific intervention is required to support and solve the scarcity of pasture and water for livestock during the drought season. Climate change and variability, particularly drought, is the primary cause of food insecurity among pastoralists of the Laisamis sub-county. Climate variability results in decreased productivity and livestock numbers, outbreaks of livestock disease, food insecurity, widespread poverty, decreased grazing land quality and quantity, scarcity of water sources, and unplanned mobility of pastoralists in search of pasture and water sources, thus affecting all the pillars of food security.

RECOMMENDATIONS

There is need to review present strategies and policies to identify the gaps and opportunities for more localized adaptations to climate change to enhance the engagement of both National, devolved governments and local communities on climate variability and change. Policy papers need to address the fragmentation and privatization of rangelands, which pose a challenge to the sustainability of pastoral mobility. To prepare pastoralists for future scenarios of climatic unpredictability and change, it is necessary to promote their adaptation and coping mechanisms. Reducing climate risk and increasing options for safe livestock movement, herd diversity and livelihood diversification should be the main priorities of further efforts. Additionally, for Laisamis' households to be climate resilient, interventions that encourage education, empowerment of women, improvement in access to markets, and dissemination of climate information are crucial. To support the three villages during extreme weather conditions with irrigation in their kitchen garden and watering their livestock, new tanks and other water sources need to be built. The pastoralists in Laisamis Sub-county need to be educated about climate change and variability to better understand what causes climate change and how it affects their ability to adapt.

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