# The Intersectionality of Climate Change Adaptation and Agricultural Policies for Smallholder Farmers in Ghana

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**NUHU Mohammed Gali**

# The Intersectionality of Climate Change Adaptation and Agricultural Policies for Smallholder Farmers in Ghana

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**NUHU Mohammed Gali**

**Abstract**

Given the importance of smallholder farming to the livelihoods of the African population, the devastating impacts of climate change on agriculture will have far-reaching consequences for food security and economic development. This concern over climate change impacts on agriculture behooves policy analysis researchers to understand the extent to which climate change adaptation measures can be incorporated into agricultural development plans through effective inter-agency coordination and local engagement.

African countries formulated more comprehensive adaptation policies incorporating various stakeholders' needs. At the regional level, developmental policies for climate change adaptation are being implemented, including the Southern African Development Community's Climate Change Strategies and Action Plans and the West African Agricultural Policy. At the national level, Ghana, Kenya, Uganda, and Zambia are developing anticipatory scenarios for low-carbon agriculture as part of their partnership for adaptation and development. However, incorporating adaptation into individual countries' and regions' economic development plans and policies has been hampered by misaligned development and climate agendas, gender inequality, elite capture, institutional fragmentation, lack of coordination, and a clear governance mandate. Considering these challenges, this thesis investigates the intersection of agricultural policy and local needs for climate change adaptation in Ghana. This case study attempts to shed light on Sub-Saharan Africa's more viable adaptation options in the future.

This study employs a literature review, qualitative document analysis, and a questionnaire survey. The qualitative document analysis was used to investigate how climate change adaptation interventions are integrated into agricultural and development policies. A focus group discussion and a questionnaire survey were conducted among 200 smallholder farmers to determine their needs for climate change adaptation. The potential of south-south cooperation in connection with adaptation action for Africa's agriculture was discussed through a past study content analysis.

The assessment of policy integration revealed that Ghana's climate change policies are implemented by identifying priority areas for adaptation, with a focus on increasing the resilience of smallholder farmers and agricultural development. This thesis then examines Ghana's climate change-agricultural interface. It first identifies key policy formulation agencies, including the Ministry of Environment, Science, Technology, and Innovation (MESTI), that developed Ghana's climate adaptation policies. In disseminating climate change

adaptation measures among farmers, it introduced the Food and Agriculture Sector Development Policy (FASDEP II) and Investing for Food and Jobs (IFJ). In this implementation process, significant barriers were identified. Only a limited aspect of these program objectives was implemented in selected local areas, partly due to inadequate institutional capacity and financial constraints. It was also found that these programs needed to incorporate and respond to local needs sufficiently.

After highlighting the importance of understanding local needs, this thesis examines gender-specific smallholder farmers' adaptation needs and perceptions. This examination is based on the questionnaire survey conducted among female respondents in northern Ghana, who mostly belonged to middle or lower-income groups. The result shows that the respondents urgently needed financial support to improve their income. They needed more farmland, as 94% had less than 5 acres to farm. In addition, 91% of the female respondents expressed the importance of connecting to farmers' mutual-help groups to share information about everyday farming needs. Based on the survey results and correspondence analysis, it was also found that there were gender-specific needs for extension services, farm inputs, climate information, mechanization, and infrastructure. The focus group discussion found that women farmers need more farmland, agricultural inputs, credit, production technologies, storage, and marketing facilities. Women are customarily barred from owning land and can only access the farmland assigned to them by extended family. Regarding access to resources, the respondents had little interest in investing in farming as the land they borrowed could be taken away by male owners.

The past study content analysis revealed that south-south cooperation in knowledge sharing and technology transfer had assisted African countries in meeting internationally prescribed climate action priorities. It also identified such challenges as inadequate policy and regulatory frameworks that facilitate cooperation and coordination among African countries. Language barriers further added difficulties in penetrating local people regarding the importance of these adaptation efforts. African countries have different development priorities and strategies that are also significant barriers to south-south cooperation in Africa. This research will clarify local adaptation needs and the need for future collaboration for African countries to incorporate climate change adaptation action into development policy-making.

**Keywords:** Climate Change; Adaptation; Agricultural policy; South-South Cooperation; Gender; Smallholder farmers; Ghana

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Table of content

List of Tables

List of Figures

## List of Abbreviations

| | |
|---|---|
| CAADP | Comprehensive Africa Agriculture Development Programme |
| FAO | Food and Agriculture Organization |
| FASDEP | Food and Agriculture Sector Development Policy |
| GSGDA | Ghana Shared Growth and Development Agenda |
| GSS | Ghana Statistical Service |
| MTDF | Medium Term Development Framework |
| MESTI | Ministry of Environment, Science, and Technology |
| NAIP | National Agricultural Investment Plans |
| NCCAS | National Climate Change Adaptation Strategy |
| NCCP | National Climate Change Policy |
| NDC | Nationally Determined Contribution |
| OECD | Organization for Economic Co-operation and Development |
| SSC | South-South Cooperation |

# Chapter 1 Introduction

## 1.1 Background

Agriculture remains one of the most important economic sectors in many African countries. On average, agriculture accounts for 15% of the total GDP in Sub-Saharan Africa and employs 48% of the continent's population (IMF, 2012; OECD-FAO, 2021). Smallholder farmers control the majority of agriculture in Africa. These are farmers who own less than a hectare of land. Smallholder farms constitute approximately 80% of all Sub-Saharan African farms, contributing to 90% of the region's food supply (FAO, 2012; Wiggins and Keats, 2013). Most smallholder farmers are poor rural dwellers who depend on rainfed agriculture for their livelihoods (Morton, 2007; World bank, 2009).

Climate change poses a significant threat to agriculture and food security in Africa due to reliance on rain-fed agriculture production systems (Roudier et al., 2011; Antwi-Agyei et al., 2014; IPCC, 2022). The land area suitable for agriculture, the length of the growing season, and the yield potential in semi-arid and arid areas of Africa have decreased (Thornton et al., 2008). A decline in agricultural yields of 33% is attributed to climate change in Africa, which is frequently characterized by rising temperatures, increasing rainfall variability, and more intense or frequent events like floods and droughts (Ortiz-Bobea, 2021). Temperature changes exacerbate agricultural pest and disease infestations (fall armyworm and desert locust in West and East Africa), which accounted for 9% of crop and livestock production losses between 2008 and 2018 (FAO, 2021; Schoonover, 2021). Global warming and accompanying hydrological changes affect soil fertility and water-holding properties, leading to less productive agricultural soils (Rosenzweig and Hillel, 2000). These changes affected Africa's smallholder farmers, who tend to have a low capacity to adapt (Challinor et al., 2015; AGRA, 2021). This devastating impact of climate change on agriculture will have far-reaching consequences for livelihood security and regional development (AFSA, 2016).

Previous climate studies emphasized the importance of incorporating climate change adaptation into agricultural research for development in Africa (Runhaar et al., 2017; Mogelgaard et al., 2018; Afokpe et al., 2022). According to Afokpe et al. (2022), most African countries have developed climate governance tools aligned with ratified international agreements. This raises the possibility of coordinated action in the fight against the effects of climate change. However, adaptation must be scaled up sustainably through the development

of supportive policy environments, climate change outreach, research, efficient technology, and information dissemination, particularly at the local level of governance.

Incorporating objectives for climate adaptation into current policies is strongly encouraged for public action, according to research by Runhaar et al. (2017). They identified the majority of adaptation policy outputs, with only a minority of cases translating into policy outcomes. This implementation gap is most strongly seen in developing countries.

The intersection of gender and climate change adaptation has grown in importance as local climate change adaptation and development are considered, highlighting that climate change issues and, consequently, solutions are not gender-neutral (Pearse, 2016). Links between adaptation measures and the gender dimension can facilitate inclusive development for transformative climate action (Resurreccion et al., 2019; Agarwal, 2018).

