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The effects of climate change on gender roles among agro-pastoral farmers in Nabilatuk district, Karamoja subregion, North Eastern Uganda

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This study examines the effects of climate change on gender roles among agro-pastoral farmers in Nabilatuk District, Karamoja subregion, in North Eastern Uganda. Data were collected from 10 focus group discussions, 10 key informant interviews, and observations. Atlas Ti 7.5.18 software was used to analyze the data. Findings indicate that climate change has disrupted traditional gender roles among men and women in Karamoja. Because of this, men have been forced to shift from pastoralism to crop farming. Additionally, some men have taken on reproductive roles that were formerly female-dominated. Women, on the other hand, have taken on petty trade in trading centers, which was formerly only a men's pursuit. This has come as an increased workload for women, leaving them even more vulnerable. This shift brings into question the notion of the stability of gender roles and how this affects the agricultural productivity of both men and women. Conclusively, there is a need for the adaptation of gender-sensitive strategies that can reduce the work burden of women.

KEYWORDS

climate change, gender roles, division of labor, drought, agro-pastoral farming

1. Introduction

Agro-pastoral farming is an agricultural practice that includes both the growing of crops and the raising of livestock (Le Gal et al., 2022). It is an important source of livelihood in many low- and middle-income countries (LMICs) (Doss and Quisumbing, 2020). Crop–livestock integration is needed for the sustainability of men and women worldwide. For example, Paul et al. (2022) reveal that, in the Great Mekong region in Asia, it is a pathway for rapid agricultural and socio-economic transformation. Abraham and Pingali (2020) indicate that over 1.5 billion people globally are smallholder farmers, practicing crop and livestock production. However, issues of climate change such as drought—as manifested in an increase in temperatures—have significantly affected the agricultural production of agro-pastoral farmers (Nagarajan, 2020).

Climate change, specifically drought, is a physical process that involves a shortage of precipitation, resulting in higher temperatures (Mukherjee et al., 2018). The World Meteorological Organization defines climate change as a change in the statistical distribution of weather patterns that lasts for an extended period of time (i.e., decades to millions of years) (Zambrano-Bigiarini and Baez-Villaneuva, 2019). The Intergovernmental Panel on Climate Change (IPCC) notes that, due to climate change, the global mean surface temperature has

increased by ∼1°C above pre-industrial levels and is likely to rise to 1.3°C–4.8°C by 2081–2100, resulting in higher regional warming with strong effects on agricultural productivity (Arnell et al., 2019). The projected increase in temperatures in Africa (from 2°C to 4°C) poses a threat to agriculture, especially to agro-pastoral farmers (Sandstrom and Strapasson, 2017; Egbebiyi et al., 2020).

The study draws on two anthropological theories that study human–environmental issues. The first is the Disaster Risk Theory, which presupposes that natural disasters, such as drought, affect the lives of different groups of people in society (Blaikie et al., 2005). Disasters or hazards repeatedly destroy livelihoods (livestock and crops), homes, and tools at the household level, while roads, bridges, hospitals, schools, and other facilities are damaged at the national level (Blaikie et al., 2005). The hazards restructure social relations in households and affect the normal lives of men and women. The study also draws on Feminist Political Ecology, fronted by Rochelau et al. (1996), to analyze the effects of climate change on gender roles in the Nabilatuk district. Ecofeminists argue that there is a close connection between women and nature based on a shared history of oppression by patriarchal institutions and dominant Western culture. They further categorize women's participation, specifically in agro-pastoral farming, as a social construct.

1.1. Agro-pastoral farmers' perception of climate change

Agro-pastoral farmers are more likely to perceive climate change when they have more years of farming experience. For example, agro-pastoral farmers in the Karamoja subregion perceive climate change as an increase in temperature and a decrease in rainfall (Lwasa et al., 2017). Egeru et al. (2015) confirms that farmers in the Karamoja subregion have experienced temperature changes from 0.9°C to 1.3°C. Furthermore, there have been temperature changes since the 1970s, with a break around 1985. There was a second gradual rise in temperature in 1991–1993, with a breakpoint between 1996 and 1997; then, the third and sharper rise of relatively higher temperature was observed from 1998, followed by a break around 2007 (Nakalembe et al., 2017). The changes in temperatures have been ongoing for the last 10 years (Lwasa et al., 2017). Relatedly, Egeru et al. (2019) observed that the inhabitants of the Karamoja subregion, more specifically the Lolachat area, experience high temperatures of 28°C–35°C with a limited rainfall of 300 mm per year. The changes in temperatures cause tremendous effects on the crops and livestock of agro-pastoral farmers.

