

Adapt or Perish? Local Stakeholders' Responses to Climate Change in Ghana's Cocoa-Growing Regions

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Research Article

Keywords: Adaptive capacity, Adaptation measures, Climate change, Local stakeholders

Posted Date: August 26th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10656527/v1>

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Additional Declarations: No competing interests reported.

Abstract

Climate change does not only impact farmers, but the perception and adaptive capacities of local stakeholders have not been well studied. Consequently, this study evaluated the views of local stakeholders regarding climate change impacts and their perceived adaptive capacities in cocoa-growing communities in Ghana. The study employed a phenomenological design and incorporated concepts from the adaptation process model, drawing on information from 24 stakeholders in the Ashanti, Western, and Western North regions of Ghana. The stakeholders identified several phenomena, like increased prevalence of pests and diseases, erratic rainfall patterns and declining soil fertility, as the current impacts of climate change. They also identified unemployment, urban migration, and water scarcity as some challenges facing their communities due to climate change. The local stakeholders perceived livelihood and crop diversification, training in sustainable farming practices, institutional support for irrigation infrastructure and climate-resilient farming techniques as important adaptation measures. The perceived adaptive capacities differed among stakeholder groups, and these differing perceptions of adaptive capacity could promote successful adaptation. We recommend the establishment of community-based adaptation committees to integrate local stakeholders' insights and knowledge into climate action plans. This approach will enhance their adaptive capacities and bolster community resilience against the adverse impacts of climate change.

1 Introduction

Climate change, an internationally acknowledged environmental issue in recent years, has emerged as a central topic in many discussions at both global and national levels (Hase et al., 2021). It has been predicted to have adverse effects on various sectors (Arnell et al., 2016; Tabari, 2020), with agriculture being the most vulnerable due to its natural sensitivity to changes in climatic conditions, especially rainfall (Alemayehu & Bewket, 2017; Malhi et al., 2021). Sub-Saharan Africa is a hotspot of adverse effects of climate change (Affoh et al., 2022) due to high dependence on climate-sensitive sectors and low adaptive capacities (Adjei & Amaning, 2021). This situation is projected to negatively impact food production in most countries, of which Ghana is no exception (Atiah et al., 2022). The changing climate is gradually threatening cocoa, which is the backbone of Ghana's economy (Afriyie-Kraft et al., 2020; Agbenyo et al., 2022).

The increasing incidence of extreme weather conditions has made cocoa-growing communities less suitable for cocoa farming. The manifested effects on cocoa farms include a high incidence of pests and diseases, a mortality increase in transplanted cocoa seedlings, cherelles and leaf wilt (Afriyie-Kraft et al., 2020; Agbenyo et al., 2022; Ameyaw et al., 2018; Bunn et al., 2019; Wongnaa & Babu, 2020), contributing to production decline. The decline in cocoa production not only impacts Ghana's economic fortunes but also affects many smallholder farmers, as their livelihoods rely on cocoa farming (Thompson, 2021). To strengthen the sustainability of the cocoa farming system and farmers' livelihoods, it is essential to assess the adaptive capacity of stakeholders in the cocoa sector to address the negative impacts of climate change. Stakeholders in climate change refer to individuals or groups who have the current and past experience of coping with and adapting to climate variability and extremes. They include policy makers, scientists, administrators, communities, and managers in the economic sectors most at risk. They are crucial to the success of any adaptation measures as they provide support and ensure the legitimacy and inclusivity of adaptive measures (Whitfield et al., 2019).

Adaptive capacity refers to the inherent ability to adapt. Past studies in sociology and other disciplines give historical meaning to adaptive capacity as a requisite property for leadership that maintains potential solutions to unexpected situations and unpredictable variations (Engle, 2011). For example, investments in adaptive capacity can include financial resource enhancement, income distribution, and adaptation options (Cinner et al., 2018). Studies have also found that access to climate information plays a crucial role in enhancing the adaptive capacity of different stakeholder groups in communities to tackle climate risks (Agyekum et al., 2022; Baffour-Ata et al., 2022; Nkiaka et al., 2020). An enhanced adaptive capacity of stakeholders in communities makes a community adapt well to changes in the climate and other hazards, resulting in a decrease in vulnerability (Smit & Wandel, 2006; Vallury et al., 2022). Many studies have demonstrated how smallholder cocoa farmers in Africa have adapted to the adverse effects of climate change (Attiogbé et al., 2024; Chimi

et al., 2022; Orimogunje et al., 2020; Yiridomoh et al., 2022). For example, Orimogunje et al. (2020) revealed that cocoa farmers in Ogun State, Nigeria, adopt adaptation strategies that include mulching cocoa with plantain or banana stem debris, planting plantain as shade crops, planting drought-tolerant cocoa, and irrigation during the dry season to reduce the negative consequences of climate change on their cocoa farming. Similarly, Yiridomoh et al. (2022) reported that smallholder cocoa farmers in the Western Region of Ghana implemented adaptation strategies such as pesticide and fertiliser application, pruning, shade management, soil conservation, and row planting to manage climate risks.

