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Climate change vulnerabilities and adaptation strategies in rural communities: an intersectional approach in the Baham sub-division of Cameroon

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ABSTRACT

Studies examining intersectionality in Africa in the context of climate change remain underexplored. The study uses life history interviews to investigate how the social differences (gender, marital status and number of years lived in the village) of rural farmers influence their observation of climatic changes, vulnerability to climate change and ability to adapt to climate change. Findings demonstrate that vulnerability and ability to cope to climate change varies due to social differences in some cases. Factors such as access to land and land tenure security affects married women more than single or widowed farmers, and food insecurity increases the vulnerability of widowed farmers more than other farmers. The farmers have adopted strategies such as belong to common initiative groups (CIGs) to access financial capital, livelihood diversification, and adopting new agriculture practices as coping strategies, which vary mainly due to gender. The findings suggest that designing policies sensitive to social differences in rural farmers and institutionalizing social identities such in climate change adaptation and mitigation frameworks are vital. Policy interventions must reflect how different social identities of rural farmers intersect to increase or decrease their vulnerability to climate change and their ability to cope in the wake of accelerating climate change.

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1. Introduction

Rural communities in Africa face uncertainties due to changing climatic conditions. Studies have indicated that elements of climate change, such as droughts and floods in sub-Saharan Africa, have created high cycles of poverty (Serdeczny et al., 2017) and household food insecurity, particularly for rural communities and farmers (Wossen et al., 2018). This cycle of vulnerability for rural farmers is especially of concern, as the agriculture sector is the occupation of 90% of Cameroon's rural communities (Tume,

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2019), and a fifth of these rural communities are food insecure (WFP, 2017). Furthermore, women make up most of the farming population in Cameroon; many are often unpaid and lack safety nets (Fonjong & Gyapong, 2021). In addition, women rural farmers are often lower class compared to men rural farmers in Cameroon, where the result is that woman rural farmers do not own or inherit any of the farmland (Fonjong et al., 2013). Azong and Kelso (2021) study highlighted that women within both patrilineal and matrilineal communities in Cameroon experienced different vulnerabilities depending on their marital status.

Although there has been an increase in literature exploring gender differentiation of climate change perceptions, impacts, and adaptations in sub-Saharan Africa (e.g., Abubakari et al., 2016; Assan et al., 2020; Carr & Thompson, 2014; Rao et al., 2019; Sultana, 2014), the use of intersectionality analysis remains underexplored. A systematic literature review by Pearse (2017) reveals a theoretical and empirical breadth to the work on gendered vulnerabilities and adaptations to climate change. Scholars such as Carr and Thompson (2014) argue that gender is a strong indicator of adaptive capacity that intersects with other vulnerability markers to constrain or enable adaptive strategies. Recently, there has been growing interest in intersectionality and climate justice/climate change scholarship such as Amorim-Maia et al. (2022), and Mikulewicz et al. (2023) who advocate for greater synergy between intersectionality and climate justice to ensure that the voices and needs of marginalized groups are adequately represented and addressed in climate policies.

The most recent IPCC Report on impacts, vulnerabilities, and adaptation stated that inequalities such as gender and other social characteristics worsen vulnerability to climate change (IPCC, 2022). However, Kaijser and Kronsell (2013) state that issues on equity and intersectionality in the context of climate change remain underexplored. Given the variations in climate and climate variability across different geographic subdivisions, examining how intersecting social identities influence vulnerabilities and adaptation strategies of rural communities is crucial.

