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**ASSESSING RESPONSE DISCONNECTS IN CASCADING CLIMATE CHANGE
IMPACTS AND STRESSORS IN NORTHERN KENYA**

MSc Thesis

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Debrecen

2024

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Abstract

Arid and semi-arid rangelands in Sub-Saharan Africa is a critical grazing area that support approximately 250 million agro-pastoralists and pastoralists, by providing essential grazing resources and water. Increasingly these pastoral communities, including those in Kenyan drylands, face unique vulnerability to increased climate variability that has necessitated this study. This study set out to characterize climatic shocks that occurred for the last forty years, including their impacts on the Borana pastoralists and their livelihood in Northern Kenya. The study further analyzed the response measures taken by local people and their perspectives on the humanitarian responses. The aim was to unpack the synergy and areas of inconsistency to highlight the need for change in approaches in the face of drought and related shocks. A combination of focus group discussions, key informant interviews, narrative interviews and semi-structured interviews were conducted with communities and practitioners in Sololo area in Moyale sub-county. From the results, droughts were the main events recorded, accounting for ten shocks, out of the seventeen cumulative shocks mapped. Borana pastoralists described most of the last dozen years as drought years because of the frequency of drought, with extreme drought episodes singled out in post-2000. The 1983/1984, 2010/2011, 2016/2017 and 2020-2022 droughts, identified as the most severe droughts led to many households in Sololo either temporarily or permanently, unable to sustain their family following heavy loss of animals. The local responses and humanitarian actions on the ground were investigated, evidences points to inconsistency between how the two responses are structured and linked. However, this subject requires further research to fully ground the policy messages.

Keywords: Pastoralists; Climatic shocks; Droughts; Local responses; Humanitarian assistance; Northern Kenya.

1. Introduction

Pastoralism, a livelihood characterized by mobile livestock rearing on extensive rangelands, is a crucially significant production strategy across the globe. Drylands encompass 41% of the Earth's landmass and play an important role in the functioning of the global ecosystem, providing habitat for more than two billion people. Pastoralism has emerged as the most viable strategy for harnessing the vast potential of drylands. Drylands by their ecological nature are unsuitable for agriculture, primarily due to their low and unpredictable precipitation patterns, as well as edaphic factors, hence the rangelands within the drylands serve as essential grazing grounds for pastoralists and agro-pastoralists. The main strategy for coping with the variability of these regions involves exploiting the diversity of resources through livestock mobility.

Pastoralism sustains the livelihoods of millions of people throughout Africa, particularly in regions facing severe poverty and deprivation. With its dynamic, adaptable and complex structures, pastoralism has demonstrated remarkable resilience to the unpredictable climate and shifting environmental conditions of arid and semi-arid regions, contributing significantly to providing and conserving various ecosystem services (Scoones, 2023). In Kenya and Tanzania, where over 75% and 90% of cattle herds are managed by pastoralists respectively, pastoralists are the primary suppliers of meat for local consumption (Wakhungu et al. 2014), and Somalia largely exports livestock internationally generates 80% of the country's income (Yusuf-Isleged, 2023). The substantial contributions of pastoral production extend to both national economies and the incomes of individual households in various countries globally. For instance, in East African nations, pastoral production contributes between 10 and 40 percent to the agricultural Gross Domestic Product (GDP) (FAO, 2009). In Kenya specifically, pastoralism contributes around 13 percent to the GDP, encompassing both traditional (milk, meat and fiber) as well as indirect benefits like those derived from tourism (Nyariki & Amwata, 2019). Pastoralism also serves as the primary source of employment, supporting over 90% of jobs and more than 95% of household incomes, with 2.2 million people directly employed in Kenya alone (Nyariki, 2017). Additionally, pastoralism largely contributes to household nutrition, either by directly providing essential proteins or by generating income from livestock product sales, which can then be used to purchase other vital dietary components like cereals and minerals (Nyariki & Amwata, 2019).

However, Pastoral communities, including those in Kenya, face unique vulnerability to increased climate variability as their livelihood relies on weather patterns, which influence the availability of grazing and water sources that are crucial for livestock production. Changes in precipitation patterns, erratic rainfall, particularly changes in timing, and increased frequency and intensity of extreme weather events significantly impact pastoralist communities (Tugjamba et al., 2023). Climate change projections suggest a probable increase in average temperatures and greater rainfall variability in the Horn of Africa, which will increase the occurrence of drought emergencies. Over the past decade, East Africa has endured three severe droughts (2010-2011, 2016-2017, and 2020-2022), hindering recovery efforts for affected populations, as reported by the United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA, 2023). In 2022, an unprecedented series of five consecutive failed rainy seasons, aggravated by high global food and fuel costs, triggered a dire food security crisis in Ethiopia, Somalia, and Kenya, pushing over 20 million people into severe hunger (Funk et al., 2023). Further, by 2030, it's projected that Kenya's arid and semi-arid regions could witness the loss of around 1.8 million animals as a result of more frequent droughts (Herrero et al., 2010). This loss would account for a total value of US\$630 million, considering the decline in animal numbers and the subsequent decrease in milk and meat production (Ibid). As such, droughts, coupled with conflicts are seriously affecting livestock production and the livelihoods of pastoralists.

To mitigate the devastating effects of erratic and fluctuating weather patterns, pastoralists have developed culturally enriched response mechanisms. These strategies comprise moving longer distances (migration) to access fodder and water, livestock offtake ahead of droughts, purchasing extra feed and water for livestock, obtaining livestock loans from relatives or neighbors, adjusting household consumption, exploring alternative income sources or adjusting household consumption (McPeak et al., 2011; Silvestri et al., 2012). However, pastoralists have unequal access to these response measures, and the increasing frequency of droughts poses a challenge to the pastoralists' resilience and coping abilities (G. A. Bogale & Erena, 2022). For instance, research conducted in Marsabit revealed that many households were still recovering from the 2009 drought when the 2011 drought hit, resulting to compounding effects on livestock assets (Mauerman et al., 2023a).

As climate extremes have intensified over time, external assistance by both governmental and non-governmental organizations has been mobilized to support pastoralists in coping with

various shocks. This assistance includes food aid, the development of range infrastructure, including boreholes and livestock markets, reseedling, and social protection such as livestock insurance and cash transfers (Mohamed et.al., 2023). These interventions aim to boost pastoralists' resilience despite increasing climatic shocks. The UNISDR defines resilience as *“the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions”* (UNISDR, 2009, p. 24). There has been huge investment in resilience-building initiatives, including investment in software development through supporting, peace, livelihoods and institutions. However, the question is whether these initiatives have really enhanced resilience or undermined the existing cultural practices for resilience.

Although some progress has been made in responding to disasters in pastoral regions through, livestock insurance (Cissé and Ikegami, 2016), cash transfers and livelihood diversification, (Little, 2001), pastoralists remain vulnerable to climate shocks, with their vulnerabilities compounded by various factors. These factors include; conflict, insecurity, structural marginalisation, exclusion, animal disease ((Alemu, 2020; F. E. Opiyo et al., 2014). Equally, an effective drought management system should address not only the immediate cause of drought, such as water deficits but also the underlying human and institutional factors that increase vulnerability to drought effects and hinder adaptation capacity (King-Okumu et al., 2019). Despite significant efforts in responding to drought emergencies in pastoral areas, policies and practices have limited consideration for the structural factors such as conflict, movement restriction, animal disease and insecurity that exacerbate the effect of drought. However, few studies have addressed this gap by exploring the long-term impact of multi-season droughts on pastoralists' livelihood, decision-making making and long-term recovery (Mauerman et al., 2023a) and changes in drought patterns and effectiveness of the social safety-sets on households' post-drought recovery in Moyale Sub-County (Aliow et al., 2017). Contributing to these studies, this research explores: broader characterization of shocks and identify response measures by local people and humanitarian agencies and reflects on ways external responses can be aligned with the needs of the communities in the face of future shocks.

Due to the rising humanitarian cost in response to drought emergencies in pastoral areas, there has been a policy push towards linking development aid and humanitarian support (Mosel & Levine, 2014). This integration is important as the proponent believes that it could enhance aid

efficiency and efficacy (Murphy et al., 2018). Similarly, integrating the existing pastoralists' drought response strategies such as livestock transfers, social solidarity in terms of moral economies and 'resilience from below' (Mohamed, 2022; Mohamed and Scoones, 2023) could strengthen the external humanitarian efforts in managing drought. However, such integration has not been fruitful as shown in (Mosel & Levine, 2014; Murphy et al., 2018). Although other scholars have emphasized the need for 'articulation sphere' to localize humanitarian assistance from below (Konaka, 2017), community perspective and practices remain divorced from the broader resilience programming. A knowledge gap exists in how interventions can be aligned with the needs and preferences of drought-affected communities in Northern Kenya. Therefore, drawing on qualitative research in Northern Kenya's Sololo area in Marsabit county, this research examined livelihoods shocks between 1984 and 2023. The study further assessed various response strategies that pastoralists, government and development agencies employed in managing the crises. By doing this, the study contributes to the wider scholarship on pastoralism, development, resilience and livelihood transformations in the face of crises.

Objectives of the study

The overall objective of this study is to analyze community perspectives on climatic shocks within the study area, their responses, and views on humanitarian and resilience actions in Northern Kenya. Specifically, the study aims to achieve the following objectives:

1. To map and understand the evolving shocks on the livelihoods of Borana pastoralists in Northern Kenya's Sololo area in Marsabit county in the last 40 years.
2. To assess the pastoralists' local-level responses and humanitarian support by aid agencies.
3. To evaluate the local perspectives on the link between the local responses and humanitarian actions in the face of these shocks and how response to future shocks can be aligned with the local actions.