However, a database search of the literature on adaptation and agricultural policies reveals that approaches to incorporating adaptation interventions into sector-specific development policies, like agriculture, need more attention. There is a dearth of information on effectively incorporating adaptation efforts into agricultural policies. Policies largely ignore how social relationships and identities intersect, which could help us better understand how smallholder farmers will need to adapt (Rao, 2017). This thesis provides an overview of pursuing an integrated approach to adaptation. It contributes to the knowledge of agriculture and climate change policies by suggesting ways to improve smallholder adaptation intervention planning and implementation.

### 1.2 Research objectives and questions

This thesis aims to investigate the intersection between climate change, agricultural policies, and local adaptation needs with a particular focus on Sub-Saharan Africa, especially Ghana. In so doing, it seeks to better understand how climate change adaptation is incorporated into development plans at national and local levels. This research objective would be achieved by answering the following key study questions:

1) To what extent are climate change adaptation interventions mainstreamed into Ghana's development and agricultural policies?
2) To what extent do smallholder farmers' social power relationships and perceptions shape their needs for climate change adaptation?

3) To what extent does South-South cooperation facilitate the implementation of climate change adaptation actions for agriculture?

### 1.3 Past policy studies for development and climate change adaptation interventions in Africa

Climate change adaptation is increasingly being recognized by policymakers and development advocates as an important component of development planning (OECD, 2009; Mogelgaard et al., 2018). At the 8th Ordinary Session of the African Union Assembly at Addis Ababa, Ethiopia, in January 2007, the Heads of State and Government expressed their committment to integrating climate change adaptation strategies into national and sub-regional development policies. They would also raise awareness among policy and decision makers in of climate change issues by strengthening climate change research in Africa.

In its Sith Assessment Report, the IPCC (2022) provides an overview of some development and adaptation interventions that have already been observed at the regional, national and subnational levels in Africa. At the regional level, developmental policies for climate change adaptation are being implemented. Early examples include the Southern African Development Community's (SADC) Climate Change Strategies and Action Plans, the least-developed countries' National Adaptation Programmes of Action (NAPAS), and the West African Agricultural Policy (ECOWAP).

The SADC Climate Change Strategy and Action Plan (CCSAP) establishes a framework for coordinated regional and national adaptation actions in response to climate change impacts (SADC, 2015). Climate change is incorporated into SADC's agricultural, environmental, and natural resource management policies and strategies. The SADC CCSAP strategic intervention establishes a regional framework for agricultural research and development and promotes interventions that improve community resilience through adaptive agricultural technologies. The NAPAs shed light on the local adaptation priorities of most developing nations, including agricultural adaptation and development assistance. It strongly emphasizes "knowledge sharing" as a crucial component of adaptation (Chambwera and Anderson, 2011).

The West African Agricultural Policy (ECOWAP) is based on a version of regional agricultural development. The policy aims to achieve food sovereignty and serves as a critical entry point for advocacy to integrate climate-sensitive agriculture and resilience at various

scales, from the household to the regional community (ECOWAP, 2017, P. 25). According to ECOWAP, climate change is a significant threat to the vision of increasing agricultural productivity in West Africa while protecting the natural resource base.

African countries incorporate adaptation into their long-term development planning at the national level (UNFCC Adaptation Committee, 2019). In Kenya, the action aimed at incorporating gender into the country's national climate policies (Murray, 2019). In Burkina Faso, the National Adaptation Plan elaborates on its 2050 vision and connects it to development pathways (Government of Burkina Faso, 2015). Ghana, Kenya, Uganda, and Zambia are developing anticipatory scenarios for low-carbon CRD in agriculture as part of their partnership for adaptation and development (Balie et al., 2019).

Attempts to incorporate adaptation into Africa's economic development plans and policies have been hampered by misaligned development and climate agendas, gender inequality, elite capture, institutional fragmentation, lack of coordination, and a clear governance mandate (Taylor, 2016; Leck and Simon, 2018; Kita, 2019; Andrijevic et al., 2020; Robinson, 2020).

### 1.4 Ghana’s agricultural potential, regional vulnerability, and climate change adaptation

Agriculture is the backbone of Ghana’s economy, employing 50% of the workforce, contributing to 18.5% of GDP, and meeting more than 70% of the country’s food requirements. Ghana has about 13.5 million hectares of arable land, with only 6.4 million hectares cultivated. Ghana’s agriculture is predominantly rain-fed, with only 4% of its irrigation potential developed (Nutsukpo et al., 2012; GIPC, 2021). Ghana's growth and poverty reduction plans are based on the agricultural industry. The country's current medium-term development plan, the Ghana Shared Growth and Development Agenda of 2010, has based the social and economic transformation of the country on modernized agriculture (NDPC, 2010).

Climate change is considered a significant risk to the agriculture sector in Ghana due to the reliance on rain-fed production systems. Ghana has diverse ecological and climatic zones, from coastal savannah to humid rainforests in the south to the dry and hotter Sahel region in the north. For prolonged periods, Ghana is experiencing more frequent extreme weather events like drought and flood. Using a 2010 baseline, Ghana's Environmental Protection Agency has projected that rainfall is expected to decrease across all agroecological zones by 18.6% by 2080, while the temperature is expected to increase on average by 3.9 °C by 2080 (Republic of Ghana,

2015). Extreme climate events, including droughts and storms, are projected to increase across all agroecological zones (Abbam et al., 2018).

The Sudan and Guinea Savanna regions are the most vulnerable to climate change. The most vulnerable groups in these areas are women, migrants, and smallholder farmers due to the high incidence of poverty, high illiteracy, high population densities, and underdeveloped infrastructure (USAID, 2017). This necessitates more concerted efforts in combating climate change effects, involving all actors within the agricultural sector. These projections will have significant implications for farming households dependent on rain-fed agricultural systems and other agro-based activities for their livelihoods and food security. As Ghana's economy depends on climate-sensitive businesses like agriculture, the national economy is vulnerable to the effects of climate change. Ghana ranks 101 out of 181 countries in the Global Adaptation index (2016) for climate vulnerability (UNDP, 2008; Cameron, 2011; USAID, 2017).

### 1.5 Methodology

This study employed a literature review, qualitative document analysis, and a questionnaire survey. A review of the literature and content analysis of reports including the Food and Agriculture Organizations Quick Guide to South-South Co-operation, and UNFCC Technology Executive Committee report were used to determine the potential of south-south cooperation in connection with adaptation action for Africa's agriculture. The qualitative document analysis was then used to investigate how climate change adaptation interventions are incorporated into agricultural and development policies. The QDA process was founded on seven policy documents, including the Ghana Shared Growth and Development Agenda (GSGDA) II-2014-2017. The National Climate Change Policy (NCCP) 2014, The National Climate Change Adaptation Strategies (NCCAS)- 2010, Food and Agriculture Sector Development Policy (FASDEP) II- 2009-2015, National Climate-Smart Agriculture and Food Security Action Plan-2016-2020, National Adaptation Plan Framework 2018 and the National Agriculture Investment Plan (2018-2021). These are the key documents for understanding Ghana's policy process for addressing climate change adaptation for food security and agriculture. I conducted a focus group discussion and a questionnaire survey to investigate the adaptation needs and perspectives of smallholder farmers. Using a simple random and purposive sampling techniques, I collected data from 200 smallholder farmers in four administrative districts of

Ghana's Upper East Region. The Statistical Package for Social Sciences (SPSS) was used to aid data analysis.