The study examines how social differences (i.e., gender, marital status and number of years one has lived in the village) of rural farmers influence their observations of changes in weather patterns. Secondly, the study investigates how the social differences of rural farmers in Cameroon influence their vulnerability to climate change and their ability to adapt to the phenomenon. Our paper contributes to the existing literature by highlighting how the intersections of social identities of rural farmers influence their vulnerabilities and adaptive strategies to the impacts of climate change in the Baham subdivision in Western Cameroon. It will also serve as the basis for further analysis to build adaptive capacity in the study sites and similar areas in Cameroon and beyond. By grounding the analysis in a local case study, the paper offers concrete, context-specific insights into the lived experiences of communities facing climate-related challenges. At the same time, it engages with broader theoretical debates in African geographies, demonstrating how localized findings inform and expand existing frameworks on climate vulnerability, intersectionality, and spatial justice across the continent. We specifically seek to answer the following questions: (1). How do social differences influence how rural farmers observe changes in weather patterns in the Baham community? and (2) How do social differences of rural farmers influence their vulnerability and adaptive capacity to climate change?

The paper is divided into five sections. After this introduction, the following section discusses vulnerability framework and intersectionality concepts in relation to vulnerabilities and adaptation to climate change. The study area and methodology follow this. Subsequently, the findings of rural communities' gendered vulnerabilities and adaptive strategies are divided into three sub-sections: (i) observations of changes in weather patterns, (ii) vulnerabilities to climate change, and (iii) adaptation strategies. The paper ends with conclusions and policy implications.

1.1. Intersectionality and climate change

Using a vulnerability framework alongside the intersectionality concept can provide a comprehensive understanding of how rural farmers' social differences influence their vulnerability and adaptive capacity to climate change. Scholars acknowledge vulnerability as a multidimensional process affected by social, political, and economic forces interacting locally and internationally (Bohle et al., 1994). However, scholars such as Thomas et al. (2019) argue that access to resources and the ability to reduce exposure to climate hazards are not randomly distributed across society but are due to uneven vulnerability across social differences. Denton (2002) argues that gender inequality is arguably one of the most distinctive layers when analyzing social vulnerability.

The Intergovernmental Panel on Climate Change's (IPCC) Third Assessment Report, released in 2001, outlined the vulnerability framework for climate change. The framework is based on sensitivity, exposure, and adaptive capacity and assesses the different vulnerability dimensions affecting rural farmers and their interactions. Sensitivity refers to the degree to which a system or population is affected by climate change impacts, and this is used to identify socio-economic factors that increase sensitivity. Birkmann et al. (2022) argue for systemic societal vulnerability where characteristics of communities, such as social class, socioeconomic and demographic, are inherently autonomous from extreme climate events.

Exposure is the extent to which a system or population is exposed to significant climatic variations, such as changing rainfall patterns. Lastly, adaptive capacity is the ability of a system or population to adjust to climate change, moderate potential damages, and take advantage of opportunities or cope with consequences.

Most studies have focused on the gender dynamics of climate vulnerability and adaptation of rural communities (Goodrich et al., 2019; Nong et al., 2020), with little examination of how the intersection of social differences influences vulnerability and adaptation to climate change.

1.2. Intersectionality and climate change

In this study, intersectionality in the context of climate change refers to the way social identities – such as gender, race, class, age, and disability – intersect to shape individuals' and communities' vulnerabilities and adaptive capacities to climate impacts (Garcia & Tschakert, 2022; Kaijser & Kronsell, 2013). It highlights how preexisting social, economic, and political inequalities compound risks, making marginalized groups disproportionately affected by climate-related disasters

(Fletcher, 2018). An intersectional approach to climate action seeks to address these overlapping injustices, ensuring that adaptation and mitigation strategies are equitable, inclusive, and responsive to diverse lived experiences. An intersectional analysis of climate change reveals how different individuals and groups relate differently to climate change, due to their positions in power structures and based on context-specific and dynamic social arrangements (Kaijser & Kronsell, 2013).