The findings of this study will contribute to shaping policymakers in directing interventions to meet local community's needs based on their prioritized activities that enhance their resilience in the face of shocks. This study is also expected to contribute to the formulation of policies and interventions at the national and county level ensuring sustainability and long-term resilience of the pastoralists to shocks and crisis.

Following this introductory chapter is a literature review on global and regional climatic shocks, trends and their implications on food systems and livelihoods. It also looks into responses to shocks particularly drought that is predominant in the Horn of Africa. This chapter is followed by methods employed in carrying out the study, then results and discussions. The results and discussions were on characterization of shocks that occurred between 1984 and 2023, the contribution of compounding factors to drought impacts and response strategies undertaken by the local people and external agencies. The chapter concluded by reflecting on the response measures in ways humanitarian actions can be aligned with local actions in response to future shocks. Following this is the conclusion chapter, which summarizes the key findings and highlights the areas of further study.

2. Literature Review

This section reviews selected sources around: global climate change patterns, drylands and associated risks focusing on the drylands of the Horn of Africa, and Implications of climatic shocks on food systems and livelihoods and concludes with response strategies employed by local communities and external agencies.

2.1. Global climatic shocks and patterns

Climate change¹ is a multifaceted challenge and a major source of uncertainty for nature-dependent livelihood systems. According to Intergovernmental Panel on Climate Change (IPCC), recent years have witnessed a widespread and rapid intensification in extreme heat events, heavy rains and oceanic heat waves associated with climate change (IPCC, 2021). The rise in greenhouse gas (GHG) emissions, with an increase of 8.3% between 1990 and 2022 (Crippa, M. et al., 2023), is commonly attributed as the primary driver of global warming (Rogelj & Schleussner, 2019). Human activities are the primary source of GHG emissions (Lynas et al., 2021), largely through coal and fossil fuels burning, as well as deforestation, which is recognized as the primary drivers of climate change (Shivanna, 2022). The expected temperature increase linked to global warming is disproportionately high in Africa. Already, the climate models forecast a median temperature increase of 3°C and 4°C in Africa by the close of the 21st century, representing approximately 1.5 times the global average rise (Bryan et al., 2013).

The broader changes associated with climate change have an impact on livelihoods in Africa. Notable changes are observed in the erratic precipitation levels. The hydrological cycle is predicted to be more intense with an increased likelihood of both floods and droughts. For example, flood incidents in Burkina Faso have risen from an average of 11 major events over a decade (roughly one flood event annually) during the period 1986–2005 to an average of 55 over eleven years (five flood events annually) during 2006–2016 (Tazen et al., 2019). Similar changes are observed in hydrological extremes in East Africa. According to (Gebrechorkos et al., 2023), the severity and duration of droughts are anticipated to rise in the 2050s, particularly affecting regions in Kenya, Uganda, and Tanzania. Likewise, the frequency and intensity of

¹ Climate change is defined as a long-term changes in weather and temperature due to human activities (Shivanna, 2022)

floods are expected to increase across most basins in Ethiopia, Kenya, and Uganda. In addition, other parts of Africa experienced prolonged periods of dry spells with increased frequency of drought episodes. For instance, between 1990 and 2014, the Sudano-Sahelian region in Cameroon experienced a rise in drought frequency by 16.7% (Bang et al., 2019).

Anthropogenic climate change will significantly alter the distribution of climate zones. Across West Africa, there is a marked increase in semi-arid and arid conditions with reduced seasonality by the late 21st century (Sylla et al., 2016). This modification is primarily due to gradual temperature increase (Ibid). The analysis of temperature indices across the West African Sahel from 1960 to 2010 demonstrates a consistent upward trend (Mouhamed et al., 2013). Similarly, a recent study showed that the Sahara desert has been expanding at a rate exceeding 11,000 km² per year between 1950 and 2022 (Bedair et al., 2023).

Climate change risks can also be presented from the perception of people, particularly those whose livelihoods are considered nature-based such as pastoralists and farmers. They are expected to adapt to the changing climatic conditions due to their long-term dependency on nature-based productions that often impact their livelihoods (Kimaro et al., 2018). According to (Debela et al., 2015), pastoralists and agro-pastoralists of Borana in Southern Ethiopia noted changes in temperature and rainfall patterns, primarily experiencing higher temperatures, below-average rainfall, shorter rainy seasons, and increased frequency and intensity of extreme weather events. This observation is supported by (Snaibi et al., 2021) in their comparison between pastoralists' perceptions of climate change with climate data recorded at meteorological stations. Their findings revealed that pastoralists' perceptions of climate change, informed by their local knowledge and experiential learning, aligned perfectly with the observed climate trends since the late 1970s.

Climatic shocks vary by region and geographical location. Whereas the Arid and semi-arid areas in Ethiopia are prone to drought risks (Mera, 2018), Coastal regions like Bangladesh experience extreme floods (Kundzewicz et al., 2014). Such a climate crisis is inherently unjust, with poorer countries bearing a disproportionate burden of its impacts. The degree to which these shocks affect human well-being depends on vulnerability levels, which vary within countries. Africa contributes less to global warming which is between two to three percent of global emissions (Bedair et al., 2023), yet, they are hit the most by the consequences of climatic changes arising from its attributed shocks. Importantly, projections suggest that the loss of

human life due to climate change in Africa could be up to 500 times greater than in Europe ((Bedair et al., 2023). The Horn of Africa is currently facing its most prolonged drought in more than 40 years, with a significant impact on the arid and semi-arid regions, greatly affecting the populations in the region.

2.2. Drylands and associated climatic shocks.

Drylands, also known as Arid and Semi-Arid Areas (ASALs), cover more than 40% of the global land surface and provide approximately 44% of global cultivated systems and 50% of the world's livestock population, while also inhabited by over two billion people (IUCN, 2017). These regions are characterized by low and unpredictable precipitation levels and are highly heterogeneous, ranging from hyper-arid to sub-humid climates, with substantial variations in rainfall patterns (Semplici & Campbell, 2023). The availability of water is a key limiting factor shaping the dynamics of dryland ecosystems, as they are highly sensitive to precipitation and Potential Evapotranspiration (PET) dynamics (Stringer et al., 2021). As such, Climate change which exhibits itself as heightened temperatures, altered precipitation patterns, water scarcity, and increased frequency of extreme weather events in drylands, increases the fragility of the systems and livelihood on it. Evidence in regions such as East Africa was projected to warm faster than the world's temperate changes, increasing the frequency of catastrophic events like prolonged periods of dry days, storms, and hot spells (Osima et al., 2018). As supported by the agro-climatic conditions of East Africa, the result by (G. G. Haile et al., 2020) strongly agreed with the widely observed phenomenon of “drying will get drier, and wetting will get wetter”, implying that areas experiencing dry conditions are expected to become even drier, while regions with wet conditions will become even wetter due to climate change.

Drought, a common occurrence in drylands, is a weather phenomenon widely considered the most devastating and complex (F. Opiyo et al., 2015). While definitions may differ based on the context, generally, drought is one aspect of extreme weather conditions - a prolonged period of reduced precipitation over months or years compared to the annual average, leading to significant water scarcity (Wilhite, 2000). It is commonly described as an insidious natural disaster with a slow onset, evolving over months or even years to reach its full impact (Wilhite et al., 2007). Droughts are prevalent across almost all agroecological zones globally, and more than half of the planet is prone to drought yearly (Kogan, 1997; Wilhite, 2000). While drought can occur in all climatic zones, the frequency and impacts of drought vary notably from one region to another. It is more intense and frequent in arid and semi-arid regions, as climates in

these regions are more sensitive to deficiency in rainfall and temperature extremes (Bhuiyan, 2008). These areas are primarily occupied by pastoralists whose livelihood depends on spatial-temporal variable resources in the rangelands. Drought occurrences in eastern Africa is often linked with the development of La Niña events in the Pacific Ocean, typically leading to drought conditions during the "short rains" period of October to December" (Funk et al., 2023). Evidence derived from marine sediment data in the Gulf of Aden over the last 2,000 years suggests a strong correlation between global warming trends and arid conditions in the eastern Horn of Africa (Tierney et al., 2015). If this relationship persists, the ongoing global warming may exacerbate drought conditions, potentially resulting in more severe drought events. Projections suggest that by the end of the 21st century, East Africa will likely experience more frequent droughts, with areas affected by extreme drought expected to increase compared to those facing severe and moderate droughts (G. G. Haile et al., 2020).

In Kenya, the frequency of drought has accelerated drastically over the last fifteen years, severely affecting livestock production (Ndiritu, 2021) and other related livelihoods. According to a study by Howden (2009) in (M. Huho & Kosonei, 2014), the frequency of droughts in northern Kenya increased from once every ten years in the 1970s to once every five years in the 1980s to once every two -to three years in the 1990s, and almost every year in the 2000s. Recent drought events in Kenya are more severe and frequent. For instance, the two successive droughts of 2009 and 2011(Mauerman et al., 2023b), and the drought in 2016-2017 was identified a national disaster with over three million Kenyans food insecure (Ondiko & Karanja, 2021) and 2020-2022 as the most recent with an unprecedented series of five failed rainy seasons – which coupled with other compounding factors, led to an exceptional food security crisis in Kenya, Ethiopia and Somalia, pushing over 20 million individuals into severe hunger (Funk et al., 2023). With a rising trajectory in both the frequency and severity of extreme droughts, the risk profile in drylands is inevitably rising, affecting the lives and livelihoods of people.