### 1.6 Structure of dissertation

This dissertation consists of five chapters. The first chapter clarifies the research objectives and the general methodology for the whole thesis. The second chapter evaluates the progress and barriers in terms of integrating adaptation interventions into Ghana's climate change and agricultural development policies. In doing so, It helps to comprehend how climate change adaptation initiatives are planned and carried out at the local, subnational, and national levels. The third chapter investigates the adaptation needs and perspectives of smallholder farmers in the Upper East Region. It clarifies how and what gender dimensions can be important factors for farmers' climate change adaptation. The fourth chapter investigates the potential of south-south cooperation in implementing agricultural and sustainable development adaptation actions in Sub-Saharan Africa. It also highlights some significant challenges to south-south cooperation. The fifth chapter summarizes the key findings and their significance. Figure 1.1 depicts the research outline.

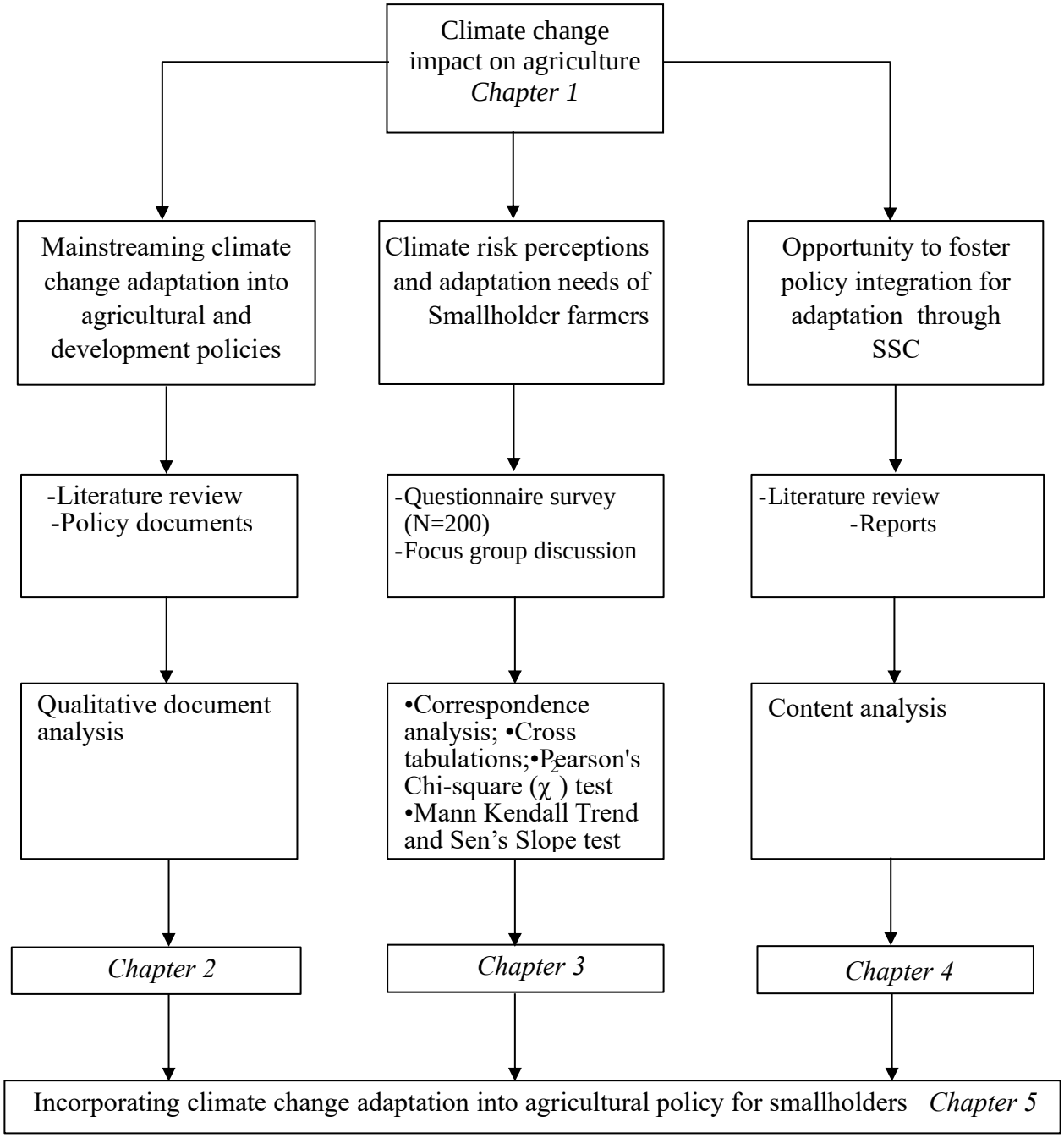


Figure 1.1 Structure of the dissertation

# Chapter 2 Mainstreaming Climate Change Adaptation Interventions in Ghana's Agricultural and Development Policy Processes

## 2.1 Introduction

Climate change has a significant impact on the economies of developing countries and delay the achievement of Sustainable Development Goals (UN, 2019; UNESC, 2019). Africa's economic growth has been slower than that in other parts of the world due partly to climate change impacts (Odusola and Abidoye, 2015; Acevedo et al., 2020; Kalkuhl). A sector-based analysis confirms that climate change has reduced Africa's agricultural productivity by 34%, reducing total food calories by 1.4%, with reductions of up to 10% in Ghana and Zimbabwe (Ray et al., 2019; Ortiz-Bobea et al., 2021).

Previous research (Olhoff & Schaer, 2010, Runhaar et al., 2017) acknowledged the necessity of integrating climate change adaptation and development. In international climate change negotiations and climate policy, the concept of "mainstreaming" is becoming more prevalent. Given the linkages between climate change and development identified, many believe that adaptive policies can only be effective if they are integrated into the broader development agenda (AfDB et al., 2003).

By shifting to a more integrated approach to adaptation planning, many African countries are attempting to create a national adaptation policy. Climate change adaptation programs in Ethiopia and Mali, for example, have integrated adaptation at the sectoral, regional, national, and local community levels (Hunde, 2012; Frode et al., 2013; IPCC, 2014a). Some community-based adaptation initiatives were also launched at national and local levels in Sudan, Tanzania, Uganda, Zambia, Malawi, Kenya, Zimbabwe, and South Africa. The Community-Based Adaptation Learning Program is also being implemented in Ghana, Niger, Kenya, and Mozambique (CARE International, 2012).

Past studies examined the connection between adaptation and development, as well as the significance of mainstreaming adaptation into national and subnational levels (Gupta, 2009; Dzebo et al., 2015; Runhaar et al., 2018). Funder et al. (2018) highlighted an uncertainty about the extent to which adaptation interventions are implemented in a broader development planning context. Other studies discussed how local governments and planners in developing countries frequently confronted with inadequate access to guiding information. They are left with few options to deal with future climatic changes and the potential consequences (Wilson,

2006; Storbjörk, 2007; Patt and Schröter, 2008; Urwin and Jordan, 2008; Gupta et al., 2010; Mathew et al., 2012; Rodima- Taylor et al., 2012; Mukheibir et al., 2013). As a solution, collaboration and participation from a diverse range of stakeholders are suggested (Stringer et al., 2009).

Although climate change adaptation and agricultural development can be observed in policy documents, challenges remain in the implementation, according to some scholars (Moser and Ekstrom, 2010; Biesbroek et al., 2013). Past studies highlighted that these implementation challenges in Africa are attributable to a number of internal problems, such as incoherent/fragmented administrative responsibilities, poor capacity to manage climate finance, low stakeholder participation, gender inequalities, jurisdictional strife over development and climate agendas, and elitist control over climate governance (Taylor, 2016; Banga, 2019; Andrijevic et al., 2020; Nemakonde et al., 2021).