Garutsa (2021) argues that most literature on climate change, agriculture and gender has explored rural populations' vulnerabilities through binary gender lenses, making other social identities 'analytically invisible.' Hence, growing literature has used intersectionality to understand and address how multiple social identities intersect to influence privileges and oppressions (Amorim-Maia et al., 2022; Collins, 2019; Djoudi et al., 2016; Mikulewicz et al., 2023). For instance, Mikulewicz et al. (2023) in their paper highlight that that early studies recognize that vulnerability to climate change impacts can be influenced through privilege or oppression by multiple intersecting axes of difference. The study by Amorim-Maia et al. (2022) highlights the need for an intersectional approach in climate adaptation, emphasizing that conventional strategies often fail to address the compounded vulnerabilities of marginalized communities. The authors propose a new conceptual framework to integrate social-environmental justice into adaptation by tackling racial and gender inequalities, redressing differential vulnerabilities, incorporating ethics of care, adopting place-based strategies, and fostering cross-identity activism. Using Barcelona as a case study, their paper demonstrates how intersectional, justice-driven climate actions can create more equitable and resilient communities.

Reviewing 41 papers that examined gender and climate change adaptation, Djoudi et al. (2016) critique the dominant 'men-versus-women' framing in climate adaptation studies, arguing that intersectional analysis remains largely absent in discussions of gender and climate change. The study highlights that existing research often reinforces a 'feminization of vulnerability' and victimization discourse, overlooking the power dynamics and social relations that shape differential climate impacts. The authors advocate for a critical intersectional approach to reveal agency and emancipatory pathways, offering a more nuanced understanding of how climate adaptation interacts with broader social and political structures. These studies collectively emphasize that addressing climate vulnerability requires nuanced, intersectional approaches that consider the complex interplay of various social determinants, ensuring that climate policies and interventions are both effective and equitable.

This paper adopts an intersectionality approach and vulnerability framework to understand how rural farmers' social differences influence vulnerability to climate change in the humid forest zone of Cameroon. Employing an intersectional and vulnerability lens, the study explores how different social identities influence climate change vulnerabilities and adaptation strategies in rural African communities. Understanding these dynamics is crucial for developing inclusive and effective policies that enhance resilience and ensure equitable access to resources and opportunities for all community members.

2. Materials and methods

2.1. Study site

The study took place in the Baham sub-division in the Upper Plateau Division of the west of Cameroon, specifically in two communities, Kaffo and Nguongwa. The population of the Baham sub-division is approximately 60,000 people (Bih & Kelly, 2021). Most of the population identifies as the Bamileke ethnicity, where the language is either Baham or Hom. However, due to Cameroon's colonial history, much of the Baham sub-division, specifically Kaffo and Ngougoua, speak French as their official language and data was collected in French. Telefo et al. (2011) indicated that the region's climate is split into two seasons: the dry season, which usually occurs from mid-November to mid-March, and the rainy season, ranging from mid-March to mid-November. In addition, they indicate that the Baham is characterized by both subsistence and commercial farming due to the area's ecosystems providing conditions such as fertile basaltic and lateritic soil. The blend of subsistence and commercial farming helps balance food security and economic growth in the Baham sub-division.

2.2. Participants and recruitment

Participants were purposively sampled to ensure a diverse representation of gender, age groups, and marital status and to select participants who were willing to share their life histories. Additionally, snowball sampling was used as farmers recommended other participants who were useful to the study. Participants from the same household or family were excluded from the sample. Two data collectors were recruited to assist with data collection and were trained on ethical considerations in accordance with the University's ethical guidelines. Ethical approval was obtained from the School of Geography Research Ethics Committee at the University of St Andrews, United Kingdom, to conduct the research. Participants gave informed consent and permission to have their interviews recorded, and they were assigned pseudonyms to protect their identities.

A local non-governmental organization working with the rural community guided by a community leader as a gatekeeper familiar with the composition of the two communities was engaged. The role of the gatekeeper was to establish a good rapport with the local leader to guide with planning fieldwork as they understood the cultural nuances of the local community (Tumiel-Berhalter & Kahn, 2023). However, the gatekeeper did not influence the data collection process as the community leader is in a position of power, which may negatively influence participant engagement (Singh & Wassenaar, 2016). Data were collected between June and August 2021. It was difficult to recruit participants during COVID-19, resulting in a small sample size. However, social distancing and wearing masks were the COVID-19-related safety measures taken.