Research on adaptive capacity in developing countries is gaining traction, with limited studies in Ghana (Abdul-Razak & Kruse, 2017; Yaro et al., 2016). According to Abdul-Razak & Kruse (2017), awareness of climate change, financial resources, technological capabilities, and training among farmers in Ghana play a crucial role in enhancing the adaptive capacities of smallholder farmers. Additionally, Baffour-Ata et al. (2023), using a variety of capital assets, conceptualised smallholder cocoa farmers' adaptive capacities and found them to be moderate in the Ashanti Region of Ghana. The above studies provide vital evidence about farmers' adaptive capacity to the changing climate in Ghana; however, they focus solely on one stakeholder group, smallholder farmers, neglecting other stakeholders such as license buying company representatives (LBC reps), Cocoa Disease and Pest Control (CODAPEC) gang supervisors, and agro-input sellers who are also affected by climate change. This sampling bias has resulted in little information or literature on other local stakeholders' perceived effects of climate change on cocoa production and, more importantly, their perceived adaptive capacities in cocoa-growing communities in Ghana. This gap is problematic given that, according to Baas and Ramasamy (2008), developing farmers' capacity to contribute to the adaptation process is necessary to ensure sustainable livelihoods, and that global and regional stakeholders are dedicating resources to train local stakeholders in enhancing their adaptive capacity. Without understanding how local stakeholders perceive their adaptive capacities and their role in facilitating adaptation measures, interventions risk being misaligned with community realities and capabilities. The study advances theory by expanding analysis beyond individual farmers to encompass the broader local stakeholder ecosystem, recognizing that adaptation is a community-level process requiring collective capacity, thereby providing empirical evidence on how local stakeholder capacities can facilitate or constrain adaptation measures.

In addressing the gaps above, this study employed a qualitative approach to evaluate: (i) stakeholders' perspectives on both the current and future impacts of climate change on cocoa farming and challenges to their communities; (ii) perceived adaptation measures from local stakeholders to manage climate change; and (iii) their perceived adaptive capacities to facilitate effective adaptation. Assessing the perspectives of local stakeholders on climate change and their adaptive capacities will enhance transparency and trust, and the formulation of socially inclusive climate change adaptation policies, thereby ensuring resilience within cocoa-growing communities.

2 Methodology

2.1 Study Area

This study draws on qualitative data collected in the Ashanti, Western, and Western North regions of Ghana (Fig. 1). The Ashanti Region, with a population of 5,440,463, is the second most populous region in Ghana (GSS, 2021). It shares borders with six other regions and has a bimodal rainy season with 1,270 mm of annual rainfall. Particularly in rural areas, the region lends itself to agriculture. Cocoa farms account for the region's greatest proportion of crops grown (22.1%) (GSS, 2013a). Bekwai Municipal was selected from the cocoa-producing district (Fig. 1). The Central Region, Western North Region, Côte d'Ivoire, and Gulf of Guinea border the Western Region, which is home to about 2,060,585 people (GSS, 2021). It experiences annual rainfall between 1,250 and 2,000 mm, with two rainy seasons. The region has three main vegetation types: evergreen rainforest, deciduous forest, and coastal savannah. Its climate and vegetation make it suitable for tree crop production (GSS, 2013b). The Western Region alone produces more cocoa beans than any other region in Ghana, making it the country's leading cocoa producer (GSS, 2013b). Amenfi Central District was selected from the cocoa-producing districts. The Western North Region in Ghana, bordered by Côte d'Ivoire and the Central Region, has a population of 880,921 (GSS, 2021). Its tropical rainforest climate, with high temperatures and moderate to heavy rainfall, makes it ideal for agricultural activities. The region

is a top producer of valuable cash crops like cocoa, with cocoa farms accounting for the majority of crops grown (GSS, 2013b). Bia West District was selected in the Western North Region (Fig. 1).