1.2. Effects of climate change on crops and livestock of agro-pastoral farmers

Globally, climate change is rapidly redefining human–environment relationships as both livelihoods and human societies are greatly impacted (Paprocki, 2022). For example, it has caused the atmosphere to warm, temperatures to increase, and rainfall to become erratic (Cooke et al., 2018). This has, in turn, caused poor crop yields, loss of crops, and reduced farm revenue among African agro-pastoral farmers (Bogale and Erena, 2022). Similarly, a study on the effects of climate change and gender roles in Western Uganda revealed that the change caused crop pests and diseases (Nagasha et al., 2019). Climate change in Africa affects agricultural systems by reducing grazing quality and quantity, causing shortages of food and feed, and affecting gender roles in communities (Ncube et al., 2018).

1.3. Gender roles before climate change

Men and women had different roles before the climate change globally (Singh et al., 2022). According to Phiri et al. (2022), 60% of African women devote their time to farming activities before the climate change. Furthermore, before climate change, women were engaged in their social roles as caregivers and provisioners of their homesteads (Falkowska, 2023). Other women are involved in small livestock keeping, such as chickens, and men take on big livestock like camels and cattle (Stephen et al., 2023). Women are also involved in various methods of food preservation, which are important during times of disasters like drought (Singh et al., 2022). Stites (2020) states that, before the climate change in the Karamoja subregion, women were involved in crop farming and men were engaged in livestock farming for the provision of their families. However, with the onset of climate changes such as drought and reduced precipitation, women are taking on more roles.

1.4. Women in multiple roles due to climate change

As climate change causes crops to die, women have taken on previously male-dominated roles for survival, increasing their work burden in both the Global South and North (Glazebrook et al., 2020). Gender roles are reversed as the climate changes. For example, in Asia, women take on new gendered roles in agriculture, while others assume new power (Oppong and Bannor, 2022), resulting in women having to take on productive roles such as protecting their crops (Nagasha et al., 2019). The advent of climate change also causes women to find new sources of food and other items to support their families by traveling further and spending more time addressing the food scarcity problem (Karmakar, 2021). Relatedly, Marie (2020) discusses the struggles of women in Karamoja and argues that drought has increased the work burden for women. As a result, some of them have ended up sending their daughters to work outside Karamoja in exchange for food. Additionally, men have also taken on formerly female-dominated roles to survive.

1.5. Reproductive roles of men and migration for survival

It has been reported that, in East Africa, men used to engage in livestock farming for their survival (Caravani, 2019). However, the climate change crisis has caused a decrease in agricultural activities driving men to migrate and seek out other roles in non-farm economic activities in order to survive (Håkansson, 2022).

In many ways, this adaptation is disruptive in nature since men's stable income-generating projects consequently decline. As such, they migrate to other areas in search of survival mechanisms outside of crop cultivation (Mueller et al., 2020). In Karamoja, the intermittent droughts have destroyed livestock farming, which was the major livelihood for men, causing them to take on crop farming, which was a female-dominated activity (Caravani, 2019). Worse still, the recurrent droughts have led to an increase in livestock diseases and deaths (Asiimwe et al., 2020), forcing the male pastoralists to migrate and share roles with women in artisan mining (Rugadya, 2020).

Based on this background, this study, therefore, explores the effects of climate change on gender roles among men and women in agro-pastoral farming in the Karamoja subregion, North Eastern Uganda. It focuses on the effects of climate change on gender roles in the Lolachat and Nabilatuk subcounties in the Nabilatuk district.

2. Materials and methods

2.1. Research design, study area, and participants

This study draws on a cross-sectional design that involved collecting data from individuals in Nabilatuk and Lolachat subcounties in the Nabilatuk district. The district is located in the Karamoja subregion, North Eastern Uganda. The study sought to analyze the effects of climate change on livestock–crop production and gender roles among smallholder farmers in Lolachat and Nabilatuk subcounties in the Nabilatuk district. Using qualitative methods, data were obtained from agro-pastoral female and male farmers in the two subcounties of Lolachat and Nabilatuk.