The final sample included sixteen participants, eight women and eight men, who shared their life history on how they have experienced climate change and their coping strategies as rural farmers, as shown in Table 1. Most participants are married except for one man, one single woman, and one woman who is a widow. The small sample size of single and widowed participants is the major limitation of this study and the need for further research to draw more definitive conclusions.

Table 1. Demographic profiles of the participants.

Pseudonymised Name	Community	Years in village	Gender	Marital Status
Marie	Ngougoua	15	F	Widow
Nadine	Ngougoua	28	F	Married
Pauline	Ngougoua	40+	F	Married
Aissatou	Ngougoua	25	F	Married
Emmanuel	Ngougoua	52	M	Widow
Michel	Ngougoua	20	M	Single
Bernadette	Ngougoua	40	F	Married
Oumarou	Ngougoua	60+	M	Married
Adamou	Kaffo	20	M	Married
Thomas	Kaffo	25	M	Married
Jeannette	Kaffo	10	F	Married
Etienne	Kaffo	12	M	Married
Raphael	Kaffo	43	M	Married
Marceline	Kaffo	40+	F	Single
Victor	Kaffo	8	M	Married
Asta	Kaffo	23	F	Married

2.3. Life histories interview procedures

The study used a life history approach to explore how social differences (e.g., age, gender, and marital status) of rural farmers influence their observations of changes in weather patterns, their vulnerability to climate change, and their ability to adapt to climate change. Life history as a qualitative method was used because it allows the collection of detailed accounts of lived experiences, personal narratives, memories, and reflections of individuals or groups across various time frames (Atkinson, 2007). Hence it provides insight into the complex nature of farmers' vulnerability and coping strategies to climate change (Roncoli et al., 2009).

An unstructured interview guide was used to guide the conversations to capture the nuanced dynamics that shape the vulnerability and adaptive capacity of rural farmers in Cameroon. The interviews were conducted in the French, ranging from 1 hr 30 mins – 2 hrs. The life history interviews were then translated and transcribed into English by two data collectors from the local non-governmental organization to ensure the data were contextually translated accurately and were trained in research ethics.

Individual experiences offer valuable insights that contribute to a broader understanding of intersectionality and vulnerabilities to climate change. The sample size underrepresents certain groups, as the lived experiences of single individuals or widows may not be well captured, and findings may bias conclusions toward the experiences of married individuals. In addition, future studies can also use a mixed methods approach to identify similarities and differences between and among the genders and other intersecting social differences to understand vulnerabilities and coping strategies among rural farmers.

2.4. Data analysis

Reflexive thematic data analysis was used to identify similar and different themes that emerged from the data (Braun & Clarke, 2013), particularly on the influence of intersectionality on farmers' vulnerability and adaptive capacity to climate change. The research team practiced reflexivity processes to ensure a transparent

and credible research process. Three research team members (IB, CN, SAY) conducted a peer debriefing to reflect on and evaluate the data collection process to ensure that data collection adhered to ethical guidelines and clarified the data collection process. Two research team members did the initial coding (IB and NC) and consulted others on their coding process and interpretation of the findings. IB completed coding for the other transcripts and checked with CN and SAY if they offered an appropriate data translation. Thereafter, themes were defined and named.

3. Findings

Three major themes were identified: observations of changes in weather patterns and pest hazards, vulnerabilities in climate change and adaptation strategies. Themes are described below with illustrative quotes from participants.

3.1. Observations in changes in weather patterns

All sixteen participants recounted how they have experienced persistent and inconsistent timing of rainfall, leading to more erratic and unpredictable rainfall patterns which has disrupted their farming activities and agriculture-based livelihoods over the years. Most farmers indicated that the temperature had increased, and the sun was described as 'very hot,' and they no longer understand the unpredictable climatic changes as it has destroyed their vegetation and made it difficult to engage in farming activities. Raphael, who has lived in this community for 43 years, said he had noticed the climate change since 1999, but now *'the rains do not respect the calendar anymore'*.