2.2 Research Design

This qualitative study employed a phenomenological research design to explore the perspectives of local stakeholders on climate change and their adaptive capacities. This design facilitated a deeper and more nuanced understanding of various stakeholders lived experiences, attitudes, and narratives regarding the impacts of climate change within their communities and their perceived capacities (Pilarska, 2021). The purpose of this study is not to clarify or predict occurrences but to explore the essence of experience as perceived by stakeholders. That is, climate change and its impacts on cocoa farming and challenges posed to the communities, as experienced by the different local stakeholders in cocoa-growing communities, are the phenomena under investigation in this study. The stakeholders bring unique perspectives on their experiences with climate change impacts and their perceived adaptive capacities to ensure effective adaptation measures.

2.3 Selection of the various stakeholders

We used stakeholder mapping to identify local stakeholders for the focus group discussions. They comprised chief farmers, license buying company representatives (LBC reps), Cocoa Disease and Pest Control (CODAPEC) gang supervisors, and agro-input sellers. The first step involved compiling a comprehensive inventory of potential stakeholder types. After identifying the various local stakeholder types, we used stakeholder mapping to carry out a step-by-step iterative process (Conde & Lonsdale, 2005). This process was based on a broad definition of stakeholders, which refers to anyone who can affect or be affected by an issue. In this case, those affected by climate change's adverse effects on cocoa production in the various communities. The following three main criteria influenced the mapping for the focus group discussion: exposure to climate hazards, expected adaptive capacity, and stakeholder significance to adaptation. In each of the study regions, we purposefully selected two members from each stakeholder group, resulting in a total of eight participants. The chosen members were diligent individuals within the communities, as recommended by the elders and community extension agents.

2.4 Data collection

We organised three focus group discussions (FGDs), one for each region, each with eight participants, to collect data for the study. Although the recommended group size for FGDs varies, a common benchmark is six to eight participants (André, 2013). This small group size allows for active participation in the discussion, enabling everyone to communicate with one another and express their opinions (Wibeck et al., 2007). Participatory techniques were employed to stimulate discussions centred on the participants' experiences and unique perspectives on current and future climate change impacts, adaptation measures they perceive, and their perceived adaptive capacities to support such measures. All discussions were audio recorded with the participants' permission, and they were guaranteed confidentiality in communication. The transcripts were transcribed verbatim. The content of the participatory activities was recorded and photographed as the basis for the analysis.

2.5 Data analysis

Data from the FGDs were analysed using a thematic analytical procedure that aligns with the first two principles of Attride-Stirling: familiarisation and the production of initial codes, along with theme identification (Attride-Stirling, 2001). We used thematic analysis because it helped us identify patterns of meaning in stories without forcing them into strict, predefined categories, which is in line with phenomenological inquiry. It also deals with this diversity by letting themes come up on their own, which makes it ideal for a small but rich qualitative dataset. This analysis incorporated theoretical insights from Moser & Ekstrom (2010) model of the adaptation process, which consists of three phases: understanding, planning, and management. Discussion on current and future climate change impacts on cocoa production and challenges in the community formed the understanding phase. The FGDs on the perceived adaptation measures and related topics also formed the planning stage. The management stages included discussions on stakeholders' perceived capacities to facilitate

effective adaptation. Thematic map and tables presented the coded results with codes, basic themes, and organising themes as headings.

3 Results and discussion

This study's findings integrate data from focus group discussions involving twenty-four participants across four stakeholder groups in cocoa-growing communities, focusing on their perspectives regarding current and future climate change impacts on cocoa production, the challenges to their communities, perceived adaptation measures, and their perceived capabilities to address these climate impacts.

3.1 Stakeholders' perspectives on climate change impacts and challenges in cocoa production

During the discussion about the current impacts of climate change on cocoa farming in their communities, the participants highlighted that increased pest and disease prevalence, erratic rainfall patterns, rising temperatures, and declining soil fertility threaten cocoa production (Table 1). One of the participants had this to say about the current impact of climate change on their cocoa production.

The observed changes in climate variables are undeniably real and visible. When I started my cocoa farming about 45 years ago, during the main harvesting season, it was usual for rain to fall at night, allowing me to sun-dry my cocoa beans during the day. However, that is not the situation presently; now the rainfall typically occurs during the daytime without any warning, and if you are not careful, it destroys your dried cocoa beans. (FGD, Chief Farmer, Adjoafua, 2023)

The stakeholders' viewpoint on the current impact of climate change aligns with several studies (e.g., Agbenyo et al., 2022; Afriyie-Kraft et al., 2020; Ameyaw et al., 2018; Bunn et al., 2019; Wongnaa & Babu, 2020) that reported that climate change is negatively affecting cocoa production by contributing to reduced soil fertility, altered flowering and fruiting, a high prevalence of disease and pests, and heat stress on cocoa plants.