2.2. Study area

The study was carried out in the Nabilatuk district in the Karamoja subregion, North Eastern Uganda. The Karamoja subregion is a semi-arid region of East Africa found in North Eastern Uganda between latitude 1° and 4° North and longitude 33° and 35° East (Byaruhanga and Stoltsz, 2021). Mbogga et al. (2014) noted that the subregion covers 27,511 km², while UBOS (2020) elaborated that it is composed of nine districts, namely Abim, Amudat, Kaabong, Karenga, Kotido, Moroto, Nabilatuk, Nakapiripirit, and Napak. The study area (Lolachat and Nabilatuk) has one rainy season from April to September (Atuhaire et al., 2018) (Figure 1).

Nabilatuk district was curved out of Nakapiripirit by the Government of Uganda in June 2018. Two of the subcounties in the district, Nabilatuk and Lolachat, were purposively sampled because they experience climate changes that destroy crops and livestock of agro-pastoral farmers (Akwango and Egeru, 2016). The study area had, by 2019, a total population of 85,700 people. Of these, 40,800 were women and 44,900 men (UBOS, 2020). The majority (80%) live in rural villages called "*manyattas*" (Cau et al., 2018). The *manyattas* are homesteads of the Karimojong people called Pian, who practice agro-pastoral farming (Cau et al., 2018).

2.3. Participants selection

We employed purposive sampling to select men and women aged above 21 years who were involved in both crop and livestock farming. These individuals had not previously participated in structured interviews; instead, they were invited to take part in Focus Group Discussions (FGDs). Ten focus group discussions were conducted (five for men and five for women) across the Nabilatuk and Lolachat subcounties. Each discussion took ∼2 h. The men and women who participated in the FGDs were aged between 21 and over 60 years, practicing agro-pastoral farming and solely livestock farming. We purposely selected a total of 10 key informants, including four government officials (two district production officials and two natural resource officials) and six non-government organization (NGO) representatives working on climate change and livelihood issues in the study subcounties. All key informant interviews and FGDs were recorded verbatim with participants' consent.

2.4. Data collection methods and tools

We collected data through FGDs with men and women smallholder farmers, key informant interviews (KIIs) with district government officials and NGOs working on climate change and livelihood issues and observations of men and women in smallholder farming communities.

The key questions in the FGD guide sought to establish the types of farming practiced, the experience the respondents had with drought, the effects drought had had on agricultural production, and how the drought had changed gender roles in the study area. From the KIIs, the study sought to establish the characteristics of the dry season and the changing roles of men and women in crop and livestock farming. For observation, we developed an observation guide to observe the effects of drought on the agricultural livelihoods of men and women. We also observed the adaptation strategies that men and women in crops, livestock, and mixed farming used to withstand the drought. FGDs and KIIs took between 45 min and 1 h. The FGDs had participant numbers ranging from 9 to 12. Voluntary participation was encouraged throughout the study. We also sought informed consent from the participants in the study.

2.5. Data management and analysis

Analysis of qualitative data followed the transcription of audio recordings verbatim and translated the transcripts from Ngakarimojong into English for analysis. We began by reading and annotating transcripts to make preliminary observations. Then, we identified themes from these preliminary observations. Finally, we developed a coding scheme using the identified themes. Atlas Ti 7.5.18 software was used for this, and a thematic analysis approach was applied. The thematic approach helped to classify, code, and categorize the codes into relevant emerging themes and sub-themes. In the subsequent section, we present the results of the study following the methodology that we employed.

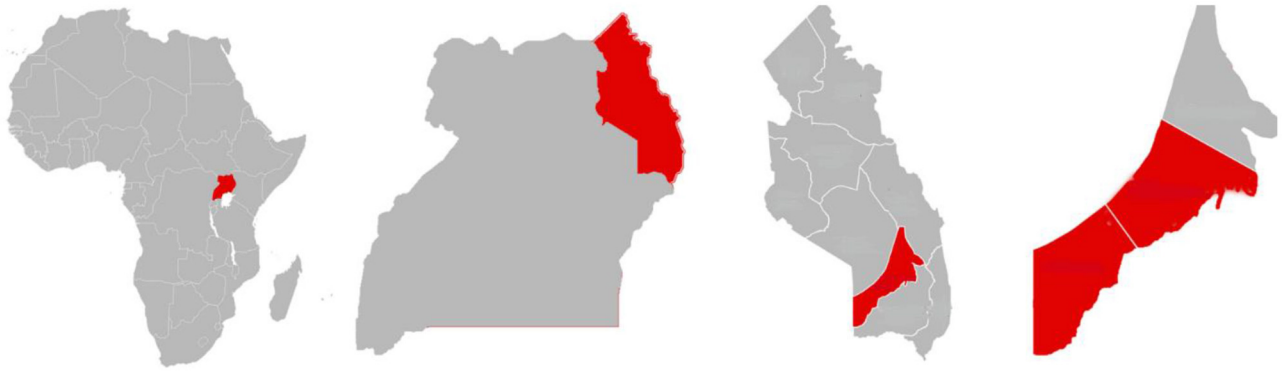

FIGURE 1
Map of Nabilatuk district and all its subcounties. Source: Mukisa (2023).