However, the lack of technology, such as using weather forecasting tools to complement Indigenous weather prediction, leaves rural communities unprepared for the uncertainties of climate change. Three men and two women highlighted that they observed frequent outbreaks of pests such as crickets, bats, and insects destroying their crops. In addition, due to droughts affecting natural vegetation, human-wildlife conflicts are becoming more frequent as wild animals encroach on agricultural lands, causing economic losses and creating tension between farmers and wildlife.

3.2. Vulnerabilities to climate change impacts

Through the life histories, it has emerged that there are gendered experiences on how cultural and socio-economic practices influence the vulnerability of farmers of different social identities. The emerging factors include access to financial capital, land and land tenure security, and food insecurity.

3.2.1. Lack of access to financial capital and land and secure land tenure

The findings revealed that the lack of access to financial capital increased their gendered vulnerability to climate change. Women and men farmers have different perceptions of how their gender identity influences their access to and use of financial resources. Five of the seven men participants stated that women had more access to loans than men, as women are perceived as honest and have better saving habits. Hence, men struggle to

access financial capital compared to women farmers to cope with the impacts of climate change. Victor said that *'women have an advantage over men in that they have more options financially than men (can easily take loans),'* and Etienne supports this by saying that *'women save better than men ... it's quite easy for them to access loans ...'*

However, two men and two women who have lived in the village for more than 40 years revealed that traditional gender roles place women at a disadvantage in accessing financial resources and decision-making power in the household. All men are breadwinners and responsible for managing money, which disadvantages the women in a household. Adamou, who has lived in the village for 20 years, said he takes *'care of all financial issues to ensure the family is comfortable after work'*. Asta and Pauline, who have lived in the village for 23 and over 40 years, respectively, indicate that women suffer more due to the lack of financial resources than men.

Despite their marital status, both women and men revealed that increased prices of farm inputs exacerbated their lack of access to financial capital, thereby increasing their vulnerability to climate change. Thomas has lived in the village for 25 years and states that, *it comes down to resources and financial ... if you don't have enough resources for adaptation, then it becomes more and more difficult'*. Marie had been in the village for 15 years and is widowed said, *'I am a widow; I could not raise the necessary resources to cultivate it. ... I did not have enough capital to buy farm inputs.'*

All participants indicated that micro-finance companies ask for land titles as collateral to secure loans, which farmers do not have despite having traditional land rights. Adamou said, *'It is practically impossible because the conditions imposed by financial companies are difficult for villagers like us; for example, they ask for a land title that is difficult to have'*. In addition, all the participants indicated that the lack of education was a limiting factor in accessing loans, as education increases the chances of one getting access to information. Oumarou, who has lived in the village for over 60 years, says, *'It is very, very difficult, especially for us with low educational level, and the procedure is not easy for those who have not gone to school, but for those who have gone to school, it is relatively easier'*.

3.2.2. Access to land and land security tenure

Five married women participants have access to land through their husbands, who own and control the farming land. Nadine, who has lived in the village for 28 years, said that *'they (men) do own their own farms because they need to have a level of control over the food produced.'* Six men and one woman had inherited the land from their father or grandfather. Oumarou, who has lived in the village the longest, stated, *'It was an inheritance from my grandfather to my father then to me ... I will give it to my children.'* One man and woman indicated that the land was shared between family members; Jeannette said that her land *'was shared among family members, and we each have our own land'*. An interesting finding is that single or widowed woman participants own and control inherited land and have more economic capacity than some married women in the same community.