The stakeholders also expressed concern regarding the potential for their farming lands to become unsuitable for cocoa during discussions about the future impacts of climate change. They further elaborated that if the lands were to become unsuitable for cocoa farming, many livelihoods would be adversely affected, as cocoa farming serves as the primary source of employment in their communities (Table 1). Quartey-Papafio et al. (2021), Kozicka et al. (2018) and Läderach et al. (2013) have predicted in their studies that some parts of cocoa-growing areas in Ghana will not be suitable for cocoa production by the years 2030–2050 due to climate change, and that aligns with the views of the stakeholders when expressing their thoughts on the future impacts of change in their farming communities. One of the stakeholders shared the following statement:

As both a CODAPEC gang supervisor and a cocoa farmer, I get earnings from supervising the gang's activities and selling cocoa beans from my farm. The revenue generated from the cocoa beans is essential for financing my children's educational expenses. The ongoing pace of climate change poses a significant risk to both my means of earning a living and my capacity to support my family in the future. (FGD, Supervisor, Bekwai, 2023)

The stakeholders during the discussion on the challenges in their farming communities due to climate change highlighted issues such as higher food costs as a result of low production, high unemployment due to low cocoa production, urban migration due to unemployment, and drinking water scarcity due to the drying up of streams. They stressed that due to climate change, higher yields of agricultural products are negatively impacted, leading to demands that outweigh the quantity produced, resulting in higher food prices. They explained that reduced yields from climate change have resulted in many farmers abandoning their farms to look for greener pastures in urban cities (Table 1). Their sentiments resonate with earlier reports by Haile et al. (2017), Tietjen et al. (2023) and Turyasingura et al. (2023) on the adverse effects of climate change on water resources, food price volatility and increased urban migration. The statement below was shared by one stakeholder during the discussion:

Most of the farmers who used to bring me cocoa beans to buy have relocated from my community due to the low yields from climate change. This has led me to employ a few people as loading boys because of the drastic reduction in the beans I used to purchase. (FGD, LBC representative, Manso Amenfi, 2023)

These findings imply that the stakeholders in the cocoa trajectory are aware of climate change's current and future impacts, and they need to be factored in during climate policies and programmes in the farming communities. The stakeholders' awareness of climate change's current and future impacts and challenges in their communities highlights their extensive insight into the understanding phase of the adaptation process model Moser & Ekstrom (2010) laid out.

Table 1: Thematic analysis on stakeholders' perspective on climate change impacts

Codes	Basic themes	Organising themes
High heat stress	High changes or variabilities in weather patterns	The perceived changes in climate
Low rainfall		
Erratic rainfall		
Long dryness	Adverse effects of the changing weather on cocoa farming or production	The perceived current impacts of climate change in cocoa farming communities
Prolong harmattan		
Increased pest attack		
High cocoa disease	Soil and the farming environment associated effects due to the consistent weather changes	The perceived future impacts of climate change in cocoa farming communities
Yields reduction		
Increased runoff		
Soil nutrient depletion	The perceived future or long-term threats of the consistently changing climate	The perceived future impacts of climate change in cocoa farming communities
Biodiversity loss		
Cocoa failure due to adverse weather conditions		
Cocoa farming land suitability reduction	The manifesting consequences of climate change in the communities	Challenges in cocoa farming communities due to climate change
Farmer income decline		
Loss of livelihoods		
Urban migration		
Water scarcity		
High employment		
High food prices		

3.2 Stakeholders' perceived adaptation measures

The stakeholders suggested several approaches during the discussion about adaptation measures to reduce climate change impacts in their farming communities. These included livelihood and crop diversifications, training in sustainable farming practices, and provision of institutional support to ensure effective irrigation systems and the implementation of sustainable practices (Table 2). They explained that farmers in their communities need to safeguard their livelihoods by engaging in alternative sources of livelihoods that are resilient to climate change, such as crop diversification, which aligns with studies on adaptation measures being employed by farmers (Afriyie-Kraft et al., 2020; Mohammed et al., 2021). They also highlighted training farmers on sustainable farming practices and institutional support to monitor and ensure effective implementation

of sustainable practices in their various farming communities. They further indicated the building of irrigation systems on farms, since most water bodies in their communities are in dire condition due to climate change. The opinions of the stakeholders about their suggested ways to adapt match the strategies for dealing with climate change impacts described by Alare et al. (2018), and Haro-Monteagudo et al. (2023), Zakaria et al. (2020). The following statements from two stakeholders were captured during the discussions on their perceived adaptation measures:

If farmers in our communities want to secure their future by still engaging in the same old farming practices, they will weep; now is the time for them to embrace change and adopt climate-resilient practices. State and non-state authorities like the Department of Agriculture, COCOBOD, and NGOs should assist them in the adoption of these practices. (FGD, Agro Input Seller, Achichire, 2023)

The government should prioritize the establishment of irrigation systems in our farming communities to help our farmers reduce the impact of climate change on their farming activities. (FGD, Purchasing Clerk, Bekwai, 2023)

The stakeholders' knowledge and anticipated adaptation measures to mitigate climate change impacts demonstrate the explanation of Moser & Ekstrom (2010) planning phase of the adaptation process model.

Table 2: Thematic analysis on stakeholders’ perceived adaptation measures

Codes	Basic themes	Organising themes
Crop diversification	Climate-smart and sustainable agricultural practices	The perceived adaptation measures to reduce climate change impacts
Intercropping		
Farm tree planting	Management of soil health and fertility	
Mulching	Management of water resources	
Poultry manure		
Fertilizer		
Compost	Pest and disease management	
Rain harvest		
Irrigation		
Pruning	Knowledge and skills transfer (Capacity building)	
Resistant varieties		
Insecticide		
Agric officers	Diversifying livelihood through alternative activities	
Filed training		
Farm visit		
Group meetings		
Poultry farms		
Beekeeping		
Soap making		

3.3 Stakeholders’ Perceived Adaptive Capacities

The stakeholder groups had varying adaptive capacities as presented in Figure 2 during the discussions of their perceived adaptive capacities to ensure the effective implementation of adaptation measures to reduce the negative climate change impacts in their farming communities. Chief farmers are often seasoned cocoa farmers who are chosen or designated by the cocoa farmers or community elders to provide guidance and leadership to the cocoa farmers in the community. In discussing their perceived adaptive capacities, they showed commitment to serving as the facilitating link between farmers and institutions in their communities (Figure 2). They were committed to coordinating with financial institutions to offer flexible credit to farmers in their communities. In their explanation, the credit will be used to hire labourers to undertake adaptation measures to tackle climate change impacts by the farmers, since most of them are elderly. Again, the chief farmers to ensure the effectiveness of adaptation measures, indicated a commitment to ensuring better access to information and resources such as climate-smart programmes and adequate input supply from agricultural institutions to farmers under their jurisdictions. According to Afriyie-Kraft et al. (2020), Oluwatusin (2014), and Yiridomoh et al. (2022), access to extension and credit positively influence the adoption of adaptation strategies by farmers. This implies that the perceived adaptive capabilities of chief farmers are likely to ensure effective adaptation measures to reduce the adverse impacts of climate change. A chief farmer presented the statement below during the discussion:

As chief farmers, if we organised our farmers by having a vibrant farmer group, we should be committed to liaising with savings and loan agencies in our communities to offer flexible loans to group members to aid them in financing their adaptation measures. (FGD, Chief farmer, Essam, 2023)

The CODAPEC gang supervisors oversee the sprayers in the community and ensure that inputs, such as insecticides, fungicides, etc., from the CODAPEC programme are sprayed on the cocoa farms to control pests and diseases (Omane-Adjepong & Oduro, 2012). They emphasised maintaining a strong commitment to ensuring strict compliance with the standard operating procedures in the CODAPEC working documents during discussions on their perceived adaptive capacities to support cocoa farmers to ensure effective adaptation measures (Figure 2). They provided clarification by highlighting the importance of ensuring that sprayers strictly adhere to the recommended dosages, mode, and time of agrochemical applications. According to Singh et al. (2022), compliance with good agricultural practices ensures effective adaptation, which aligns with the views of the CODAPEC supervisors discussing their perceived adaptive capacities to effective adaptive measures. A supervisor had this to say during the discussion:

I am committed to training farmers to effectively use the spraying machines, aside from my foremost commitment of ensuring my sprayers strictly adhere to the recommended practices in agrochemical applications to ensure effective pest management adaptation. (FGD, Supervisor, Manso Amenfi, 2023)