3. Results

We present the results under five main thematic areas: (1) agro-pastoral farmers' perception of climate change; (2) effects of climate change on crops and livestock farming; (3) gender roles before the climate change; (4) women's multiple roles in reproductive, productive, and community roles; and (5) men in reproductive roles as others migrate for survival.

3.1. Agro-pastoral farmers' perception of climate change

The results from both subcounties revealed that both male and female farmers had observed significant climate changes for the last 5 years. For example, in the Lolachat subcounty, women revealed in the FGDs that there have been climate changes for the last 5 years, as one crop farmer stated:

> For the 57 years I have been in this subcounty, I have observed changes in the weather and climate. For example, in the 1960s, the weather was fair but, in the 1980s, it was worse, and even, in 2017, it was bad. This climate changes almost every 5 years (Interview n. 1, crop farmers, women, March 2019).

Still in the Lolachat subcounty, another woman respondent mentioned, "…this sunshine is on and off, sometimes it is too much, and other years it rains. But these years it is worse." This shows that both men and women in both subcounties acknowledge that there has been climate change in the Nabilatuk and Lolachat subcounties. These changes have particularly affected crop and livestock farming.

3.2. Effects of climate change on crops and livestock farming

Findings reveal that climate change has had devastating effects on crops and livestock farming for both men and women. In the Nabilatuk subcounty, both men and women observed, during FGDs, that the climate changes have had tremendous effects on crop farming, with negative consequences for their wellbeing. During FGDs with women in the Lolachat subcounty, it was revealed that climate change was associated with crop pests and diseases, i.e., army worms, stalk borer, and head smut for sorghum. From the FGDs, a woman involved in crop farming narrated:

> I planted my eggplants in 2017, but when the sunshine came, it caused diseases which damaged my eggplants and I didn't harvest anything. This means that women who depended on the cultivation of crops for survival had food deficits in their households. This resulted in food insecurity and hunger (Interview n. 2, crop farmers, women, March 2019).

Men involved in livestock farming in Lolachat reported that the intermittent, prolonged dry seasons created favorable conditions for the emergence of pests and diseases such as brucellosis, contagious bovine pleuropneumonia (CBPP), caprine pleuropneumonia (CCPP), and East Coast fever (EFC). These regularly attacked their cows and goats, leading to livestock deaths. A man in livestock farming explained in an FGD:

> Within this drought season, ticks multiply a lot and they spread diseases. I have lost many of my livestock due to the climate change problems and I don't even want to recall about it (Interview n. 1, livestock farmer, men, March 2019).

Women revealed during FGDs in both Lolachat and Nabilatuk subcounties that the drought had caused poor crop yields, and they harvested one bag of sorghum from an acre of land, instead of six bags, which they used to harvest before the drought. A participant in crop farming stated:

> Last year, instead of harvesting seven bags of sorghum I harvested half a bag; the sunshine was so much and we suffered so much in this area. Up to now, hunger is so much in our households and survival is very difficult (Interview n. 3, crop farmers, women, March 2019).

This resulted in food insecurity in both Nabilatuk and Lolachat subcounties. A key informant further elaborated that the severity of

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the drought was causing women in crop farming in both Nabilatuk and Lolachat subcounties to grow one crop, sorghum, and abandon others like groundnuts. A government official stated:

> Women in Nabilatuk subcounty could plant all types of crops, i.e., sorghum, maize, and sunflower. However, this consistent drought has made them abandon some crops. They are currently growing sorghum only (Interview n.1, government official working with the district production department, March 2019).

Women made the decision to grow sorghum because it is more drought-resistant compared to other crops within the study area, such as maize.