2.3. Implications of climatic shocks on food systems and livelihoods

Climatic risk profoundly impacts nature and human society (Liu et al., 2022). Notably, local people whose livelihoods depend on natural resources are more vulnerable to climate change impacts. In regions like Sub-Saharan Africa, where agriculture serves as a primary occupation

(Ayanlade et al., 2022), farmers and herders are particularly susceptible to these changes (G. Bogale & Erena, 2022). Research by (Kogo et al., 2021) underscores that climate change and its variability will continue to pose significant challenges to crop production and food security, especially in developing countries where communities are already vulnerable. In the study by (Rosenzweig et al., 2014), the yield reduction was approximately 50% for maize in the Sahelian region and about 10–20% in other Sub-Saharan regions when accounting for nitrogen stress. Failure to consider nitrogen stress still reflects an overall negative trend ranging from 5% to 50%. For instance, projections indicate that regions like East Africa, characterized by arid-semi-arid mixed crop-livestock systems, will likely witness declines in maize and bean yields by 2050 (Thornton et al., 2010).

Kenya's arid and semi-arid regions face higher exposure to food insecurity, particularly during droughts and floods, which diminish farm yields, decrease household food availability, and reduce agricultural income (Laibuni, 2021). According to UN-OCHA, approximately 18 million people in East Africa are food insecure due to the recent severe droughts, with Ethiopia, Kenya, and South Sudan requiring humanitarian assistance for 7 million, 4 million, and 5 million people, respectively (Toreti, A et al., 2022). Similarly, floods occurring during the production season significantly disrupt crop production. For instance, the floods in Malawi during the 2014/15 growing season had substantial adverse effects on maize yields and the value of crop production per capita, where households in severely affected flood areas experienced reductions of approximately 50% in maize yield and the value of crop production per capita (McCarthy et al., 2018). Such drought and flood implications can likely translate to significant challenges in meeting household food needs, potentially resulting in food shortages and increased food insecurity.

In addition, climate variability affects water resource availability through changes in rainfall patterns and rising temperature intensity (Ayanlade et al., 2022). Rain-fed agriculture, constituting 69% of global water usage, faces significant climate threats due to rising temperatures and increased aridity (UN Water, 2020), further impacting agricultural productivity. Projections indicate a 30–70% decrease in groundwater recharge rates in the western regions of southern Africa, under both 2°C and 3°C warming compared to pre-industrial levels (Döll, 2009). The Result of the study by (Alimagham et al., 2024) showed that

climate change decreased aggregated rain-fed potential yield of cereals by around 6% in East and Southern Africa by 2050.

Climate change impacts are the primary cause of livestock mortality (McCabe, 2021). Drought-related livestock losses vary across specific species within livestock populations, as shown in the survey conducted by (Mengistu & Box, 2016); the mortality rate of livestock due to drought was highest among cattle, with 68% of cattle dying, followed by 15% mules, 6% goats, 5% sheep, 4% donkeys, and 2% camels. They further pointed out that cattle, often the main asset of livestock owners in the Borana Zone, are more vulnerable to drought than other livestock, resulting in increased vulnerability of the local community to further impacts of drought.

The economic impacts of drought on pastoralists are evident in the declining health of livestock resulting in a decline in livestock prices. As pointed out in the study (Mengistu & Box, 2016), that during the drought season, livestock prices and animals' physical condition experienced significant declines. According to a study by (Mauerman et al., 2023b) in Northern Kenya, pastoral households spent more on securing water and feed for their livestock and received less income from animal sales. Pastoralists offset such a burden by investing in alternative sources of livelihood. To avert livestock loss to starvation, pastoralists are compelled to either slaughter or sell their animals to markets at a giveaway price. World Bank further underscored this point, emphasizing that the suffering and emaciated livestock contribute to food insecurity by diminishing the purchasing power of pastoralists due to reduced incomes from animal sales and increased food prices, particularly for staples like maize (World Bank, 2011).

The droughts in Northern Kenya have indirectly impacted local pastoralist groups due to violent conflicts over the past three decades (Ide, 2020). According to (Ember et al., 2012), droughts create localized water and grazing area shortages, intensifying competition among pastoralist groups for these resources. During dry spells occasioned by drought, such resources are scarce, prompting pastoralists to relocate with their livestock in search of fodder and water. Such competitions result in widespread drought-related farmer-harder conflicts (Cabot, 2017). However, despite the growing recognition that drought and environmental factors pose significant risks to human security, attention is also drawn to socioeconomic, natural, and other factors that lead to conflicts among pastoral communities (Ayana et al., 2016). According to them, the speed of response to environmental challenges like drought relies on the coping mechanisms available to pastoralists; prolonged decreases in rainfall and forage could deplete

these coping mechanisms, increasing the connection between environmental changes and the occurrence of recent conflicts.

In summation, it is clear that multiple hazards, including drought, floods and conflict have great implications on pastoral food security, resulting in loss of livelihoods, market instability, loss of income, all affecting the well-being of pastoralists. However, despite these challenges, pastoral livelihoods continue thriving, and this potential is partly enabled by the pastoralists' flexible capacity to manage crises. The next section will explore various response strategies in managing livelihood shocks in the drylands of East Africa.

2.4. Responses to shocks

Pastoralists employ different adaptation strategies as a long-term response to drought and to maintain the sustainability of their livelihood (Lelamo et al., 2022). According to this finding, 82.7 percent of pastoralists in the Korahey zone of Eastern Ethiopia use mobility as one of their primary adaptation techniques (Ibid). Seasonal mobility of the herd and herders was a management strategy used to respond to climate variability and unpredictable resources in the drylands (Roe, 2020). However, (F. Opiyo et al., 2015) note that these movements are frequently affected by impacts such as recurrent drought, violent conflicts, and disease outbreaks. According to (Debsu, 2013), the imposition of restrictive policies and external interventions, such as expansions of schools, water centers, schools, and other amenities, have undermined mobility. Equally, the implementation of restrictive policies have weakened mobility and other local adaptive responses. Pastoralists manage rangelands at a communal scale rather than fragmenting them into private and individual tenure systems thereby maintaining mobility as an adaptation strategy (F. Opiyo et al., 2015).

Pastoralists also use livestock mix as an adaptation strategy to mitigate the effects of drought. In a study carried out in the pastoral community of Northern Kenya, surveyed households kept a variety of livestock species, including cattle, donkeys, camels, and shoats (sheep and goats) (Okoti et al., 2014). According to (F. Opiyo et al., 2015), households that diversify the species and composition of their herds have better access to food during droughts and higher off-take. The growing interest in camel keeping among former cattle pastoralists in Southern Ethiopia is primarily in response to low rainfall and the vulnerability of cattle to recurrent droughts (Wako

et al., 2017). However, it is well known that communities whose traditional life has always been based on livestock may hold on to livestock even in the face of severe droughts rather than switch to other species, such as camels. And the high cost of acquiring a camel (Cuni-Sanchez et al., 2019). Other pastoralists diversify their livelihood instead by engaging in complementary income-generating activities. The rationale behind diversification is to build a portfolio of livelihoods with different risk attributes to manage the risks of drought before moisture deficit and speed up recovery after the event (Reardon & Vosti, 1995). Most of these livelihood diversification activities were adapted not to replace livestock production but rather as a complementary approach to pastoralism (F. Opiyo et al., 2015).

Another strategy Pastoralists employ is selling their livestock; they are often compelled to sell their animals at any price to meet their financial needs or to escape severe droughts or disease outbreaks (Yitayew et al., 2023). During drought, pastoralists must sell their animals because they cannot withstand extended dry spells due to lack of feed and water. The prices of cattle decline due to an increase in livestock and the low demand, requiring farmers to sell even more to buy feed. These prices negatively affect the farms and household assets and income (Bahta & Myeki, 2021). However, access to markets limits pastoralists from selling their animals to reduce losses. Equally, (Cuni-Sanchez et al., 2019) pointed out that extremely limited access to markets in Marsabit is the reason why the selling of animals before the drought was not practiced by the study participants as a response mechanism.

In addition to local responses, the government, non-governmental organizations, and other humanitarian agencies often play a significant role in supporting pastoralists to manage drought shocks. The humanitarian response relies on early warning systems (EWS) to predict crises and direct interventions. Despite the understanding that the effects on welfare due to insufficient consumption are influenced by stress duration, and intervening before harmful coping mechanisms are adopted and communities deplete their coping capacity is essential to mitigate long-term impacts on food and livelihood security during emerging crises (Hansen et al., 2022). However, the conventional procedure of monitoring, emergency assessment, appealing for resources, mobilizing resources, and delivering assistance frequently results in delays by several months, even when efficient EWS are utilized, and each step is managed effectively (M. Haile, 2005). Assessments of African Risk Capacity (ARC) demonstrated significant

potential for reducing welfare losses through earlier intervention and increased number of beneficiaries (Kramer et al., 2020).

Emergency relief food is a vital aspect of humanitarian aid to a country during natural or human-induced disasters (Tofu & Wolka, 2023). Prolonged droughts and flash floods adversely impact pastoral and agro-pastoral livelihoods, resulting in low crop yields, decreased pasture, limited water access, and widespread chronic and acute food insecurity, leading to heavy dependence on external food aid in affected regions (Asrat & Anteneh, 2020). However, governmental food assistance is not always consistent and often lacks precise targeting, primarily due to the government's reliance on foreign donations and bureaucracy in aid distribution (Ayantunde et al., 2015). Food relief decreased in Kenya after 2011 with the introduction of cash transfers through the Hunger Safety Net Programme (HSNP), yet not all registered individuals benefited from these cash transfers as reported by (Akall, 2021).