A review of the United Nations Framework Convention on Climate Change mainstreaming revealed significant differences in progress across countries and sectors (Dewulf et al., 2015; Wamsler, 2015). There has been little sectoral analysis that has systematically assessed mainstreaming achievements, drivers, barriers, and associated theory development (Jordan and Lenschow, 2008; Runhaar et al., 2014). The guidelines for mainstreaming climate change adaptation were rarely put into everyday practice. Earlier efforts to integrate adaptation and development across multiple sectors, including agriculture, were not supported by strong policy signals (Funder et al., 2018). In his case study on Ghana, Cameron (2011) discovered that little is known about local adaptation processes and to what extent it is incorporated and implemented, particularly at the local level of governance.

Against this background, this chapter assesses the progress and barriers to integrating adaptation interventions into Ghana's climate change and agricultural development policies. In doing so, it seeks to better understand how the efforts to achieve climate change adaptation are planned and implemented at national, subnational and local levels. The study contributes to studies on governance for adaptation planning and implementation, which tend to focus on adaptation strategies and plans. In the following discussion, I first present an analytical framework for assessing climate adaptation mainstreaming in development planning. Then I describe the methodology to investigate climate change adaptation and agricultural policy mainstreaming, followed by a discussion of the findings.

## 2.2 Materials and methods

To examine how climate change adaptation interventions are incorporated into agricultural and development policies, this chapter uses Qualitative Document Analysis (QDA). This is a type of qualitative research in which documentary evidence is analyzed and specific research questions are answered by using a systematic and unbiased procedure (Fischer, 2006; Wisely, 2011; Frey, 2018). The QDA process in this study is primarily based on the following seven policy documents that explain how adaptation interventions are integrated into national, subnational, and local plans and how they relate to agricultural development needs:

(1) The Ghana Shared Growth and Development Agenda (GSGDA) II- 2014-2017;
(2) The National Climate Change Policy (NCCP) 2014;
(3) The National Climate Change Adaptation Strategies (NCCAS)- 2010;
(4) Food and Agriculture Sector Development Policy (FASDEP) II- 2009- 2015;
(5) National Climate-Smart Agriculture and Food Security Action Plan- 2016-2020;
(6) National Adaptation Plan framework 2018; and
(7) Investment for Food and Jobs (2018-2021).

The Ghana Shared Growth and Development Agenda (GSGDA II), for example, is an important reference document to understand development agenda in connection to climate change adaptation in the agriculture sector. The National Climate Change Adaptation Strategies (NCCAS) 2010 and National Climate Change Policy (NCCP) 2014 contain detailed information about Ghana's strategic directions to coordinate climate change issues.

These two documents lay the groundwork for a national framework for climate-resilient agriculture and food systems. The Food and Agriculture Sector Development Policy (FASDEP II) shows how the Government of Ghana attempted to guide development and interventions in food and agriculture production. This document helps better understand a link with the NCCP. The National Climate-Smart Agriculture and Food Security Action Plan shows Ghana's effort to translate broad national goals and objectives into community-level climate-smart agriculture. The National Adaptation Planning Framework (NAP-F) process is a national effort to address climate change impacts in a more integrated, coordinated, and long-term manner.

In the second stage, I used the climate mainstreaming building blocks as a framework to assess entry points, progress, and barriers to integrating adaptation interventions into agricultural strategies and development policies. A framework for assessing and characterizing

adaptation interventions in planning and implementation serves as a foundation for climate mainstreaming (Mousumi et al., 2013).

Figure 3.1 depicts the framework's key building blocks, which outline the issues to be considered when planning and implementing adaptation interventions. The framework includes three cross-cutting building blocks: enabling environment, policy and planning, programs and projects. (1) An enabling environment is required for the effective and long-term integration of climate adaptation into development planning processes. It has two significant subcomponents. Political will means government's and stakeholders' commitments to policies and strategies. Information services generate, manage and disseminate climate information for adaptation. (2) The policy and planning building block has three components. The policy framework help integrate climate change adaptation into policy documents. The financial framework illustrate how much climate change interventions are resourced and integrated into development priorities and budgets. The institutional arrangements investigate how governments and stakeholder organizations support the coordination of climate change adaptation planning. (3) The program and project building block assess how policies, strategies, and action plans are translated into concrete actions.

In the third stage, I interviewed government experts to understand the progress and barriers to implementing adaptation interventions. Experts were purposefully selected based on their responsibilities for climate change issues and policies. A prerequisite for selection was that they had a long-standing comprehensive overview and understanding of the policies in this area. In September 2020, eleven experts from various ministries and MMDAs were interviewed. Four of them were district agricultural directors, another four were national disaster management officers, two were district planning officers, and one belonged to a regional environmental protection agency.

### 2.3 Enabling environment and institutional arrangements

In response to international commitments, Ghana joined the UN Framework Convention on Climate Change in 1995 and ratified the Paris Agreement in 2016 (UNFCC, 2016). Article 7.10 of the Paris Agreement requires Ghana and all other countries to regularly communicate about its adaptation efforts. Ghana informas about its priorities, implementation status, support needs, and actions (UNFCC, 2015).

The integration of climate change policies into development planning in Ghana is driven by politicians with technical support from technocrats. As the focal point of the UNFCCC, Ghana's Ministry of Environment, Science, Technology, and Innovations (MESTI) formulate climate policies. It also administers the implementation process. In 2021, MESTI established the National Climate Change Committee (NCCC) (Ghana/BUR, 2021; NAPA-F, 2018) to coordinate the highest-level planning, implementation, and monitoring of climate change policies and programs. The EPA also became responsible for the coordination of UNFCCC-related policies and programs.

Other ministries, departments, and agencies are expected to cooperate with the NCCC in coordinating Ghana's adaptation planning process. Key players include the Ministry of Food and Agriculture (MoFA), the Ministry of Water and Sanitation, the Ministry of Lands and Natural Resources, the National Disaster Management Organization (NADMO), and the Ghana Meteorological Agency. In addition, academic experts on health, water, infrastructure, energy, and agriculture were to be mobilized in this effort.

In response, the MoFA established an internal climate change task force comprised of representatives from MOFA's various technical directorates. It established stakeholder platforms, such as the Ghana Climate Adaptation Network (G-CAN), to encourage the public to participate in the discussion (MoFA, 2016).The MoFA recognized that civil society organizations are critical partners in developing adaptation plans, education, awareness-raising, research, and implementation. The role of the international community, particularly development partners, is critical in resource mobilization, capacity development, and technology development and transfer for adaptation action.

However, Babu and De Pinto (2017) discovered a number of challenges. The National Climate Change Committee's function was hampered by insufficient funding to support activities such as data collection, knowledge management, monitoring, and evaluation. They also discovered that policy specialists with technical expertise were not involved in climate change policymaking. In addition to financial and human resource limitations, local institutional capacity was limited by remote locations and time constraints (Yaro et al., 2015). In his analysis of climate-smart agriculture policy and institutional context, Essegbey (2016) emphasized the lack of policy literacy at the regional, district, and community levels. He discovered little coordination effort among sector institutions regarding decision-making, advocacy, and project implementation.

Decentralization is a key entry point for local adaptation (Orindi and Eriksen, 2005). In Ghana, local governments and districts are the primary subnational institutions in development planning and implementation. Government-led adaptation initiatives are primarily carried out by local-level stakeholders (MMDAs) through environmental committees within the framework of NCCAS. The National Development Planning Commission (NDPC) guidelines for medium-term development plans for MMDAs and MDAs are used for planning at this level. The Ministry of Finance (MOF) provides budget guidelines for National Medium-Term Planning Frameworks and District Annual Action Plans (AAPs) to aid implementation. The district's activities are evaluated annually using the functional operational assessment tool (FOAT).