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3.2.3. Food insecurity

Five married women and three men who have lived in the village for over ten years expressed concern over food insecurity and the possibility of famine this year due to changes in climate affecting their household's well-being. The participants indicated that they had reduced their food consumption to increase household food security. In addition, they all indicated that they have frequently experienced reduced crop production due to poor rainfall, resulting in climate-induced food price increases and forcing the farmers to spend more of their little income on food. All woman participants raised concerns about how inadequate food will result in poor health, especially for young children, which becomes another burden, exacerbating their vulnerability to climate change. Aissatou said, *'It's a woman that feeds the children; if a child falls sick, it is her responsibility.'*

Five men and four women indicated that they lack financial security as they now focus on producing food for household consumption rather than selling it to earn an income, which threatens their livelihood and exacerbates poverty. Etienne addressed this point by saying, *'It is better just to farm what children will eat,'* and Thomas said, *'Now we just do it just to survive.'*

3.3. Adaptation strategies

While the study highlighted the factors that increase farmers' gendered vulnerability to climate change, the life history interviews revealed the gendered adaptation strategies to build the farmers' resilience to climate change. The factors included adopting new agriculture practices, diversifying produce grown, diversifying livelihoods, and joining common initiative groups (CIGs) to access financial capital.

One common adaptive strategy from most participants is the increased use of chemical fertilizer rather than organic fertilizer emerged as a common agricultural practice to increase agricultural productivity. Five women and four men of the sixteen participants indicated that they now use chemical fertilizer instead of organic manure to ensure the soil regains fertility, which was an uncommon practice when they were growing up. However, four elderly participants, i.e., two men and two women, raised concerns about the environmental and health risks of using the chemical fertilizer. Adamou believes that *'everybody is using fertilisers, although with limited knowledge . . . this is even the greatest danger.'*

3.3.1. Diversification of produce grown

Eight of the sixteen participants, i.e., five women and three men who are married, highlighted that they are diversifying their agriculture production and are willing to try something new as they have the capacity to do so. Michel said, *'instead of focussing on only one crop, we mix everything,'* and Etienne said, *' . . . we are looking for different crops*

to plant'. This use of new varieties of existing crop types are important adaptation strategies as observed in other studies (Acquah & Onumah, 2011). Furthermore, five women and one man mentioned that they had to adapt by changing the cycle and frequency of planting as a way to maximize agriculture production in response to changing climate.

However, the findings reveal challenges associated with the diversification of plants grown. Four women and one man discussed the risks of replanting multiple times or trying new produce. Pauline indicated that she tried a substitute of egusi (pumpkin seeds) *'but later discovered that it is too difficult to crack and there is no market'*. Nadine and Emmanuel highlighted that replanting is a labor-intensive process. Hence, single-parent-headed families struggled to adapt due to a lack of adequate manpower, unlike man-headed households. vital resort for African producers to better manage climatic risks.

3.3.2. Livelihood diversification

The findings indicate that there are variations between men's and women's adaptive strategies in response to the impacts of climate change. Men engage in other livelihood activities to diversify their income, and women with such partners have reduced vulnerabilities. Pearse (2017) supports these findings by showing that women's and men's adaptive strategies are varied and specific to their socio-economic and cultural contexts. The men indicated engaging in *'other menial jobs'* such as *'building a pit toilet'* as other means to sustain their livelihood. Interestingly, most women clarified that their agriculture has always been their main source of income, and they struggled with finding other sustainable livelihood activities, unlike their man counterparts. Nadine says that *'they (men) change activities if it (agriculture production) is not productive.'* Unlike woman-headed families struggled the most to diversify to other activities due to a lack of appropriate skills to engage in other activities. Marceline, a single parent, stated, *'I am a petit businesswoman; all these are secondary activities for me; my main activity is agriculture'*.

3.3.3. Access to financial capital through community initiative saving groups (CISGs)

Three men and three women indicated that access to community initiative saving groups or njangi houses'.¹ increased their access to financial capital. Community initiative saving groups are organized by local community members who contribute financially and agree on saving and borrowing procedures. All the participants who discussed loans agreed that these groups provided the most access to finance. However, both Marceline and Raphael stated that you require a 'collateral' before receiving the loan, meaning an asset must be offered if the loan is not repaid. In addition, three women participants indicated they also had access to 'njangi houses' Njangi houses are a product of njangi financing, where the community comes together to contribute money to an account for agreed local projects. Bernadette mentioned that she *'can easily get loans from njangi houses than banks because in the njangi house, we know everyone'*.