Social protection programs, as highlighted by (Herrero et al., 2016)), remain crucial in assisting impoverished and vulnerable pastoralist households amidst climate change. These programs, often administered by national governments, strive to safeguard the livelihoods of persistently poor households through various means, including cash or in-kind transfers, labor market interventions, and risk mitigation strategies (Hansen et al., 2022).

The majority of humanitarian agencies currently employ cash transfers as cash contributes to strengthening household resilience. It achieves this in two important: firstly, acting as social safety nets, regular cash transfers offer immediate relief from shocks, averting drastic declines in consumption or resorting to harmful coping strategies like asset depletion. Secondly, cash transfers enable households to amass productive assets and broaden their income sources (Gertler et al., 2012; Stoeffler et al., 2019). As argued by (Wood, 2011), cash transfers play a substantial role in achieving adaptation goals, primarily by safeguarding and enhancing adaptive capacity. Although cash transfers alone cannot address all adaptation challenges, they can indirectly contribute to many while also improving the effectiveness of other policies. Hence, there is a strong argument regarding cash transfers as a key component of the policy toolkit for addressing adaptation requirements in developing countries.

Studies suggest that emergency crises tend to be complex and often evolve into long-term crises, posing challenges for resolution and requiring a broader, multi-actor response (Kaga & Nakache, 2019). Since the 1990s, the notion of linking relief and development initiatives has

gained visibility, prompting agencies, scholars, and professionals to seek ways of reconciling the humanitarian-development nexus, aiming to deliver both efficient humanitarian assistance and sustainable medium- and long-term development actions (Béné et al., 2018). For example, the shift towards cash transfers and efforts to link them into national social protection systems represents a notable innovation in humanitarian aid, particularly with the rising prevalence of delivering assistance through cash transfers (Cherrier, 2021). While this approach extends coverage to more recipients, it is crucial to address the political disparities between the two systems carefully.

Concerning development projects, most interventions implemented in pastoral areas of Northern Kenya were not deemed advantageous over time. For instance, the national government, operating through the Kerio Valley Development Authority (KVDA) in the north Rift Valley region, initiated a 150-hectare solar-powered commercial pivot irrigation scheme in 2016 to tap into the aquifer. Yet, such external interventions have had minimal to no effect on the well-being of local Turkana residents (Akall, 2021). As he suggests, the fragmentation of rangelands, which includes converting grazing areas into irrigation schemes and expanding permanent settlements or small-town development, hinders the practice of mobile pastoralism. Similarly, (Schilling et al., 2016) proposed that the discovery of oil in Turkana will significantly impact the existing water, land, and livestock resources while also generating new revenues, employment, business opportunities, and infrastructure development. Notably, major projects have either failed or fallen short, with the threats of extensive land appropriations remaining unrealized as local persistence tends to prevail (Galaty, 2021). In this context, (F. Opiyo et al., 2015) proposed that policies and development interventions aimed at reducing risks, livelihood constraints, and broadening opportunities for enhancing household resilience to drought are crucial complements to existing pastoral strategies.

3. Material and Methods

3.1. Study area and sampling

This study was undertaken in Sololo in Moyale sub-county, located in arid and semi-arid areas in the northern part of Marsabit County. It covers an area of 5,995.6 km² and borders North-Horr sub-county, Wajir county and Ethiopian (see figure 3.1). Sololo has a population of 44,822 people (KNBS, 2019). The area is predominantly home to Borana pastoralists who mainly keep cattle species, but recently due to the loss of cattle to the recurrent droughts, they are diversifying to camel, sheep, and goats. Sololo receives 700mm of mean annual rainfall with two rainy seasons: the “long rains” from March to May and “short rains” in October and November. However, this timing fluctuates with both decrease and increase of precipitation amounts—the mean annual temperature in the area is 28°C (CIDP, 2023).

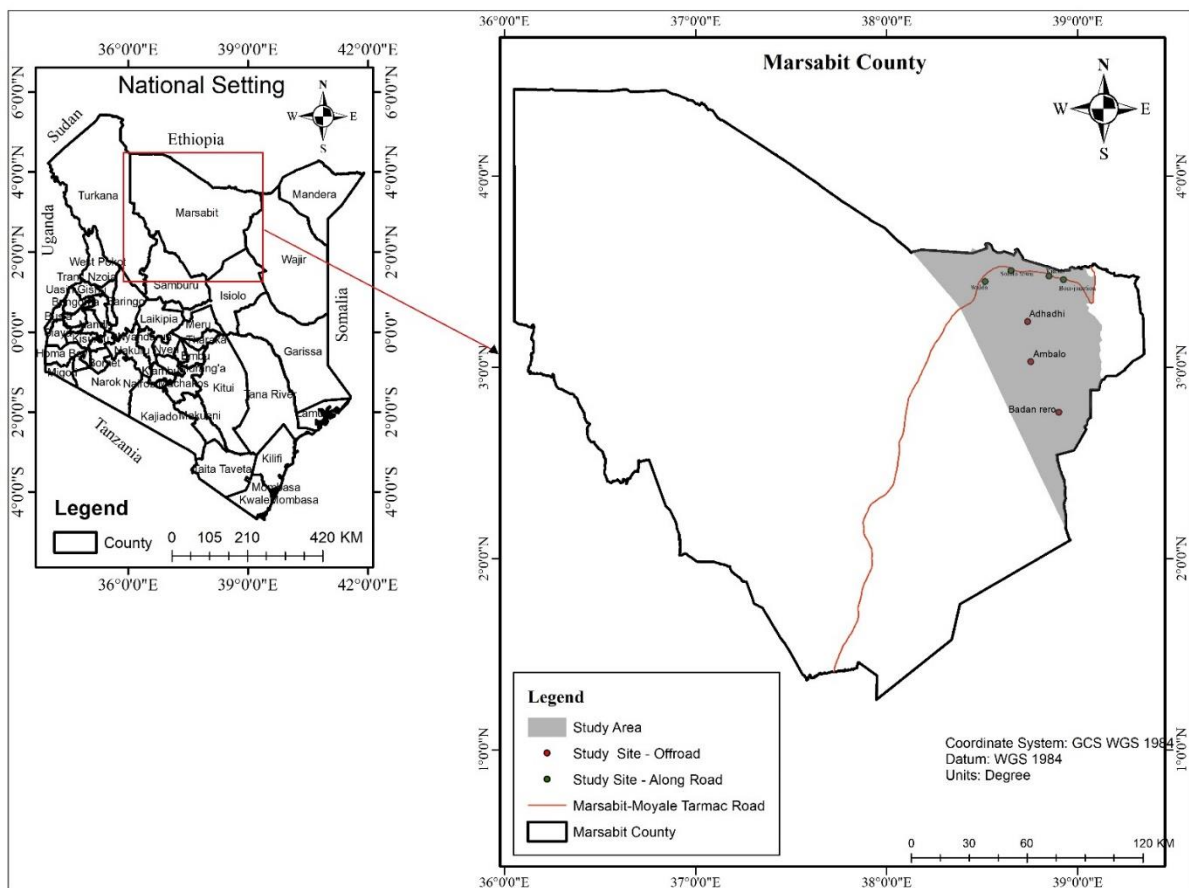


Figure 3.1: Map of Sololo study area

Specifically, the study took place in the following sites: First, areas along the main Marsabit-Moyale tarmac road were sampled, considering a mix of old permanent settlement areas such as Sololo Ramata and Walda which are old established towns with permanent water points, amenities and mixed livelihood. Along the highway, relatively new settlements such as Borr Junction and Kukub were additionally sampled. The second sampling was conducted in relatively far-flung settlements that are about 50 kilometres from the Marsabit-Moyale main highway. The areas sampled under this category are strategic dry/wet season grazing areas and areas with knowledgeable herdsman who have experienced intergenerational shocks. Other areas sampled in this category are exclusively pastoral region of Badan Rero, bordering Wajir county and Adadi, an area that is mid-way between the highway and Ambalo and has established institutions for managing grazing areas during wet and dry seasons. See Table 3.1 below illustrating the study sites and criteria for selection.

Table 3.1. Overview of the study sites within Sololo and the selection criteria.

Region	Areas selected	Selection criteria
Along the tarmacked road sites	Sololo Ramata/Makutano	An old settlement area that borders the Kenya-Ethiopia escarpment with mixed livelihoods, occasional cultivation and improved access to goods, services and transportation due to road infrastructure.
	Walda	An area known for its permanent groundwater points (wells) used by pastoralists across the Moyale Sub-County, with well-established institutions governing these water resources.
	Borr Junction	A new settlement that extends to larger golbo rangelands.
	Kukub	A new settlement primarily composed of immigrants from southern Ethiopia. A sample that is likely to introduce new perspectives on grazing landscapes and livelihood systems.
Off tarmac road sites	Amballo	This is far from tarmac road with dry/wet season grazing zones and the presence of knowledgeable herdsman who experienced intergenerational shocks targeted as key informants.
	Badan Rero	An important grazing unit of the golbo rangelands that border Wajir County with exclusively pastoralists communities.
	Adadi	This area has well-established institutions for managing grazing areas during wet and dry seasons.

3.2. Study design

This study used a qualitative approach through combined mixed methods. The methods include focused group discussions (FGD), Key informant interviews (KIIs), narrative interviews (NIs), Semi-structured interviews (SSIs) and community historical event mapping. The data was collected between December 2023 and February 2024. FGDs, KIIs, NIs, and SSIs were recorded after obtaining participant consent in local languages. Audio files were transcribed verbatim in the local language and then translated verbatim into English for data analysis purposes.