The LBC reps, also known as purchasing clerks in the community, are responsible for buying cocoa beans directly from the farmers (Owusu-Ansah et al., 2018; Tuffour et al., 2023). At the community level, the LBC reps normally give loans to the farmers, and during the harvesting season, the farmers use the cocoa beans to offset their debt (Vellema et al., 2016). In discussing their adaptive capacities to effective adaptation, they stressed their commitment to ensuring prompt payment to farmers whenever they deliver their cocoa beans (Figure 2). Again, they highlighted their commitment to ensuring that the farmers are not cheated while weighing the cocoa beans by ensuring certified electronic devices are used. They further explained that prompt payments and fairness in their transactions with the farmers would enhance their annual income and empower them financially to plan and implement adaptation measures effectively. Farmers with higher income positively influence the adoption of adaptation measures (Ndamani & Watanabe, 2016). This finding fits with the view of the LBC representatives on their perceived adaptive capacities to effective adaptation. An LBC representative shared the statement below:

Colleagues, LBC representatives here, our commitment to dealing fairly with the farmers will help them to be financially sound, to invest in adaptation measures in tackling negative climate change impacts. (FGD, LBC representative, Adjoafua, 2023)

Agro-input sellers operate local stores where farmers can purchase agricultural inputs such as fertilisers, pesticides, and farm tools (Asante et al., 2021; Thapa, 2019). They normally offer a range of farming products tailored to the farmers' needs.

Agro-input sellers often provide cocoa farmers with advice on product selection and application techniques (Hyde-Cooper et al., 2024). In general, they enhance cocoa production output by ensuring the availability of inputs and timely supporting services (Asante et al., 2021). The agro-input sellers highlighted their commitment to supporting the farmers in ensuring effective adaptation by selling only COCOBOD-approved agrochemicals during discussions on their perceived adaptive capabilities (Figure 2). They further reiterated their commitment to educating farmers on the recommended application dosage of agrochemicals, especially to farmers who lack access to extension services. Most cocoa farmers use agrochemicals such as pesticides and foliar fertilisers as adaptation strategies (Kosoe & Ahmed, 2022; Yiridomoh et al., 2022). However, a significant proportion of cocoa farmers use unapproved agrochemicals (Hyde-Cooper et al., 2024), despite available data on approved agrochemicals from COCOBOD in cocoa-growing communities. Hyde-Cooper et al. (2024) reported that most unapproved agrochemicals are sourced from agro-input shops. The commitment from agro-input sellers to only sell approved agrochemicals in discussing their perceived adaptive capacities has the likelihood of ensuring effective adaptation. The following statement was captured during the discussion:

My commitment to ensuring that only COCOBOD-approved agrochemicals are sold to the farmers not only leads to effective adaptation but also protects the lives of our farmers, since the use of unapproved agrochemicals can be deadly. (FGD, Agro-input seller, Kokofu, 2023)

The varying commitments from the stakeholders in the discussion of their perceived adaptive capacities in support of cocoa farmers have the potential to ensure effective adaptation measures, and that highlights the management phase of Moser & Ekstrom (2010) adaptation process model.

4 Limitations of the study

The study included only 24 stakeholders from three regions, which constrains the applicability of the findings to all cocoa-growing communities in Ghana. As a phenomenological study, the results are derived from the participants' subjective experiences and perceptions, potentially leading to bias or selective memory. Some important local stakeholders, like chiefs, community extension agents and committee chairpersons, were also left out, even though they have an impact on adaptation processes. Furthermore, limited time and financial constraints made it challenging to cover more ground and do a more in-depth comparison of the regions.

5 Conclusion and recommendation

The study assessed the perspective of local stakeholders regarding climate change impacts and their perceived adaptive capacities in three cocoa-growing communities in Ghana. The local stakeholders identified variabilities in weather patterns and their associated effects on cocoa farming, such as low yields, as the current impacts of climate change. They fear that the lands in their communities may not be suitable for cocoa farming, and they may lose their source of livelihood in the not-too-distant future. They expressed concerns about the challenges their communities face from climate change, including unemployment, urban migration, and water scarcity. The knowledge of local stakeholders, particularly regarding the current and future threats posed by climate change and the associated challenges in their communities, illustrates the understanding phase of the adaptation process model. Diversification of livelihoods and crops, training in sustainable farming practices, and institutional support for irrigation infrastructure were some of their perceived adaptation measures. These measures have the potential to empower farmers to reduce the adverse effects of climate change on cocoa farms and their communities, and that aligns with the planning phase of the adaptation process model.