Twelve farmers, six women and six men discussed their future farm plans, expressing both hopes and uncertainties. Three men and two women stressed their determination to thrive regardless of what the future holds. Victor remarked, *'... we have to live in the reality we find ourselves in and find ways to get out of*

situations.’ Conversely, four men and one woman felt that continuous losses were inevitable, with Emmanuel noting, ‘... *the truth is when we try, we tend to lose everything (time, money) ... when you try, you are bound to fail.*’ Interestingly, five women and two men were adamant about never giving up farming, no matter the outcome. Marie, a widow, summed it up by saying, ‘*I see no other way ... I can never abandon farming ... I will keep struggling.*’ Overall, participants expressed concern about coping with the impacts of climate change, emphasizing their need to remain resilient.

4. Discussion

The study uses life history interviews to investigate how social interaction among rural farmers in Cameroon influences their perceptions of weather patterns, vulnerability to climate change, and ability to adapt to climate change. Although lack of education among farmers was a barrier to better opportunities, it was a social identity underexplored in this study. The results demonstrated that despite social differences in gender, marital status, and the number of years one has lived in the village, rural farmers observe persistent and inconsistent rainfall patterns, which disrupt their farming activities and agriculture-based livelihoods. Increasingly changing rainfall patterns and extreme weather events also disrupt agricultural productivity, increasing poverty and food insecurity for all rural farmers.

Their knowledge of climate change is based on individual and collective experiences of local, indigenous, and/or traditional environmental knowledge (TEK), which informs their climate forecasting (Thomas et al., 2019). In addition, the farmers have observed place-specific observations of persistent outbreaks of pests and insects, which may also connect the natural environment with social and cosmological processes (Heeb, Jeener and Cock., 2019). These observations are supported by (Skendžić et al., 2021), who assert that climate change and extreme weather events have a major impact on crop production and agricultural pests as they respond differently to different weather changes.

However, the lack of technology to complement local knowledge weather predictions, leaves rural communities unprepared for the uncertainties of climate change. This resonates with Mbuli et al. (2021) study, which concluded that rural farmers are becoming more vulnerable due to the lack of climate data technology to assist them in adapting to temporal weather patterns. Therefore, access to Climate information services (CIS) could be a vital resort for African producers to manage climatic risks better.

The study provides evidence that despite rural farmers’ social differences, their vulnerabilities are generally uniform because both groups depend similarly on agriculture as a livelihood. In addition, the findings indicate that dependency on agriculture-based livelihoods creates common vulnerabilities that overshadow social differences among rural farmers. Furthermore, the lack of diversification of income sources creates similar vulnerabilities for both men and women. This pattern of results aligns with Madu’s (2016) discussion that rural communities are more vulnerable to climate change due to their remote location, dependence on natural resources for income and livelihoods and limited capacity to adapt to climate

change. These findings are similar to those of Kabir and Serrao-Neumann (2020), who argue that climate change impacts threaten the livelihoods of people who depend directly on the environment to earn a living.

The findings demonstrate that lack of access to financial capital exacerbates the ability to cope with climate change vulnerabilities and affects men and women differently. Interestingly, women tend to have more access to financial capital through community-common initiative groups (CIGs) than men. Men face more challenges in accessing formal or informal credit finance to adapt to climate change, increasing their vulnerability to the impacts of climate change. These findings are supported by Leichenko and Silva (2014), who indicate that men's lack of access to credit and loans exacerbates their vulnerability as they struggle to respond or recover when they experience extreme weather events, thereby limiting their economic capacity. Similarly, Birkmann et al. (2022) indicate that extreme weather events are independent of socioeconomic vulnerabilities, where elements such as the lack of finances or education are barriers to reducing their ability to cope with vulnerabilities due to climate change.