3.2.1. Data collection

To map the historical shocks, I conducted twenty-one focused group discussions (FGD), each consisting of seven to ten participants. In each study site, I undertook focus discussion with separate groups of youth (below 35 years, mixed gender), women over 35 years old and men over 35 years old. In addition, I conducted two key informant interviews for a deeper understanding of past crises in each selected study site. I then constructed the historical event timeline over the past 40 years.

These interviews were complemented by six individual narrative interviews (Bauer, 1996) across the study sites with knowledgeable elders who have memories of past shocks. The narrative questions were asked to get a whole story of how the different shocks occurred, when they happened, and the details of the impacts experienced at the individual and community levels, before, during, and after the shocks. The narrative research centered around the first-hand experiences of participants, detailing the sequence of events and actions they encountered throughout their lives (Riessman, 2012). Additionally, I undertook narrative interviews with three key individuals who had unique strategies to manage shocks. These three individuals and have developed skills and expertise that ensure effectiveness and a high level of reliability in managing their livestock and resources, and respond to crises efficiently through networks, relationships, and diverse livelihoods (see Mohamed et.al., 2023).

Lastly, I conducted three Semi-structured interviews with individuals working with humanitarian agencies, (NGOs) and government staff that supported the local people during the shocks. All the individuals interviewed were identified from FGD discussions with the members of the community, while others were reached through snowballing.

3.2.2. Data analysis

A thematic coding frame for data analysis was developed with four main categories relating to the study objectives: Shocks, local responses, humanitarian responses, and alignment/misalignment of the local and humanitarian responses. Each category further contained sub-codes. This coding was applied to all the transcripts using RQDA® qualitative data analysis software.

4. Results and Discussions

4.1. Inventory of shocks and their impacts

Borana pastoral communities of Sololo are affected by different climatic and non-climatic shocks, with different levels of shocks to their livelihoods (see Table 4.1). From the trend analysis, community members mapped 17 shocks in the last 40 years. From the timeline, droughts are the main events recorded, with 10 shocks, out of the 17 cumulative shocks mapped. This observation corroborates with (Nicholson, 2014) assertion regarding drought events in northern Kenya, where he examined rainfall conditions in Eastern Africa between 1998- 2012; rainfall were recorded to be at least 50% to 75% below average in nearly half of the region affected by drought within the Greater Horn of Africa. Conflicts, floods, Covid-19 and desert locusts are also considered essential events but were perceived by communities to be minor shocks relative to the drought.

Pastoralist in Sololo categorized drought into four types - normal, moderate, severe, and extreme. Normal and moderate types were considered as droughts with minimum impacts to livelihood and a drought where the associated shocks are manageable internally and within the capacity of the community to respond. On the other hand, severe and extreme droughts are those associated with substantial livestock loss exceeding 60% on an absolute number, coupled with crop failure, and the household food security situation deteriorates. However, the distinction between severe and extreme drought is very narrow while differentiation is blur in some areas. Usually, a year with complete failure of rainy season or below optimal seasons causes severe drought, but with some compounding factor the drought classification shifts to “extreme”.

Table 4.1. Droughts and other shocks mapped in Sololo (1983-2023)

Year	Drought (Category and brief description)	Other shocks
1983/84	Extreme drought: Lasted for 2 years. It's considered extreme drought due to the highest level of livestock mortality and malnourishment especially among children.	
1985		Flood
1991/92	Severe drought: 2 rainy seasons failed; increased completion for resources due to settled refugees from the Ethiopia-high number of livestock loss but not like 1983/84 drought.	
1995/96	Normal drought: It was manageable, few animal losses- major problem was shortage of water in the region.	
1997/98		<i>El nino</i>
1999/2000	Moderate drought: Lasted for 1 year. A number of livestock loss were reported.	
2002		Flood
2003/04	Severe Drought: Lasted for more than 1 year. More than 60% of livestock loss.	
2005/06		Conflict
2008/09	Moderate drought: 1 failed rainy season, followed by shorter long rains. A number of animals died.	
2010/11	Extreme drought: Lasted for more than 1 year. Considered extreme due to the cumulative impacts of years of drought.	
2013/14	Severe drought: 2 failed rainy seasons. A number of animals lost but slightly better than the preceding drought.	
2016/17	Extreme Drought: Lasted for 1 year. The impacts were huge due to consecutive droughts. Over 80% of livestock loss recorded.	
2018		Conflict
2019		Locust invasion and Covid-19
2020-2022	Extreme drought: Considered as the worst ever experienced in 30 years. 90-95% livestock loss.	
2023		Flood

Borana pastoralists described most of the last dozen years as drought years because the frequency of drought is increasing, with extreme drought episodes singled out in post 2000. Except for the 1983/84 drought, all other severe and extreme droughts were witnessed in last 20 years. For example, 2010-2011, 2016-2017 and 2020-2022 happened in the last 15 years. They stated that in the past, droughts were not close together. Only after some years, would another drought come. Given that there are increasing occasions of back-to-back droughts and fewer good seasons witnessed between droughts, households have had progressively less time within which to recover from subsequent shocks. Severe and extreme droughts come with

livelihood loss. For instance, the 1983/1984, 2010/2011, 2016/2017, and 2020-2022 droughts led many households in Sololo, either temporarily or permanently, unable to sustain their family following a heavy loss of animals. Drought weakens the livestock, leading to low prices in the markets, consequently diminishing income from the sale of animals.

The implications of the back-to-back drought is far-reaching among the Borana pastoralists. Households that are affected by droughts are those that mainly keep cattle and sheep (without goats and camels), those relying on rain-fed farms alone, and people with few livestock. For instance, during the recent droughts of the years 2020 -2022, every household in the study area lost 90-95% of their cattle. Those who were considered most successful in terms of responding to drought and surviving with the higher number of livestock have about 10-15 cattle while those who were most affected have 0-3 in number, which was mostly not productive herd but calves that were fed at home. With cattle as the most predominant livestock type kept among Borana pastoralists due to their primary role in livelihood and cultural heritage, the extreme loss especially for households entirely dependent on them resulted in the loss of their productive asset and household income. This has implication on household food security, especially child nutrition.

“I am not able to provide for my children because of drought. All the cows I kelp have died. The health of one of my children is deteriorating and I could not afford to get him food nor medication” A participant of women focused group said.

Pastoralists name drought events based on multiple factors, including the subsequent event following the given drought, the type of support received on that drought, and the places the animals moved to in response to drought. For instance, the 1983/84 drought was referred to as *ola dhima suga* (the drought of yellow maize), a relief food distributed by the government. The 1992 drought was called *Ola refugee* (drought of refugees), coinciding with the year when refugees from Ethiopia were settled in Sololo following ethnic violence in Ethiopia, and the drought of 2004 was *Ola Magado*, named after a place in Ethiopia, where animals trekked to and settled.

The gaps between droughts have significance to pastoralists. For example, reading from the shock pattern above, there is an interlude between the extreme drought of 1984 and that of 1992. According to pastoralists, such gaps between two extreme droughts allow for herd

reconstruction and growth and ability to bounce back from the impact of previous drought and resilience to face subsequent shocks. The change in pattern and interval of drought has implications on pastoralist households. For example, the severe droughts of 2010/11, 2013/14 and 2016/2017 happened within 2 years depriving people of the potential to regenerate their stock.

Drought is compounded by other shocks as shown in the table. The period between 2017-2020 is considered a good period of recovery and no droughts but conflicts, Covid-19 pandemic and desert locust invasions occurred in 2018 and 2019. These events erode the potential of the community's recovery. Firstly, locust invasion competed for vegetation with livestock and as mentioned by the local people, pasture areas that they normally graze for 5-6 months before drought, could only give 2 months of grazing for their animals.

Secondly, in the period of conflict and covid-19 pandemic, herders' access to strategic grazing areas is limited and livestock losses are amplified by localized grazing. At the beginning of the 2020-2022 drought, some parts of Golbo rangelands like Basir area were not accessible to Borana herders because of conflicts with the neighboring Somali community of Wajir county. Such constraints in mobility have implications on herd growth and livestock productivity, affecting the resilience of livestock to withstand the impacts of the prolonged 2020-2022 drought. These droughts were considered extreme, partly attributable to the compounding factors.

Another factor that compounds drought risks is weakening resource governance. According to herders, the weakened internal institutions of managing land and the diminishing grip of the elders on land and water management led to increased influx of animals from other areas. Unregulated access through different points through the directives of the county government officials, undermining the customary regulation. The unhindered access and diminishing role of elders contribute to poorly planned and managed grazing and therefore, contributes to feed shortages in times of need. This implies that the drought reserve for season grazing are misused by the outsiders through unregulated use. This was experienced particularly in 2018 and 2021, which resulted in open-access abuse of their rangeland. Furthermore, the incoming herds introduce unknown diseases into the Borana pastoralists' herds, worsening the existing drought impacts.

“.... Our biggest threat is not drought on its own. As long as those communities will not join us by entering into our territory and destructing our land, our grazing land is enough for us even for 10 years without rain.” Key informant emphasized.

The Borana community traditionally engages in farming to complement their food resources during favorable seasons, yet presently this practice has been neglected. The absence of oxen, which are crucial for ploughing, due to frequent drought-induced livestock losses, coupled with the financial constraints of hiring oxen, deters households from cultivating their land at all, or ploughing a small portion of their land or ploughing in late season. Consequently, this situation adversely affects the quality of harvest, resulting in minimal or no harvests for many households.

“Extreme droughts have led to water shortages, due to lack of rain, we have not been able to do subsistence farming. We have now given up on farming”, said a Key informant RML

“We did not have oxen to farm with, so some community members hired a tractor to dig the farms. It costs 4000 Ksh to plough one acre so the community contributed, others sold their goats, but as for me I farm a small portion that I can manage manually.”, An elder in a narrative interview reiterated.