Ghana's adaptation planning processes, which are applied to the National Adaptation Plan, combine horizontal and vertical integration (NAP-F, 2018). Vertical integration is "the intentional and strategic linking of national and subnational adaptation planning, implementation, monitoring, and evaluation" (Daz et al., 2016). The Ghanaian decentralization process emphasizes the importance of incorporating climate change adaptation into national and subnational structures, including district development plans. Sharing information and building capacity will be critical for vertical integration success and should be planned accordingly (Daz et al., 2016). As previously stated, the NCCP and the NCCAS emphasized the importance of horizontally integrating climate change adaptation across government functions. The National Development Planning Commission already requires ministries, departments, and agencies (MDAs) to incorporate climate change adaptation into their development plans.

The ongoing decentralization process in Ghana creates opportunities for more community-led adaptation planning, but MMDA faces key capacity and resource challenges that are barriers to the effectiveness of this process (Sova et al., 2014).

### 2.4 Climate change adaptation and agriculture policy in Ghana

The policies focusing on Ghana's key adaptation initiatives are the Ghana Shared Growth and Development Agenda (GSGDA II), the National Climate Change Adaptation Strategy (NCCAS, 2012), the National Climate Change Policy (NCCP, 2014), the Nationally Determined Contributions (NDC, 2015), and the National Climate Change Master Plan Action

Programmes for Implementation (2015-2020). These different but interrelated policies have evolved and have been incorporated into the National Adaptation Planning (NAP, 2018).

Climate change adaptation is described as a critical issue in the Ghana Shared Growth Development Agenda (GSGDA II) document (NDPC, 2014). This document identifies climate variability and change management within the theme of sustainable natural resource management. The objectives associated with this theme include strengthening early warning systems, increasing research and awareness of climate change, and assisting in implementing alternative livelihood strategies.

Ghana's UNFCCC commitment to ensure climate issues are considered in the National Climate Change Adaptation Strategy (NCCAS) of 2012. The NCCAS helps to integrate climate change and disaster risk reduction into national development plans. It allows for more effective adaptation across sectors and planning levels. The NCCAS's overarching goal is to protect Ghana's current and future development from the effects of climate change by strengthening adaptive capacity and increasing the resilience of society and ecosystems (MESTI, 2012a). Major agriculture strategies include developing and strengthening the capacity of local farmers to increase agricultural productivity and awareness of climate issues. Another strategy is to develop and strengthen the capacity of extension officers in new farming technologies to improve their support for farmers. Other strategies include improving the living standards of vulnerable groups by acquiring alternative livelihood skills and protecting the environment through promoting agricultural biodiversity.

Ghana's National Climate Change Policy (NCCP) was officially launched in 2014 as a supplement to GSGDA II (Sova et al., 2014). The National Climate Change Committee led its development with technical assistance from MESTI and the Environmental Protection Agency (EPA). The goal was to ensure a climate-resistant, climate-compatible economy while achieving sustainable development (MESTI, 2012). Agriculture and food security feature was listed as the first of five focus areas.

In 2018, Ghana launched the National Adaptation Planning (NAP) process, which was to be guided by a National Adaptation Plan Framework (NAP-F). Ghana's NAP Framework established the implementation roadmap and stakeholder engagement. NAP-F was to align the NAP process with existing policies, strategies, programs, and adaptation research. The NAP Framework takes a sectoral approach and is coordinated by the EPA (NAP-F, 2018).

The Food and Agriculture Sector Development Policy (FASDEP II) is the broader policy instrument that embodies the Ghanaian government's vision for the agriculture sector. The National Climate-Smart Agriculture and Food Security Action Plan details strategies for aligning agricultural adaptation issues in the NCCP with FASDEP II (Essebey et al., 2016). The action plan's goal was to develop climate-resilient agriculture and food systems for all agroecological zones in Ghana, build human resource capacity for climate-resilient agriculture, and provide a framework for implementing specific climate-smart agriculture activities at the national and local levels of governance. The primary goal of the action plan is to assist the NCCP in effectively incorporating climate change considerations into the development policies and programs of the food and agricultural sectors.

Later Investing for Food and Jobs (IFJ, 2018-2021) was developed to operationalize this vision. The IFJ is the government's flagship agricultural program that included several climate adaptation opportunities, including One Village, One Dam (1V1D), One District, One Warehouse (1D1W), and Planting for Food and Jobs (PFJ) initiatives. The PFJ initiative, for example, has five implementation modules: (1) food crop production, (2) Planting for Export and Rural Development (PERD), (3) Rearing for Food and Jobs (RFJ), (4) greenhouse technology development, and (5) mechanization. These initiatives aligned with some aspects of the National Climate Change Adaptation Strategy (NCCAS) and National Climate Change Policy (NCCP). Generally, the flagship programs focus on rural developemnts and supports climate change. Table 3.1 shows the linkage between the national climate change policy, Ghana Shared Growth Development Agenda, the Food and Agriculture Sector Development Policy and the Investing for Food and Jobs program.

### 2.5 Progress and barriers of climate change-agriculture integration

An interview with government officials at the regional and district levels was conducted to assess the progress and barriers to incorporating climate change adaptation into development planning. The interview revealed some key issues that aided in understanding the barriers to incorporating major climate change and agricultural policies at the national, regional, and local levels. When asked about climate change policies, all government officials stated that they were aware of the Ghana Shared Growth Development Agenda (GSGDA II), the National Climate Change Policy (NCCP 2014), and a related agricultural policy, the Food and Agriculture Sector Development Policy (FASDEP II).

According to the government officials interviewed, climate change inclusion in the national development framework is a critical step toward mainstreaming national climate change adaptation. However, it is constrained due to limited connection with sectoral policies necessitating stakeholder and community involvement in policy development and implementation. The interviewees stated that the National Development Commission requires all ministries, departments, and metropolitan, municipal, and district assemblies to incorporate climate change into development planning. At the local level, the District Medium-Term Development Plan (MTDP) establishes connections and is the starting point for integrating climate change adaptation into development strategies. According to MMDA officials, despite the inclusion of climate change in the national policy document (the GSGDA II) and, by extension, the MTDP at the local level, coordination and implementation are limited at the regional and local levels of governance. This validates the finding of my content analysis of the Ghana Shared Growth and Development Agenda (GSGDA II) 2014–2017, which revealed that climate variability and change severely threaten national development (NDPC, 2014) and emphasize prioritized policy interventions supporting environmental governance such as climate variability and change.

In the case of the National Climate Change Policy (NCCP 2014), the analysis of the policy document outlines its objectives of the national effort to combat climate change. It outlines the strategic focus areas, such as climate change and food security, and identifies climate change mitigation plans. Climate-smart agriculture is consistent with the National Climate Change Policy's overarching goal. Officials confirmed reduced awareness and limited incorporation of the NCCPs strategies into the district's MTDP at the decentralized level and that achieving its vision is difficult due to insufficient resources and capacity at the local level. They suggest defined actions translated into sectoral and decentralized plans.

The officials confirmed their awareness of FASDEP II as a critical agricultural policy document. They confirmed implementing non-climate change intended programs, including Planting for Food and Jobs (PfJ) and the One Village One Dam, which promote adaptation at the subnational and local levels. They stated that limited capacity, limited dissemination of information, inadequate resources, and a top-down approach to policy formulation and implementation are major constraints. This confirms my analysis of FASDEP II, which creates a critical link with the National Climate Change Policy on climate adaptation. FASDEP II in Ghana is linked to the African Agricultural Development Program (CAADP), which aims for

6% annual agricultural growth and a 50% reduction in poverty (MoFA, 2015). The main finding from the interview was the significance of policy decentralization at the regional and district levels and climate change policy literacy. This is consistent with the National Adaptation Plan's proposal for vertical integration, which is inextricably linked to community-based adaptation practices (NAP-F, 2018).