Each stakeholder group demonstrated varying perceived adaptive capacities. Resource access coordination, strict compliance with CODAPEC rules, financial transaction integrity and quality input supply were the perceived adaptive capabilities of chief farmers, CODAPEC gang supervisors, LBC representatives and agro-input sellers, respectively. These adaptive capacities can support cocoa farmers to ensure effective adaptation measures that align with the management phase of the adaptation process model. We recommend training cocoa farmers in climate-smart agricultural practices, such

as soil conservation and integrated pest management, to help mitigate the adverse impacts of climate change. There should be local stakeholder involvement in policies like community-level adaptation committees to ensure diverse adaptive capacities are harnessed for sustainable adaptation planning and implementation.

Declarations

Author Contribution

Conceptualization, Methodology, Formal analysis, Writing - Original Draft: PKA; Supervision, Writing - Review & Editing: EKT-A; Supervision, Writing - Review & Editing: LKB; Supervision, Writing - Review & Editing: J-EAB; Writing - Review & Editing, Formal analysis: GAA; Writing - Review & Editing: MFA; Writing - Review & Editing: SA; Writing - Review & Editing: YSA.

Acknowledgement

We extend sincere appreciation to the local stakeholders for sharing valuable time with us to conduct the focus group discussions.

Data Availability

The qualitative data generated and/or analysed during this study are not publicly available due to ethical and confidentiality considerations but may be available from the corresponding author upon reasonable request, subject to applicable ethical restrictions.