The reduction in Livestock population also resulted in most household having non-viable herd for mobility. As such, the ability of households to maintain their customary nomadic lifestyle to effectively manage risk is compromised. Furthermore, the inability to access essential resources due to limited mobility has implications on the health and productivity of their animals, making it even harder to deal with other shocks.

4.2. Responses to drought shocks

This study established that drought response measures and livelihood support are usually taken by community through their local response mechanisms, complemented by support from external agencies, including the government, development projects and humanitarian support. The following section discusses these responses in detail.

4.2.1. Local communities’ responses to drought shocks

Borana pastoralists use different strategies at different phases of drought cycle. Some of the salient strategies are deployed in pre-drought period while others are deployed during drought

emergencies and post-drought recovery periods. Before we discuss these responses, there are few essential facts that should be noted about the study area, i) while some proportion of Borana households in Sololo are mobile, increasingly others are settled around towns like Ramata and Sololo Makutano, ii) response strategies are not universally applied; different strategies are employed by different people, and not all responses are suitable for every drought situation, iii) some responses are applied at household level and individual levels while others are taken at community level. The table below shows a list of local-level responses to shocks and a brief description of each response.

Table 4.2 Local responses to shocks and brief descriptions

Local responses	Brief descriptions
Movement and settlement in dry season grazing areas.	A strategy employed mostly by wealthier herders but also the less wealthy households pool their herds and migrate together to share responsibilities and the costs for water and herders.
Traditional stock sharing and restocking mechanisms (<i>Dabare</i>)	This is mostly a post-drought response deployed when someone loses all/part of their herd to drought. Such livestock loans are given by their relatives and sub-clan (<i>Millo</i> and <i>Balbal</i>). <i>Dabare</i> is usually given to poor, non-ambulatory households (with <i>no livestock ownership</i>).
Livestock sale	Families with enough livestock (wealthier household) sell part of the livestock to obtain food for their family as well as veterinary drugs for their animals.
Splitting of the herds	Dividing herds into smaller and more manageable groups to lessen the risk of losing all animals to drought and related shocks in one grazing location.
Restricted grazing in some grazing landscapes.	Part of pasture areas are designated and enclosed as dry season reserves (<i>Kalo</i>), hence with restricted access and exclusively to be used during drought shocks by weak lactating animals
Others	Some of these strategies are not widely accepted but still applied to some scale by Borana pastoralists e.g. charcoal production for sell, getting food on credit, fodder purchase, gathering edible wild fruits for food and labour-related work in farming and urban areas.

Movement and settlement in dry season grazing areas: Migrating with livestock to distant areas like Isiolo and other grazing areas in southern Ethiopia in search of pasture and water is a common strategy during severe and extreme drought. Analysis of migration patterns indicates a shift in the nature and extent of livestock mobility. Livestock migrations are traditionally limited in geographical scope with Sololo herds migrating within a short radius circuit around

Sololo. In extreme and severe droughts, the radius of migration extends to far-flung areas which are 300-500 kilometers. In the last severe drought, wealthier households trucked their herds to Isiolo-Meru borderland that is 600 kilometres away from their traditional grazing territory. However, such extensive mobility is usually done by households with substantial livestock numbers, enough savings, and diverse sources of income to be able to cater for huge costs associated with such trucking.

“Unlike people here, I have camels, I sold two camels to get transport money for (moving) the cows. One camel was sold at 40,000Ksh and the other at 50,000Ksh. I used 80,000Kshs to pay for transport, that's how my cows were able to survive the extreme drought of 2020-2022. I moved 36 cows to Waso, 2 were stolen, 2 weak ones died in Isiolo and 32 survived which I have now” Key informant, WD.

Other households, typically those belonging to less wealthy herders which are becoming majority of the household population are restricted by costs and thereby remained within the limited Sololo grazing radius. Since their grazing flexibility is confined, restricted by financial challenges, they tend to lose higher livestock per capital compared to their wealthier colleagues.

A decline in mobility was observed due to reduced herd size as a result of recurrent drought in a study carried out in Somali regional state, of Eastern Ethiopia (Lelamo et al., 2022). However, with regards to reduced livestock herd in this study, a slight shift in strategy was also observed from the results of less wealthy households (households with small herd size). These groups pool their animals together to share responsibilities of herding, watering and also cost of transportation. In the recent past, several challenges constrain mobility among Borana pastoralists. One emerging challenge is conflicts that arise due to encroachment of other pastoralist communities and the expansion of agricultural and settlement areas driven by population growth. This is one reason that has reduced migratory radius within Sololo. Moving to unfamiliar grazing territories to extend mobility also brings its own difficulties, such as increased risks of animal theft by neighboring communities and the emergence of unfamiliar animal diseases, leading to more livestock losses.

Traditional stock sharing and restocking mechanisms (*Dabare*): Borana pastoralists use traditional asset redistribution systems which are meant to support households that have lost many assets due to shocks such as droughts, conflicts, or diseases. Borana use livestock redistribution systems called "*Dabare*" or "*busa gonofaa*" which is redistribution of livestock

based on clan and kinship connections. One example of Dabare given by respondent is where a female cow is temporarily loaned to a household affected by hazards like drought, enabling them to obtain milk supply for their household. *Dabare* goes beyond providing access to milk supply and in some cases, when the cow ceases to produce milk, recipients may retain the offspring to potentially serve as their seed stock to rebuild their future herd.

A key informant said (KI 3 BR) “...*“I began with 50 goats, grew to about 300 in 12 years, but recent droughts wiped out my herd. Two neighbors each donated five goats, those are what I got now...”*”.

According to (Berhanu & Fayissa, 2009) successive years of drought pose a significant risk to pastoralists, as they gradually undermine households' capacity to access communal social support mechanisms such as financial aid or livestock loans (*Dabare*). Consistent with this account, while *dabare* is still practiced to some extent within clans, this traditional system is overwhelmed by recurrent droughts which causes a sharp increase in populations of poor and needy households while the wealthier households are getting fewer. This is leading to a shrinking pool of individuals with enough livestock to offer *Dabare*.

“Similar occurrences have been seen in the community where the community took care of their own but not as common as before because most people have nothing to offer now...” An elder in a FGD BR2 commented.

Herd splitting: Herd splitting involves dividing herds into smaller and more manageable groups to have less localized risk exposure. From the responses, herd splitting is traditionally practiced by Borana people to minimize risks by diversifying their migratory and livestock keeping strategy and is usually deployed by the well-off households with larger herds to split. Those who have been able to split their livestock to various locations are less likely to suffer devastating losses from droughts or at least to survive with a section of the herd. It was observed in the result that the herd splitting activity is based on the health, age, sex and trekking ability of the animal.

While vulnerable cattle, lactating cows, and young stock were separated and left to feed around homesteads, the healthier stronger animals were moved to distant places as a ‘satellite herd’ to escape the drought. The lactating herd remains in the village, while satellite herd is moved to locations where water and pasture can be found. This coping strategy enables them to survive

with a section of their herd through satellite herd grazing/migration in other areas where there is better prospect for pasture and water. Similar result was obtained in (Lelamo et al., 2022) where 65.3% of the respondents were reported to employ herd splitting as a coping strategy to reduce drought impacts in Eastern Ethiopia.

However, as witnessed in the recent droughts, many herders experienced losses among the herds relocated elsewhere, while those presumed weaker and left near the homestead survived. This is because recent droughts impacted all areas uniformly, which compelled herders to move further into unfamiliar territories beyond their traditional mobility radius.

Livestock sale: The Borana community sells livestock strategically before drought, especially animals they consider too weak to survive drought. Households with enough livestock (wealthy group) sell some livestock to cover food and income needs for the family as well as veterinary drugs for the animals. In extreme circumstances households with few livestock are forced to sell to cater for their basic needs. In recent shocks, the number of animals sold are increasing as households aim to reduce losses from drought intensification and the aim to reduce economic loss that will be incurred by higher livestock deaths that could result from drought stress. This finding is congruent with that of a study (Bahta & Myeki, 2021) on farmers responses to agricultural drought in South Africa which revealed that the fall in cattle prices due to increased livestock sales during low demand, compelled farmers to sell more to purchase feed- this decline in prices negatively affected the farm and households assets and income.

From the result, it was also observed that goats and camels are priority species to be sold to purchase fodder and water for cattle because Borana pastoralists attach stronger cultural significance to cattle. However, when the drought prolongs more than expected, cattle are also sold. The price of animals drops as their body gets emaciated following drought impacts.

Challenges associated with lack of livestock market in the area make the herders unable to employ the strategy flexibly to increase their livestock sales before drought. Similarly, the study (Cuni-Sanchez et al., 2019), on pastoralists' adaptation to climate change in Motane region of Marsabit County, argued that the extremely limited access to livestock market in the area explained why pastoralists did not mention animal sales before the drought. In this study, most of the herders opt to sell their animals to traders at low prices while others engage in faraway markets such as in Moyale town or Dillo market in Ethiopia and such markets are associated with higher transaction costs.

Restricted grazing in some pasture areas: Borana pastoralists restrict certain pastures under enclosure called *Kalo* while also governing some strategic pastureland under rules and regulation (*Seer*). Such grazing and resource management plans are put in place before drought. When the drought intensifies, other communities would at times seek help and such resources are shared following an agreed local protocol. Before these communities are settled in their rangelands, borana local elders are approached, and upon agreement, thorough inspections of the health of their animal numbers are done and a specified area is designated for the incoming herders.