## 2.6 Summary

Ghana's Ministry of Environment, Science, Technology, and Innovations (MESTI) develops climate policies, with assistance from other sector ministries, agencies, and institutions. Ghana's adaptation planning processes employ a combination of horizontal and vertical integration, which is applied to the National Adaptation Plan (NAP). Decentralization is an important entry point for local adaptation in Ghana, with a focus on incorporating climate change adaptation into national and subnational structures, including district development plans.

The National Climate Change Adaptation Strategy (NCCAS) and National Climate change Policy (NCCP) are Ghana's main climate change adaptation plans. Agriculture and food security were listed as the first of five focus areas of the National Climate Change Policy (NCCP). The NCCAS helps to integrate climate change and disaster risk reduction into national development plans; major agriculture strategies include raising climate awareness, developing and strengthening extension officer capacity, and strengthening local farmer capacity.

The National Agricultural Investment Plan/IfJ is used to implement the agriculture transformation agenda articulated in the National Medium Term Frameworks. The IFJ is being implemented with several climate adaptation opportunities, including One Village, One Dam (1V1D), and Planting for Food and Jobs (PFJ) initiatives. These programs align with aspects of the National Climate Change Adaptation Strategy (NCCAS) and National Climate change Policy (NCP).

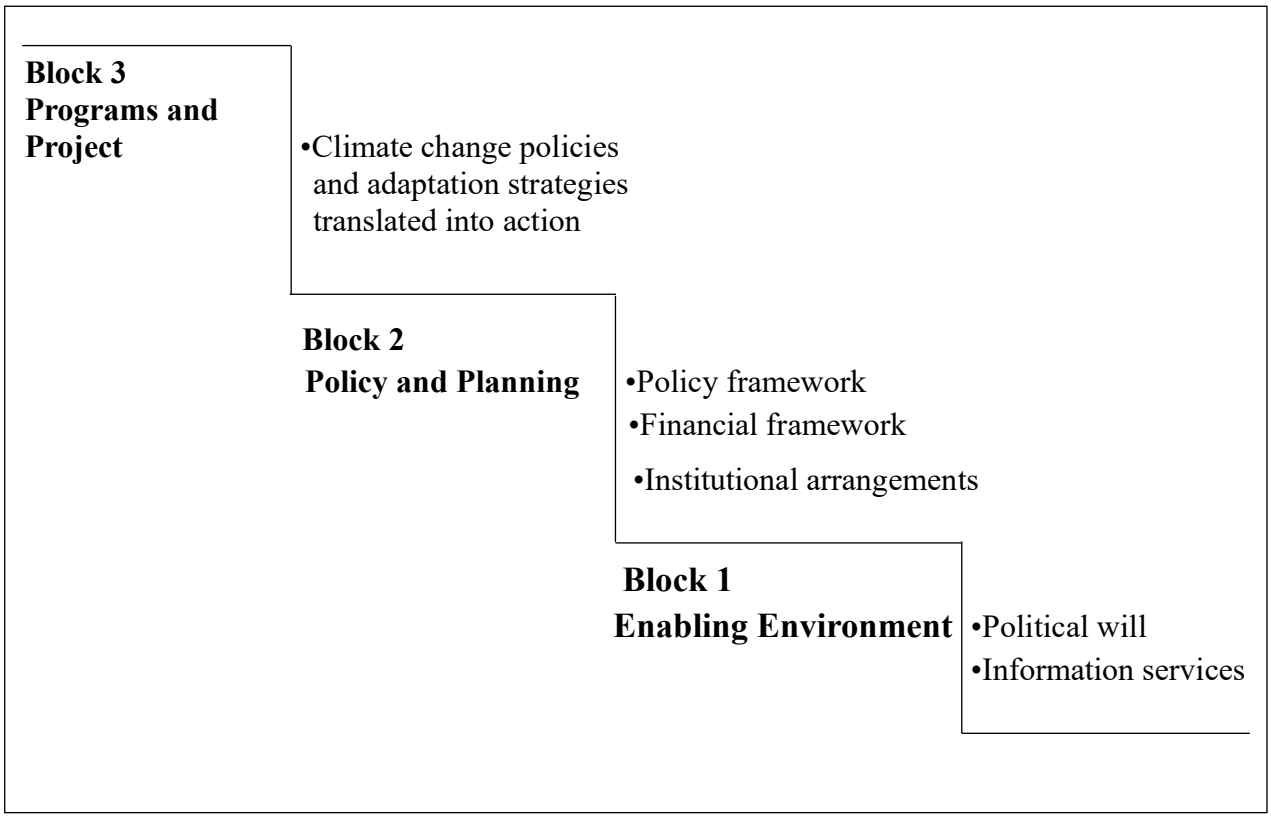


Figure 2.1 Framework for climate mainstreaming

*Source: Adopted and Modified from Mousumi et al. (2013)*

Table 2.1 Flagship programs for agriculture and climate change adaptation in Ghana

| **Medium Term Development Frameworks (*GSGDA II-2014-2017 (**Agenda for Jobs-2018-2021)** | **National Climate Change Policy (NCP 2014)** | **Food and Agriculture Sector Development Policy (FASDEP II-2009-2015)** | **National Agricultural Investment Plan (Investment for food and Jobs-2018-2021)** | **Adaptation Action** | **Adaptation Area** |
|---|---|---|---|---|---|
| *Accelerated agriculture modernization and sustainable natural resource management<br><br>**Agricultural development and rural transformation | Agriculture and food security. (Focus area 1: develop climate-resilient agriculture and food systems) | Food security and emergency preparedness | Transforming Ghana's Agriculture<br><br>**<u>flagship program</u>** –<br><br>•Planting for food and jobs (PFJ)<br><br>•One village one dam (1V1D)<br><br>•One district one warehouse (1D1W) | •[1]Supplied 577,000 farmers with subsidized fertilizers and improved seeds. under PFJ<br><br>•[1]2,700 Extension agents recruited under PFJ<br><br>•[2]570 small dams and dugouts constructed/rehabilitated in Northern (310), Upper East (150), and Upper West (110)<br><br>•[2]50,000t warehouse capacity (1D1W) | •Promotion of conservation agriculture practices<br><br>•Building capacity on Climate-Smart Agriculture<br><br>•Building resilience vulnerable landscapes<br><br>•Minimizing post-harvest loss |

Sources: [1]MoFA, 2021; [2]MoFep, 2019

# Chapter 3 Understanding the Nexus Between Social Power Relationships, Climate Risk Perceptions and Adaptation Needs of Smallholder Farmers in Northern Ghana[1]

## 3.1 Introduction

Past studies highlighted that climate change would threaten agricultural production and the livelihoods of poor and marginalized rural communities in Africa (Reid & Vogel, 2006; Antwi-Agyei et al., 2021). Sub-Saharan Africa was identified as one of the most vulnerable regions to climate change partly because 50% of its total workforce depended on basic forms of farming (IMF, 2012). Subsistence farmers were found to be less likely to adapt to climate change due to a limited access to resources and services (Yaro, 2013; Wilk, 2013). This access limitation has long exacerbated food insecurity and social disparities (Mitchell et al., 2021; IPCC, 2014)

Past climate change adaptation studies also acknowledged that equity and gender disparity, among others, affected climate change vulnerability and adaptability (Codjoe and Owusu, 2011; Sugden et al., 2014; Carr et al., 2014; Ravera et al., 2016; Kristjanson et al., 2017; Lawson et al., 2020; Eriksen et al., 2021). Thompson-Hall et al. (2016) emphasized the importance of understanding climate change impacts in the interface between regional social dimensions (e.g., gender, identity, power balance, governance, institutional arrangement) and surrounding ecological, economic, and climate conditions. In northern Ghana, Nyantakyi-Frimpong (2020) found that smallholder farmers' loss and damage due to dry spells and flash floods were interconnected to gender disparity, age distribution, marital status, health conditions, dominant religious mores, and poverty. The extent to which these factors affect smallholder's disaster loss and damage depend on physiological, institutional, and socio-cultural settings (McPeak and Doss, 2006). Some studies in Ghana showed that preferences for adaptation interventions emerge at the intersection of gender and livelihoods Codjoe and Owusu, 2011; Yiran, 202014. Codjoe and Owusu (2011). Found that, in adopting to drought conditions, women tended to rely on seasonal climate forecasts and post-harvest technologies, whereas men preferred obtaining production technologies.