The results from FGDs of both women and men in the Lolachat and Nabilatuk subcounties revealed that the drought caused pastures to dry, resulting in low milk production in cows. During the focus group discussions, women echoed the view that there was no milk at the time of the study. Yet, milk was important for women to feed their children. The inadequacy of milk production in livestock caused starvation among children and women. In the Nabilatuk subcounty, one woman in livestock farming narrated:

> The problem of climate change has caused a scarcity of milk in this area, forcing us to resort to begging for survival. This was not the case previously, we are suffering so much. We used to survive on milk in Karamoja, but these days, life is very hard and difficult (Interview n. 2, livestock farmers, women, March 2019).

3.3. Gender roles before the climate change

By gender roles, in the study, we indicate the responsibilities men and women take on in the private and public realms. Table 1 shows that, in the study sites, men and women had distinct roles ranging from reproductive or domestic roles to productive roles, which involve the production of goods and services either for sale, exchange, or to meet subsistence needs and then the community roles.

Before the drought, women dominated reproductive activities, which included fetching water, cooking, childcare, firewood collection, the construction of *manyatta* huts, land preparation, harvesting, and chasing predators from vegetable gardens (Table 1). Similar findings were revealed during women's FGDs in the Lolachat subcounty, where a woman crop farming participant narrated:

> As a woman, my work is to fetch water, take care of the family, and I cultivate to prepare for the planting season. Then, I wash plates, take [sic] of the children, sweep the compound, and take maize to the grinding meal (Interview n. 4, crop farmers, women, March 2019).

These reproductive activities have no monetary value attached to them. This indicates that more women than men were involved in reproductive roles. Of the eight productive activities in Table 1, only two are dominated by women, both in the Lolachat and Nabilatuk subcounties. These include brewing alcohol and burning charcoal. Women were not active in productive activities such as the sale of livestock, which has monetary benefits. During FGDs, women revealed that the sale of livestock is the obligation of men in the study sites. This shows that women are discriminated against even in income-generating productive activities, which can help them to sustainably survive the effects of climate change.

Regarding community roles before the drought (see Table 1), women participated in organizing weddings, while men dominated traditional meetings locally called *Akiriket*, which were male-dominated. The discrimination of women in male meetings (*Akirikets*) was reported in both study sites. An elderly man in both crop and livestock farming stated:

TABLE 1 Gender roles before the drought.

	Lolachat subcounty		Nabilatuk subcounty	
	Women	Men	Women	Men
Productive activities				
Livestock management		X		X
Grazing livestock				X
Selling of farm yields		X		X
Selling of livestock		X		X
Brewing alcohol	X		X	
Casual labor		X		X
Charcoal burning	X	X	X	X
Plowing		X	X	
Reproductive				
Fetching water	X		X	
Cooking meals	X		X	
Childcare	X		X	
Firewood collection	X		X	
Chasing crop pests	X	X	X	X
Land preparation	X		X	
Community activities				
Elderly meetings (*Akiriket*)		X		X
Participation in weddings	X	X	X	X
Participation in relief activities		X	X	
Traditional meetings (*Akiriket*)		X		X
Conflict resolution		X		X
Workshops/training		X		X

Source: Fieldwork (2019).

> In our culture and tradition, *akirikets* are a forum for men to discuss issues pertinent to the community. Women cannot be in our meetings. It is our platform to talk about our issues as men and discuss some of the problems affecting our area (Interview n.1, elderly men, March 2019).

Further analysis of Table 1 results reveals that, in both subcounties, women control relief activities such as food donations, while men share with women the role of chasing predators that attack vegetable gardens. However, due to climate change, gender roles get restructured, resulting in women taking on multiple roles and men also taking on roles traditionally associated with women, including reproductive roles.

3.4. Women in multiple roles due to climate change

The results from FGDs and KIIs after discussion with men and women from both study sites revealed that the changes in climate have restructured gender roles in multiple ways. Women have taken over men's role of managing livestock while still maintaining their integrative abilities to deal with complex systems of households, productive work, and community work during the period of drought. During the FGDs in Lolachat, women spoke about taking care of calves, cattle, and goats—a role originally reserved for men and boys. This was because sick livestock were left back home, and men had to walk for long distances to take livestock for grazing. Women reported that they had to take on additional work to manage the calves, sick livestock, or goats left at home and could not manage to walk for long distances to search for the scarce pastures and water during the drought. Women also have to walk long distances of up to 8 km to access borehole water for the calves left at home. Women claimed that livestock management is taking much of their time, yet they have to work on other domestic activities like grinding maize with stones. The increase in their workload leads to women suffering from considerable fatigue and drudgery at the study sites. This suffering includes the physical strain of lifting jerricans and collecting water from hard-to-pump boreholes.