In the Sololo area, the *Mazingira* group controls grazing during wet and dry seasons. They enforce the rules of sending animals to the extreme far end of the grazing area (*Mata deedha*), with the exception of calves and those lactating. They also control access of animals to the pasture from outside communities. However, herders from outside do not have such measures and do not respect this regulation which often leads to conflicts between different communities.

The result also revealed that the dry season grazing reserves in Sololo is shrinking due to increased privatization of grazing lands. The population of people and herds are also increasing, highlighting that such reserves are inadequate compared to previous years. As a result, the lands are left barren well before the drought period elapses.

Other strategies: Other strategies are not widely applied within a traditional pastoral practice but are employed by some households within the community. Especially low-income households tend to exploit the immediate natural resources like cutting trees for charcoal production and sale, while others who lost livestock and subsequently drop out of pastoralism go into labour-related work which include casual work in urban area like construction and farming to get some incomes to sustain their household. It is also common for the local people to obtain food on credits from local shops and purchase fodder to feed weaker animals that could not migrate with a satellite herd.

Poor households also gather edible wild fruits for food, especially during the rainy seasons and stored for use during dry seasons. This practice is diminishing in the recent past due to the disappearance of some of fruit trees in the area and insecurities that prevent people from freely venturing in the wilderness to gather wild fruits.

4.2.2. External support by humanitarian agencies

The external support from Non-Governmental Organizations (NGOs), faith-based organizations, community-based organizations (CBOs), and government agencies is increasingly seen as an important response among pastoralists during drought and related shocks. According to FGD respondents, the recent protracted crisis has over-stretched households and community level responses, increasing the demand for external support. Overall, the type and nature of support vary with the emergency level in an area and the population of poor households. Changes in humanitarian responses have been observed over time. According to respondents, relief assistance was traditionally in the form of relief food, however, food for work, cash for work and cash transfer programmes have emerged in recent times.

Over the past forty years, distribution of relief food (mainly constituting maize, beans, sorghum and cooking oil and supplementary feeding) is the most common emergency response by humanitarian and government agencies. This has helped households to sustain themselves and equally relieves pressure to sell livestock assets for food during drought. Although the number of humanitarian agencies is growing in the region, the distribution of relief food is erratic and cannot support everyone but selected villages and households. In a similar study in West Africa, (Ayantunde et al., 2015) describes food aid by the government of Niger as irregular, inefficient, and reactive, often hindered by dependence on foreign donations and bureaucratic distribution systems.

In our study area, the timing of food distributions and the amount of the food ration are not known in advance, thus in most cases, food was not enough to support households that have no other source of income. The lack of clear prior understanding of the ratio and timing of food arrival interferes with pastoralists' household planning and response to emergencies. Sometimes these supports are delivered in the form of 'food for work' and 'cash for work', to enhance pastoralists' productive engagement with physical infrastructures, such as water pans, road maintenance and bush clearance, but such an effort could interfere with labour organization, an essential resource for livestock management, especially during severe drought.

Cash transfer programs such as the Hunger Safety Net Program (HSNP) complement the food relief distribution to allow households to secure a livelihood. They act as an insurance tool before the shock occurs or can be given after the shock has occurred (Brück et al., 2019).

Households identified as vulnerable are selected and the larger population of recipients are those located in off-highway villages such as Ambalo and Badan Rero. Participants preferred cash transfers compared to food aid because it is cost-effective and has limited logistical cost of access and the cash will allow recipients to prioritize their own needs during drought emergencies. The increased reliance on the growing banking services and the mobile money transfer (M-PESA) in the area made cash transfer programs smoother. Apart from the purchase of required foodstuff, some households used the money to venture into other income-generating small businesses, restocking of small ruminants (especially goats) and to cater for school fees. A similar result was reported by (Jensen et al., 2017), cash transfers increase household consumption by about 10% on average and noted that households benefit from investing the cash transfers in some income generating activities.

Herd restocking after drought was another response by NGOs in which pastoralists are given specific number of livestock to reconstitute their herd. Although not commonly done after the recent drought, several households were restocked in the past based on the degree of losses incurred during drought. Mostly, poor households that have lost their livestock to recurrent droughts and could not maintain their livelihood are targeted for restocking. Few of the beneficiaries were given camels but the higher proportion of households restocked were given 3-5 goats which are largely preferred for its faster multiplication.

Referring to the restocking program after the 1992 drought, a participant of FGD said *“There was someone in my neighborhood who was given 10 goats by arid lands (programme) way before this drought, all his kids have been taken to school with these 10 goats as they multiply.”*

Other support services provided include emergency water trucking and hay transportation during severe droughts, fixing of malfunctional boreholes, veterinary services to contain outbreaks of diseases. Collectively, these services played a crucial role in supporting herders during drought emergencies. However, most part of the study area still experience inadequate water supply due to lack of or malfunctioning boreholes, while others have wells but are too far (15-20kms) from homesteads. The ratio of veterinary officers to the pastoralist is inadequate and local people largely rely on the existing few trained locals on basic veterinary skills. Conversely, a study carried out in Makueni, Kenya (Mugunieri et al., 2004) revealed that such local health workers were viewed as a threat to the delivery of sufficient animal health services by professional veterinarians and government officials. This was not observed in this study

because in addition to training, local practitioners had further expertise in traditional medicine, which has been used for years.

On the other hand, the fodder/hay are expensive and are provided late, mostly when the animals have died while some were given at the tail end of drought. According to the FGD respondents, the quantity of fodder was also not sufficient to sustain the emaciated animals.

4.3. Reflection on responses to climatic shocks

This study highlighted the heterogeneity in both the perception of hazards, impacts and responses to the said shocks and crises. The reflection on the shocks in 1983-2023 period illustrated increased pastoralists vulnerability, particularly to drought shocks and the different state of preparedness to manage shocks, plus effectiveness of both local and external responses in different areas.

Even though the previous drought events presented existential risks and the fact that there is awareness of potential for heightened risks to future drought(s) and other shocks, responses to climatic disasters are still reactive. The inflexible responses are partly explained by the history of shock responses in Kenya which is historically wired to reactive approaches and interventions, as opposed to more proactive approaches (Kithikii et al., 2024). As such, these reflections connect synergy and misalignment between local level responses and the external humanitarian responses, with aim of extracting some lessons for future consideration.

A reflection on the responses by the Borana pastoralist in Sololo brought out the place of social network to build collective resilience through systems of reciprocity designed to assist most vulnerable households. It was observed that the local people through clan or village networks prepare for drought way before external agencies. However, the recurrent and prolonged droughts undermine the ability of such social systems to fully function because many of the previously wealthy classes of herders have lost a substantial proportion of their herd to drought shocks, leading to burgeoning of the number of poor households. This implies that there are fewer people able to loan a cow or few goats as “*Dabare*” and the protracted droughts erode people’s ability to reciprocate, to return that which they receive.

Some of the identified local level actions which are considered first line of defence include restricted dry season grazing zones, locally managed water points and hay storage among

others. Nonetheless, unpredictable events associated with climate change in the area present a planning hurdle for local communities. A key informant elder said, “...*It always felt like we are playing catch-up, never quite ready for the next drought*”. Additionally, compounding factors such as insecurities and weakening rangeland governance make people not to fully manage their resources and prepare for future shocks. Insecurities also affected smooth delivery of external support. As such, some of the identified needy villages could not get the requisite support. This shows that responding to drought emergencies is far beyond just drought but includes responses to other compounding factors that need to be considered. Slow responses and in some places, failure to address such compounding issues is believed to be the cause of extreme livelihood losses experienced during the recent drought (2020-2022) in the area.

The quantity, frequency and the timeliness of emergency humanitarian assistance is another area of concern. Due to the nature of humanitarian emergency funding, the responses by varied agencies are rather too late. Despite the positive appreciation of humanitarian responses, the respondents complained of the scope and timeliness of humanitarian assistance. In this regard, the respondents mentioned that the number of enrolled beneficiaries is mostly low, the cash and food distributed is little and the support is infrequent. The late responses of external support means that pastoralists would lose their strategic assets and many will lose their livelihoods. With their local level responses overstretched by recurrent droughts and limited external support to bridge, people have lost several livestock assets and they become more vulnerable to future shocks. A key informant said, “... *their ways (referring to late response) of help is sinful and not beneficial for us and our livelihoods, they come when all is lost*”. Provision of strategic livestock feed and fodder for instance, were received at the end of drought episodes, when they were no longer needed.

The type of food and ration of food distributed have been changing in type and reducing in ratio over the years as distribution has also become more erratic. There is uncertainty surrounding the balance between the amount of food aid supplied and the demand from affected households. The volume of food supplied in times of emergency do not match with the need on the ground because more people are vulnerable resulting from more frequent and severe droughts in the region. As such, the available supply could only cover a small population of vulnerable households. One of the reasons for such a mismatch is that the supply of food and how long it lasts is always contingent on the size of funding and the flow of the funds, which is erratic and unstructured. Additionally, during the food distribution in some areas, the supplied food ration

is homogenous and does not factor for the level of vulnerability of specific households. Factors such as household income situation and the number of people in a household that extremely need food supply is neglected.

An elder commented, *“We would appreciate support in terms of food distribution with higher consideration for vulnerable households. As for food rations, we would seek if donors will consider household size plus vulnerability and it can be enough to help the situation”*.

While humanitarian aid is mostly short-term, longer-term interventions geared towards helping communities withstand future crises on their own is minimal. According to the respondents, some of the long-term responses like the governmental social protection systems such as HSNP is said to be highly effective in the area with potential of contributing to local resilience in the face of shocks. However, with the increasing number of vulnerable people, many needy households cannot be covered by such important schemes. Support towards scaling up such programmes is needed to increase overall resilience of households in the area.