[1] Part of this chapter was published in the Journal MDPI- Sustainability 2022, 14, 10432. https://doi.org/10.3390/su141610432.

Gender studies shed some light on climate change impacts on food production in northern Ghana (Antwi-Agyei et al., 2012; De Pinto et al., 2012; Nyantakyi, 2020). Some studies identified gender-specific climate change adaptation practices and access to resources (Kumasi et al., 2019; Ankrah et al., 2020; Antwi-Agyei et al., 2021). In Ghana's Upper East Region, female farmers were particularly constrained by a lack of farmland ownership, credit access, irrigation facilities, sufficient information about climate change, and sufficient/high-yielding seeds for planting (Kumasi et al, 2019; Antwi-Agyei, 2021).

These studies amply illustrated that more studies on gendered constraints to climate change adaptation among vulnerable communities, especially women, are needed to have a good understanding about climate change adaptation practices and prospects in connection to food production. In particular, smallholder communities are the backbone of the economy in Africa and other developing countries at large.

According to the Least Developed Countries Expert Group (LEG) report (2015), climate change adaptation is about reducing vulnerability to existing and future climate risks, whereas climate change vulnerability is largely influenced by people's adaptive capacity. Because of disparities in adaptation capacity, climate threats do not equally affect all persons within a region, community, or even household. The capacity to respond to climate change is constrained by the unequal distribution of rights, resources, and power. This is especially true for smallholder women. On average, women make up 43% of the agricultural labor force in developing countries. In Ghana, women constitute 46.4% of the total labor force in primary agricultural production. The Upper East Region of Ghana has about 80% of women contributing to the agriculture labor force (FAO, 2011; Bonye and Kpieta, 2012).

Despite their importance in agricultural activities (FAO, 2011), women generally operate on small-scale farms and are less likely to own property. A lack of ownership means a lack of collateral for accessing credit or loan that can be critical for further farm development investment. Smallholder women cannot receive training or extension services as males predominantly control modern farming practices. These challenges are further exacerbated by some cultural norms (Send Ghana, 2014). IFAD's studies on gender and land rights in Ghana showed that, although women contribute to 80% of the farm labor force in the Upper East Region, they chronically suffered from limited access to and control over resources such as land (Bonye and Kpieta, 2012). Land inheritance is customarily done through a patrilineal line. Decision making on land are left to male chiefs, elders, family heads, and religious leaders.

With the absence of male users, women can gain a temporary access to plots with permission from their husbands. After the husband's death, in the absence of male children, the widow loses her access to land. Single women do not usually have access to land. Women can have access to land if it is remotely located and found to be nutrient poor (Yaro, 2010; Bonye and Kpieta, 2012). In Ghana's Upper East Region, this male-dominant land tenure system has been largely unchanged, even though the Ghanaian government has passed laws and implemented policies to promote gender equality for decades (Antwi-Agyei, et al., 2015; Nyantakyi, 2020).

Another reason that contributed to gender inequality is related to women's educational opportunities. There is an unwritten social/cultural expectation in which women focus on domestic responsibilities. In Ghana, about 44% of women do not have formal education, compared to about 22% of men (Ahmed et. al., 2016).

Women's lack of access to information and education can limit their capacity to adapt to climate change impacts, such as seasonal droughts, floods, and insect/disease infections (UNDP, 2011; Ahmed et al., 2016). In the Upper East Region, Antwi- Agyei et al. (2015) found that women with low education background were more disadvantaged in having access to extension services and information that is important for climate change adaptation.

Furthermore, Ghanaian women are poorly represented in national, regional, and global politics (UNISDR, 2008). This disparity is heightened in remote areas, where women rarely participate in decision-making processes (UNISDR, 2008; Ahmed et al., 2016). The absence of women in decision-making increases their vulnerability to climate change, since their needs and concerns are not represented and are often inadequately addressed.

The overall objective of this research, therefore, is to respond to the needs of further regional studies with the focus on gender-specific climate change perceptions and adaptation needs among smallholder farmers in the Upper East Region of Ghana. This study contributes to the studies on climate change and livelihoods that tend to focus more on farmers in general without much insight on gender dimensions. The study's findings provide useful entry points for strengthening gender consideration in adaptation planning and implementation.

## 3.2 Materials and methods

### 3.2.1 Study area

The Upper East Region is located in the northeastern part of Ghana. It lies in semiarid Guinea and Sudan savannahs with a unimodal rainfall pattern. The wet season occurs from May to October, followed by the long dry season from November to April. The mean annual rainfall ranges from 800 mm to 1100 mm, although the rainfall pattern is erratic, spatially and temporally. The dry season has the cold, dry and dusty harmattan air mass from the Sahara Desert with no rainfall and low relative humidity. The average annual temperature ranges from 14 °C to 35 °C (De Pinto et al., 2012).

The population of the Region is estimated to be 1,301,226 (48.5% males and 51.5% females), who are predominantly Muslims (GSS, 2021). The proportion of male household heads is 72.3%. Households headed by women tend to be excluded from the decision-making process for resource access and community development due to the customary patrilineal local governance system. In this region, women (40.2%) are twice more likely than men (22%) to be home makers. A high proportion of women migrate to urban areas in southern Ghana to work as head porters locally known as "kayayei" to earn a living.

Women in the study area predominantly engage in subsistence rain-fed agriculture (GSS, 2014). About 90% of farm holdings are less than two hectares in size. Farmers mainly use basic implements like hoe and cutlass to cultivate. In some cases, they use bullocks. Major cereal crops grown in the Region are maize, rice, sorghum, millet, and sweet potato.

Cereal crops are mostly intercropped with legumes such as cowpea, soybeans, and groundnuts as sources of proteins and to improve soil fertility through nitrogen fixation. Livestock are also reared in this area. Cattle ownership is considered a measure of wealth and social status. Small ruminants are sold sometimes to pay for leasing farmland (Yilma, 2006). The Ministry of Food and Agriculture recognizes the Region's rain-fed dependent cropping practices as most vulnerable to extreme rainfall variability, floods, drought events, and pest/disease infection (MoFA, 2016). The upper east region has a high level of social vulnerability as 70% of households there are below the national poverty line of 29% (GSS, 2021). Compered to the national average of (102 persons/km$^2$), the area has a higher population density of (117 persons/per km$^{2)}$. This region has a 73% illiteracy rate, which is higher than the 58.% national average. Considering these conditions, The Upper East Region was selected.

### 3.2.2 Data collection and analysis

A mixed method approach was used for this study, including in-person interviews with individual farmers and focus group discussions. Approval and assistance from the Department of Agriculture of the Ghana Ministry of Food and Agriculture in the study area was obtained in April 2021. In the initial research stage, a focus group discussion was conducted to clarify the types of climate change-related risks and adaptation needs of farmers in the study area.

The information obtained in this preliminary survey helped to formulate the questionnaire survey. The questionnaire was pre-tested on a sample of smallholder farmers n = 30 and then changed in response to the issues highlighted during the pre-testing process.