Due to the patriarchal norms in the study sites, men dominated productive activities such as charcoal burning. However, with climate change causing drought, women have taken on productive activities such as charcoal burning as an alternative source of income to be able to purchase food items. Men and women in the two study sites unanimously agreed during FGDs that women continually participate in charcoal burning either independently or jointly with their husbands. This change is attributed to climate change, which destroys crops and necessitates a higher need for family survival. A women's FGD participant noted:

> Last year was terrible! The drought caused my crops to dry and I harvested nothing. To survive, I had to take on charcoal burning in the bush. My role during the drought is to burn charcoal to survive. However, I am overworked. I have to lift charcoal sacks on my head every time we burn charcoal and take it to the roadside; it is a cumbersome activity (Interview n. 5, crop farmer, women, March 2019).

Though the women knowingly take on charcoal burning to survive, they lamented that it requires extra time and energy, and they often have to sleep in bushes to monitor the activity. Additionally, where spouses were jointly working on charcoal burning during the drought period, women worked more than men. For example, after charcoal burning, both men and women pack charcoal in sacks. However, after the packing, women have the additional task of carrying the sacks of charcoal on their heads to roadsides for sale, including trekking for long distances to sell the charcoal on the roadsides.

During drought, crop pests and diseases increase, resulting in stunted growth and poor crop yields. Data from the focus group discussion with women in crop farming in the Lolachat subcounty indicate that, for women to protect the kitchen gardens (vegetable gardens) against pests, they spend more than 5 h, sometimes a full day, chasing pests and spraying crops using a mixture of liquid soap detergents with water. Women therefore put in additional working labor, as one woman in crop farming stated:

> When the army worm attacked my sorghum in 2017, I mixed many things like cow dung, soap detergents and water to protect my crop. But the mixing was a very hectic work. I had to mix every day to spray the crops (Interview n. 6, crop farmer, women, March 2019).

The mixing of soap, detergents, and water is a laborious activity that takes a lot of time and leaves women with limited time to search for other alternatives, such as training on how to navigate the climate change period.

The men revealed that they used to plow with oxen to prepare for the next planting season. However, the climate changes have led to the deaths of cattle, leaving many families without livestock. The consequences of this have been felt by women. Women are left with the responsibility of land preparation using hand hoes, a back-straining activity that results in fatigue. In the Lolachat subcounty, a woman in crop farming explained:

> I never used to prepare land using a hand hoe. We used to have almost 1000 cows and my husband could use oxen. But, the drought has caused problems to our livestock, and currently I use a hand hoe. This takes a lot of my time and can make me so tired every day (Interview n. 7, crop farmer, women, March 2019).

Some women had abandoned cultivation due to its associated problems, and they resorted to casual labor (*elejalej*). This involved walking to trading centers in search of work, such as fetching water or washing clothes, to get some income. Women trek for long distances to the trading centers of Nabilatuk town council to engage in activities, such as fetching water, cleaning houses, and washing dishes. In return, they earn between UGX 2000 ($\leq$1 USD) and UGX 4000 each day and use it to purchase food items such as maize flour or tomatoes. This was a formerly male-dominated role that women took over during the drought season.

In the Lolachat subcounty, the results from FGDs further showed that women had to take on productive roles in petty trading to survive. Women traded all kinds of drinks and foodstuffs to withstand the drought. Those involved in petty trade were able to get income and take care of their needs, as one explained:

> Life is not easy during the drought season, people suffer here but what we do to survive is to sell charcoal or firewood to earn some income. Charcoal burning is a lucrative business which has made us to survive [sic] (Interview n. 7, crop farmer, women, March 2019).

3.5. Reproductive roles of men and migration for survival

In the study sites, men dominated productive and community roles before. However, the drought has caused men to shift from productive to reproductive roles. For example, FGDs of both men and women show that drought has had a devastating effect on livestock farming, a male-dominated activity, causing men to shift into crop farming, which was traditionally a female activity. A male participant claimed:

> Livestock rearing and keeping was our main activity as men but as you see now we no longer have cows and we have decided to shift to crop farming. Livestock died due to the intensive sunshine which dried the pastures (Interview n. 3, livestock farmer, men, March 2019).