The architecture of local responses and humanitarian responses vary to some degree. While pastoralist responses are rapid and strongly embedded in their social network, humanitarian responses mostly do not build on such locally embedded and highly flexible adaptive practices. For instance, migration with livestock to escape drought is a common practice by locals to escape droughts. Unintended consequences such as school dropout during emergencies can be avoided if external support could be designed to align with such local practices.

Additionally, the local social support system such as livestock redistribution (*Dabare*) differs from cash transfer programs. While *Dabare* is employed at communal level starting from identification of the needy within the clan and the givers of *Dabare*, cash transfer programs operate at household level with selected committees serving as intermediaries between external agencies and the community. Borrowing or building from structured locally embedded approaches would align the cash transfers to the neediest and ensures inclusivity. Understandably, such alignment could be elusive in some cases because of the time constraints associated with emergency situations, leaving limited opportunity for a better assessment of community-level needs. Engaging in a two- way dialogue with local people requires adequate time and planning way before the emergency phase of a shock in order to fully understand the situation on the ground and how best the project or response activity could serve the intended purpose.

5. Conclusion

This study examined livelihoods shocks between 1984 and 2023 and further assessed various response strategies that pastoralists, government and development agencies employed in managing the crises. Based on the data analysis of the shocks, drought was predominantly the major shock that presented one of the existential risks. The implications of increased frequency and severity of drought are far-reaching, largely massive livestock loss. Drought also weakens the livestock, leading to low prices in the markets, consequently diminishing income from the sale of animals. The result also showed that drought risks are compounded by factors such as insecurities and weakening rangeland governance that make people not to fully manage their resources and prepare for shocks.

The shock response analysis revealed that pastoralists respond to drought emergencies through internally driven strategies such as herd mobility, livestock sharing and redistribution, livestock sale, grazing in restricted areas, herd splitting and others. In addition, they respond through the support from external agencies, including the government, development projects and humanitarian support. This external support comprises emergency food aid, social protection in form of cash transfers, veterinary training and support and emergency restocking.

Owning large herd of livestock portfolio and multiple income sources and savings describes resilient person at an individual level. These people have the ability to cater for and monitor the health of their animals, destock on time, expand and restock their livestock to a viable herd size after shock. At a community level, two regularly repeated themes were secured community that could move their herds freely and those that could effortlessly help each other during and after shocks through their own support system. However, this is merely a fleeting vision that fades with increased intensity of the shocks as the vulnerable people are constantly increasing and that the traditionally tested responses and their framework are overstretched and unable to help as much. Based on the data humanitarian responses also, particularly cash transfer and restocking programs contributed to the resilience of people by smoothening their income to meet basic needs and restoring their livelihoods. However, these responses do not align with the need on the ground; More people are in the “needy” bracket, but a handful could get the support. There are also observed misalignments between some of the desired local level needs and how external support is offered that highlighting the need for change in approaches in the face of drought and other related shocks.

The structure of local responses and humanitarian responses vary. While pastoralist responses are rapid and strongly embedded in their social network, humanitarian responses mostly do not build on such locally embedded and highly flexible adaptive practices. In spite of the positive appreciation of humanitarian responses, the support is described as late and infrequent, with a low number of beneficiaries and amount of food ration. However, some long-term responses like the governmental social protection systems such as HSNP can potentially provide adequate support as local social systems are overstretched following the back-to-back drought episodes, but support towards scaling up is needed to increase overall resilience of households in the area. While the study aimed to employ the alignments/misalignments between local responses and humanitarian actions in ways the two responses can be linked both in timing and response type, further research is needed to fully ground the policy messages in this subject area.

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7. Annex

Appendix 1 Research tools (interview questions)

Part A: Key Informant Interview

County and Sub-County Name: _____ Date: _____

Note: This will be a follow-up interview with high reliability professionals and community opinion leaders (chiefs, water manager, deedha head, etc.).

1. Mapping the occurrence of both climatic and non-climatic shocks in the past 30 years.
How did these shocks (Specify) impact you and others around you?
2. Have you observed any shifts in the nature or intensity of these shocks compared to those experienced in the earlier years? If so, what are the differences?
3. What personal strategies did you use during these challenging times? What did you do differently that helped you?
4. What kind of support did you get that helped you in the face of these shocks?
5. From your experience, what do you believe are the key elements for building resilience both an individual and community level?
6. What do you think can be done differently by local people and humanitarian agencies to respond better to future shocks?

Part B: Focused Group Discussions

Name or description to identify the location within the sub-county

Date: _____

Note: This is an interview with selected 7-10 people who have deep knowledge of shocks and resource management in the area. Three different FGDs will be held (With youths below 35 years old and mixed gender, with women over 35 years old and with men over 35 years of age)

1. What significant climatic events have affected this village in the past 30 years?
 - a) When did each of the events take place? Please identify the specific period in which the event occurred (choose a different identifier)

- b) How long did each event last? Please indicate the duration in weeks, months, or years using your preferred reference.
- c) How did the identified shock affect different people/areas differently and why?
- d) What is the nature of the impact(s)?

2. What are the response measures done during a crisis/drought, to reduce its impacts?

- a) Measures taken by community members
- b) Actions taken by humanitarian agencies
- c) How has the nature of responses changed over the years?

3. In the face of future shocks, what actions/response could be changed to minimize impacts and increase resilience?

a) by community members

- Who within the community cannot undertake these measures, and what are the reasons?
- Who within the community possesses the capability to effectively implement such measures, and why?

b) by humanitarian agencies

Name (5-7 participants)	Approx. age	Sex	Main livelihood	Roles in the community (sub-county)

Part C: Semi-Structured Interviews

County and Sub-County Name: _____ Date: _____

Name or description of the government official/NGO representative (Office, position, etc.)

Note: This will be presented to the relevant government officials and representatives of humanitarian agencies that have served the community in the face of the shocks.

1. Communities faced multiple shocks in the past 30 years, how did your organization/government department supported or aided households during these shocks (Specify the shocks as mentioned during the shock mapping)? (E.g., initiatives, programs, interventions)
2. How did the responses your organization/government department offered change over time?
3. What key lessons did your organization/government department learn from offering support during such shocks or crises?
4. What are the main challenges your organization/government has encountered in providing effective assistance during shocks?
5. How does your organization/government align its assistance and response strategies with the needs of the local communities affected by shocks?
6. In what ways do you think your organization/government can improve its support strategies during future shocks?
7. Are there any additional information/report or insights you would like to share regarding your support to the community during previous shocks?

Appendix 2 Table showing number of Focused Group Discussions in each study sites

Number	Focused Group Discussions (Gender)	Number Of Participants	Location
1	Women	10	Sololo Ramata
2	Youth (Mixed Gender)	10	Sololo Ramata
3	Men	8	Sololo Ramata
4	Youth (Mixed Gender)	10	Adadi
5	Women	7	Adadi
6	Men	9	Adadi
7	Youth (Mixed Gender)	8	Walda
8	Women	8	Walda
9	Men	8	Walda
10	Women	8	Badan Rero
11	Men	9	Badan Rero
12	Youth (Mixed Gender)	10	Badan Rero
13	Youth (Mixed Gender)	8	Ambalo
14	Men	8	Ambalo
15	Women	8	Ambalo
16	Women	7	Bor Junction
17	Men	8	Bor Junction
18	Youth (Mixed Gender)	8	Bor Junction
19	Women	10	Kukub
20	Youth (Mixed Gender)	9	Kukub
21	Men	7	Kukub

8. Acknowledgement

This research was conducted under the graduate fellowship program that was jointly funded by the Jameel Observatory for Food Security Early Action at the International Livestock Research Institute (ILRI) and the Centre for Research and Development in Drylands (CRDD). First and foremost, I thank Almighty God for His guidance and strength throughout my academic journey. I am extremely thankful to my ILRI supervisors - Dr. Guyo M. Roba and Dr. Tahira Mohamed, for tirelessly supporting and guiding me throughout my study, from the start of the study to the time of my thesis writing. I will always be grateful to you for your extremely supportive, prompt feedback, constructive criticism, and your availability whenever I needed your guidance. A special thanks to Dr. Hussein T. Wario, The Director of CRDD, for his generous support during the fieldwork and post-field engagements.

My sincere appreciation equally extends to my school supervisor, Dr. Peter Torok, for his invaluable administrative support, ensuring my work meets the requirements of the Department of Ecology of the University of Debrecen. Others within the CRDD community worth my appreciation, including, Mr. Jackson Wachira and Dr. Rahma Hassan. I cannot thank them enough for their words of encouragement, their guidance during fieldwork, and their willingness to provide support. You are indeed exceptional leaders, and your positive motivation is something I will always remember. To Dahabo Guracha at CRDD, I cannot imagine how the data collection process would have been without your sacrifices and wholehearted support; it was not just a job for you, you supported me wholeheartedly even over the weekends. To Halkano and Hussein, thank you for making the CRDD office in Sololo a welcoming environment for me and for organizing community meetings, fixing interview appointments on short notice. I am also grateful to Mr Kana Wario, driver at CRDD, who has been taking us through different terrains, and to Garbole for your timely help in transcriptions.

On settling in within ILRI, I extend my gratitude to; The Capacity Development team especially Mr Marvin Wasonga and Mrs Rita Muriuki for administrative support. I am extremely grateful to the ILRI student pull; Jabir, Stephanie, Rachel, Anita and Remi for creating a homely environment for me within ILRI. I am most grateful to my mother and my siblings for your love, support, and constant check-ins while I was in Hungary. Mum, for being my pillar of strength, your prayers have led me to places I never thought I would reach at this age. And for this reason, I dedicate my work to my beloved mother, Mrs. Hadija Godana Duba