In addition, different access to land and secure land tenure among women and men, either single or married, increase farmers' vulnerability. Lack of land tenure may hinder long-term adaptation strategies as farmers may find it challenging to make reasonable investments to curb the effect of climate change (Akugre et al., 2021). Sultana (2014) argues that factors such as lack of access to and control over basic resources and lack of entitlements amplify women's vulnerability and undermine their ability to cope with the effects of disasters. An interesting finding is that single or widowed woman participants own and control inherited land and have more economic capacity than some married women in the same community. The findings demonstrate that the intersecting identities of being a woman and single show how the difference in marital status changes how and who interacts with the forms of power (Cho et al., 2013). However, future research should explore the experiences of diverse rural women and how their social identities and socioeconomic vulnerabilities significantly influence their ability to cope with and recover from extreme events.

Therefore, innovative, community-driven adaptive approaches to climate change that are sensitive to social differences and align with local customary and statutory land tenure systems are needed. In Kenya and Burkina Faso, women have secured access to land through locally driven social innovation approaches, i.e., formal leases and intra-household tenure arrangements (Stiem-Bhatia et al., 2022). Such approaches have empowered women to adopt sustainable agricultural practices, improving food security and resilience to climate change.

The findings also reveal gendered adaptation strategies, including adopting new agricultural practices, diversifying produce grown, diversifying livelihoods, and joining common initiative groups (CIGs) to access financial capital to build resilience to climate change. The adaptive capacity of farmers is determined by several contextual factors, such as human capital, social capital, the availability of technical solutions, economic institutions, including property rights, and infrastructural and financial resources (Voss, 2022). Therefore, further studies are needed to explore how various contextual factors enable or hinder farmers' adaptation to climate change.

The findings highlight that reducing food consumption is an adaptive strategy to climate change impacts. Participants expressed concern as they do not know how to deal with the effects of climate change except to remain resilient. Due to time limitations and the limited scope of the study, these could not be explored further. Further studies need to explore climate change vulnerabilities and psychological and psychosocial and how these vary across axes of social difference such as class, ethnicity, marital status, and gender in rural communities (Loring & Gerlach, 2009).

5. Conclusion and policy recommendations

This paper sought to highlight how rural farmers' observations of climate variability, vulnerability to climate change, and their ability to cope with climatic changes vary due to social differences in the Baham sub-division of Cameroon. Despite the less diverse sample size, the findings demonstrate that exploring social differences among farmers provides more nuanced lived experiences on how rural farmers of different social identities (i.e., gender, marital status and number of years lived in the village) observe climate variability, experience vulnerability to climate change and their ability to cope with impacts to climate change. In addition, an intersectional approach provided an opportunity to go beyond gender dichotomies by illuminating how different individuals relate differently to climate change, due to dynamic social categorization. However, rural farmers need access to Climate Information Services (CIS) or relevant climate science data to inform their farming livelihood activities and better manage climatic risks irrespective of their social identities.

This study contributes to knowledge on intersectionality and climate justice literature by enhancing our understanding of how the intersection of different social identities influences vulnerability and ability to copy with climate change in rural communities in the Global South. The findings imply that policymakers and humanitarian support need to consider context-specific climate adaptation policies and programs that recognize the nuances of social differences in rural communities that influence vulnerability and ability to cope and adapt to manage climate variability. For instance, appropriate programs can be developed to support married women who solely rely on agriculture to diversify their livelihoods.

While the suggested policy recommendations emphasize the importance of context-specific adaptation strategies, their implementation should account for political and institutional realities that may influence their effectiveness. In many rural settings, bureaucratic inefficiencies, limited financial resources, and competing policy priorities can hinder the integration of intersectional approaches into climate adaptation projects. Additionally, power dynamics at the local and national levels may affect how resources and information are distributed among different social groups. Therefore, successful implementation requires multi-stakeholder collaboration, including engagement with local governance structures, community leaders, and local stakeholders, to ensure that adaptation strategies are inclusive, feasible, and responsive to existing socio-political challenges.

Note

1. Njangi houses are a group of friends or women who decide to contribute money regularly, which is saved in a regular bank. The money is given out just to members at a small interest rate.

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