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Figures

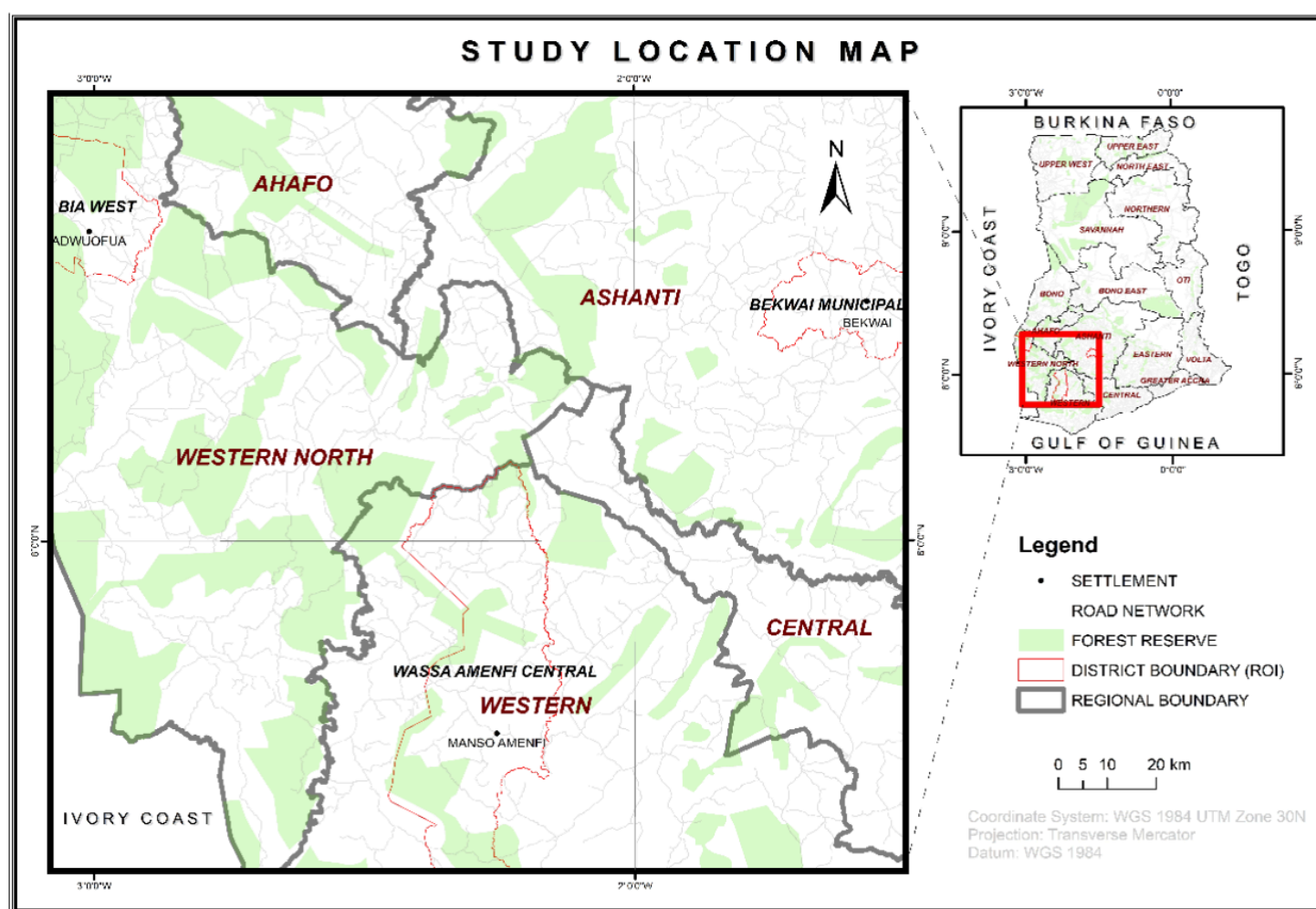


Figure 1

Map showing the study areas

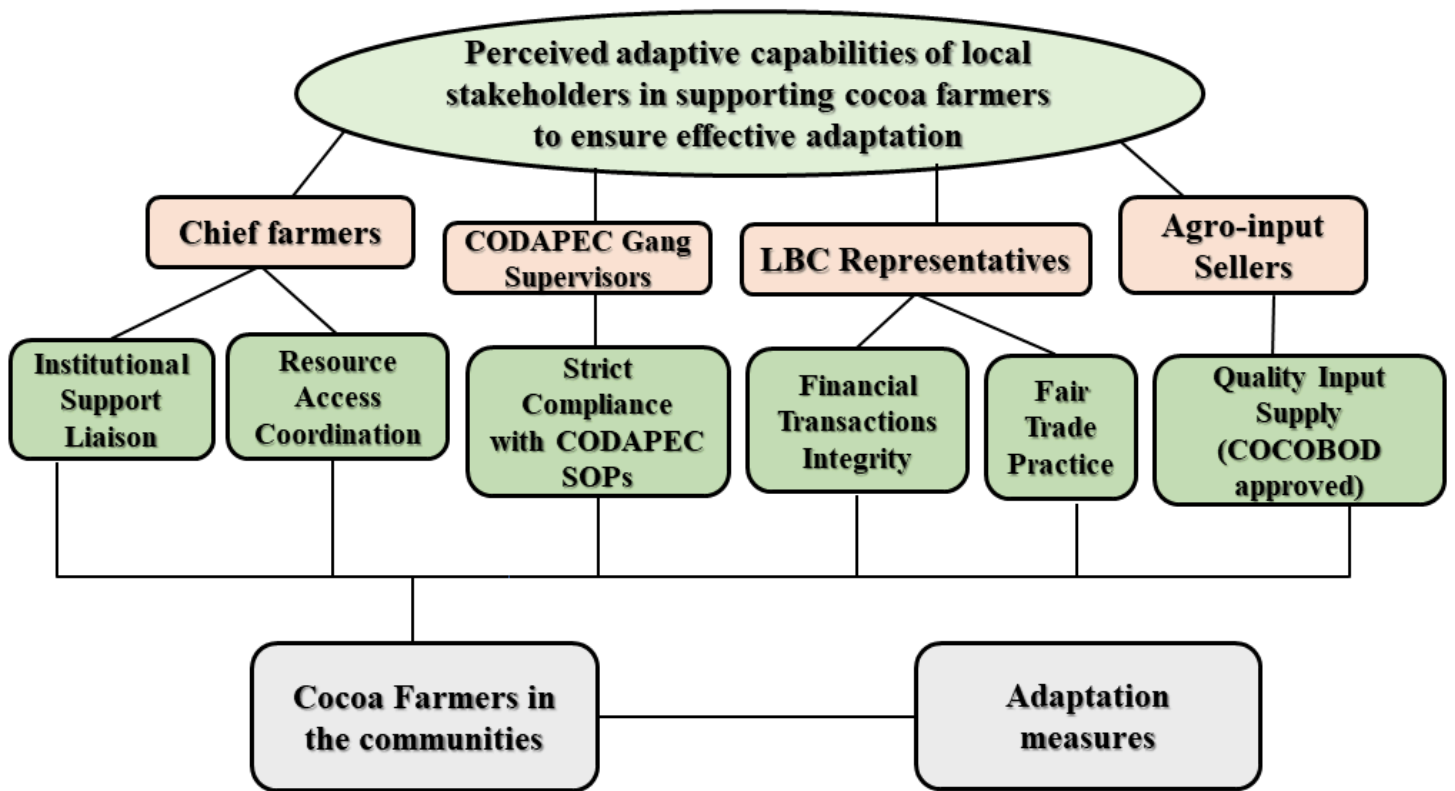


Figure 2

Thematic map of stakeholders perceived adaptive capacity