Men engage in crop farming, particularly growing crops of sorghum, maize, and sunflower, just like women. Due to patriarchal norms practiced in the study sites, other men could not handle taking over women's roles in crop farming, which was mainly planting green vegetables. They migrated to other areas like Moroto (85 km from the study area), Acerere (49 km), or Nakapiripirit (58 km) to take on the role of artisan gold and mercury mining. As one man involved in livestock farming narrated:

> I lost my cows due to the consistent climate changes, yet I have never practiced crop farming. I decided to leave this area and go to Acerere for gold mining. I also did Artisan sand mining from river bends of Lolachat to survive (Interview n. 4, livestock farmer, men, March 2019).

The migration of men to take on roles in artisan mining meant leaving women at home with an increased workload due to their triple roles of reproductive, productive, and community. From the observation in the Lolachat subcounty, men took on new roles of sand mining under dry riverbeds during January and March to survive the drought.

It was reported in the Lolachat subcounty that, traditionally, men never had the role of keeping and churning milk into yogurt (*njakibuk*). However, the change in climate has forced men to migrate with livestock to faraway areas called *Kraals*. In the *Kraals*, men take on the reproductive role of keeping milk, while young boys take on churning milk in gourds to make yogurt (*njakibuk*). A man in crop farming explained:

> It was not the role of men to keep and churn milk. No man could do such work. But, these days men and young boys are churning milk in the *Kraals*. Men are doing all types of work from grazing livestock to milking and selling meat (Interview n. 5, livestock farmers, men, March 2019).

4. Discussion

Our results show that climate change is associated with pests and crop diseases, threatening food security among smallholder farmers in agro-pastoral farming. Similar findings, indicating that climate change has increased food insecurity among agro-pastoral farmers, have also been reported in the Middle East, North Africa, and Karamoja. Additionally, the Disaster Risk Theory coincides with the study findings that the climate change hazard of drought has caused disasters on the livestock of people in the Nabilatuk district, resulting in starvation and hunger among men and women (Blaikie et al., 2005).

Literature on gender and climate change concurs with the current study's findings that changes in climate restructure gender roles in communities (Rochelau et al., 1996). For example, women's workload increased, and they took over the formerly male-dominated space of taking care of calves. However, both women and men struggled to sustain themselves and their livelihoods as the climate change problem intensified. For example, both men and women had to resort to charcoal burning for the survival of their families.

This study shows that changes in temperature increase the risk of pest attacks and disease outbreaks. This causes women to have an increased burden of cultivation in addition to childcare due to the need for pest and disease management, which also escalates the risks of crop failure. Nagasha et al. (2019) agree with our study that women have multiple roles and integrative abilities to deal with complex systems.

Furthermore, our results indicate that climate change causes a loss of biodiversity and a decline in ecosystem stability. This significantly leads to the death of livestock and, consequently, reduces livestock production. Men who were traditionally involved in livestock production shift to crop farming for the survival of their families amid climate change. Contrary studies in other parts of Africa and Asia argue that men are not visible at all in climate change discourse, and they choose to leave agriculture with no apparent responsibility toward their families (Prati et al., 2022).

This study further shows that the loss of livestock production causes men to migrate elsewhere to engage in other productive activities such as artisan mining. This finding concurs with a study from coastal Bangladesh that shows that men are increasingly out-migrating or at least inclined to migrate to nearby urban centers or the capital city so that they can support their families (Ahmed and Eklund, 2021). However, as men migrate out, women are left behind with many responsibilities, resulting in high vulnerability.

This concurs with the ecofeminists who argue that women struggle with environmental challenges.

5. Conclusion

Our research has revealed that the gender roles of men and women in the Nabilatuk and Lolachat subcounties have been affected and altered by climate change. Reproductive, productive, and community roles were the major roles of men and women in the Nabilatuk and Lolachat subcounties. However, climate change has altered gender roles, with women engaging in activities beyond their traditional gender roles in order to secure livelihoods and ensure survival. Additionally, women's double burden of productive and reproductive labor means that women's visibility in society remains low, and attention to their needs is woefully inadequate. The migration of men to other places for survival as women are left at home with the burden of feeding families increases women's vulnerability amidst climate change. Therefore, there is a need for a policy on interventions to reduce the work burden of women in the midst of climate change, a recurring problem in the Karamoja subregion.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

MA collected data, analyzed the data, and did the writing. FK was in charge of research supervision and edited the entire manuscript. BB was in charge of supervision of the research and helped in the manuscript writing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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