From the Upper East Region's 15 administrative districts Figure 3.1, I chose 4 districts with an estimated population of 338,710 (30%). A simple random sampling technique was used to choose 5 communities from each district. In the following process, a purposive sampling technique was used to reach 10 respondents in each farming community. Thanks to dedicated and generous support from agricultural extension service personnel who translated the questionnaire into local languages (Grunne, Frafra, and Kusaal), the response rate was 100% in all four districts. Altogether I obtained valid answers from 200 smallholder farmers. The survey in one community took about one hour on average. The survey form was used to capture the responses. The questionnaire survey was conducted in April and May 2021.

The questions were grouped into two sections. The first section focused on sociodemographic characteristics such as age, gender, education, income, farm size, and farming experience. These characteristics were later used to find correlations to respondents' adaptation needs perceptions that are to be clarified in the second section. Questions in the second section aimed to identify: (1) adaptation needs of the respondents to climate change; (2) gendered roles in resource use; (3) land ownership; and (4) decision-making involvement. The collected data from the questionnaire were coded and entered into a statistical package for the social science (SPSS version 27) work sheet for analysis. Descriptive statistics in the form of percentages and frequencies were used to show the results.

Farmers' perceptions of risk related to climate change were confirmed using the trend of a 20-year record of rainfall data (2002-2021). These data were obtained from the Savanna Agricultural Research Station in the study area. To confirm and validate farmers' perceptions of climate change, the Mann-Kendall trend and Sen's slope test were performed using the XLSTAT 2021 software. At a significance level of 0.005, the null hypothesis was tested.

Based on focus group discussions with farmers, I identified some adaptation needs for my analysis, including extension service, climate information, financial support, farm inputs, crop insurance, irrigation facilities, mechanization, and infrastructure.The needs were presented to the respondents in Likert-scale questions, allowing them to rank their preferences from the most important to the least important, as well as measure the degree of agreement among the respondents. I used Kendall's coefficient of concordance (W) to rank the response. This analytical technique is one of the most commonly used nonparametric methods in assessing the level of agreement among a set of observations by raters. The Kendall's coefficient of concordance(W) is denoted as follows:

$$W = \frac{12S}{P^2(n^3 - n)} - pT \qquad (1)$$

Kendall's coefficient of concordance is denoted by W, the number of respondents is denoted by p, the number of needs being ranked is denoted by n, the sum of squares is denoted by S, and the correction factor for tied ranks is denoted by T. In order to test the significance of W, I use the Chi-square ($X^2$) statistics which is given by the formulae:

$$X^2 = p(n - 1)W \qquad (2)$$

To identify the varied adaptation needs of smallholder farmers. The null hypothesis (Ho) in this situation was that there is no agreement among the respondent's assessment of their adaptation needs. The association between farmers' social status (e.g., gender, income) and their adaptation needs was investigated using Pearson's Chi-square ($X^2$) test, cross-tabulations, and correspondence analysis in SPSS software. The responses of male and female farmers to adaptation practices, gendered roles, and access to resources were examined.

### 3.3 Results and discussion

#### 3.3.1 Smallholder farmers' socio-demographic characteristics

The socio-demographic characteristics of the respondents show a gradual trend of aging among farmers in the study area. Their age ranged from 21 to 85 years old, and the mean age was 47 years old. The 20–39 age group consisted of 38% of the total respondents, mostly women (Table 3.1). Regarding education, 67% of the respondents had no formal or non-formal education. This constituted about 59% of the female respondents and about 41% of the male respondents. The female illiteracy rate of the respondents corroborated with the female illiteracy rate of 59.4% in the Upper East Region (GSS, 2014). Concerning farming experience, the respondents had an

average of 17 years of farming experience. This shows that their perceptions can be relied on for analysis in this study, given their socio-economic status and farming background.

Regarding their farming, 70.5% of the respondents cultivated less than five acres of farmland while 24.5% cultivated the area between 5 and 10 acres. Only 5% cultivated more than 10 acres. This implies that the respondents were predominantly smallholder farmers. Considering the daily minimum wage of GH¢12.53 (US$2.07) in Ghana (GNA,2021),The income situation of the respondents was categorized and analyzed as low-income group (GH¢50–599), middle income (GH¢600–1999), and high income (GH¢2000+). The monthly farm income showed that 82% belonged to the low-income group, 14% belonged to the middle-income group, and 4% had a high income.

### 3.3.2 Smallholder farmers' climate risk perception

Smallholders must understand risks, priorities, and adaptation needs in order to adequately adapt to climate change (Codjoe et al., 2012). Considering this point, the risk perception of the respondent was identified in the second section of the questionnaire survey. The results show that about 99% of the respondents had noticed changing weather patterns.

During the focus group discussions, the participants described several climatic hazards, including drought, floods, windstorms, and pest/disease outbreaks. Reflecting on this suggestion, these hazards were presented to my survey respondents and asked to assess their occurrence and severity on a scale of 1 as rare occurrence, 2 as occasional occurrence, and 3 as frequent occurrence. The result shows that 84.5% of the respondents found erratic rainfalls affected them frequently during the crop season (Figure 3.2). In connection to this, 75% and 61% observed intermittent/frequent drought and flood incidents, respectively. About 85% of the respondents experienced pest and disease infestation frequently. The degree to which farmers' perceptions in the study area matched the observed data was investigated to support the findings above. Between 2002 and 2021, the study area's lowest and highest annual rainfalls were 503 mm and 1,258.3 mm, respectively. The Sen's slope value of -13.727 and the p-value of 0.037 indicated a decreasing trend in the annual rainfall in the region (Table 3.2). According to this finding, rainfall has reportedly declined for the past 20 years, at 14% annually (Figure 3.3).

The respondents were then asked in multiple-choice questions about how these hazards affected their farming. Their choices included reduced yields due to sporadic rainfall distribution, irrigation water shortage, loss of indigenous varieties, depleting animal feed, and decreasing arable lands. In response, 97.5% chose reduced yields. Other notable impacts were irrigation water shortage (92.5%), loss of indigenous varieties (70.5%), animal feed shortage (60.5%), and decreasing arable lands (55.5%). These results support the findings of Afriyie et al. (2018) and Zakaria and Matsui (2020), which indicated that smallholder farmers in Ghana had experienced the negative impacts of extreme weather events on food production.

### 3.3.3 Smallholder farmers' adaptation practices and needs by gender

In the next section of the questionnaire survey, the respondents were asked to indicate adaptation strategies they had applied in response to the climate change-induced hazards mentioned above. About 98% of the respondents adopted some form of adaptation strategies. These include the adoption of early maturing varieties, changing sowing and harvesting time, and soil fertility management.

These strategies are largely influenced by gender (Codjoe et al., 2012; Yiran, 2014). The chi square $\chi^2$ analysis proved a significant relationship ($p < 0.05$) between gender and adaptation practices (Table 3.3). My findings revealed that female smallholder farmers adopted differently when it comes to such adaptation strategies as changing cropping patterns, adopting early maturing varieties, soil fertility management, and livelihood diversification. Some women interplanted cereals with leguminous crops and used animal manure to improve the fertility of their marginalized lands. They also relied on other sources of income to sustain their households, including shea butter processing, charcoal production and firewood sales, pito (local beer) brewing, soap making, and smock weaving.

The adaptation needs were ranked to identify the priority of their demand (Table 3.4). Access to extension services, financial support, access to inputs, access to climate information, irrigation, mechanization services, and market facilities was identified as the most important adaptation needs. Kendall's coefficient of concordance (W) was 0.401 with 1% significance. This implies that about 40% of the respondents agreed with the gendered ranking outcome.

### 3.3.4 Gendered adaptation needs of smallholder farmers

In this section, the correspondence analysis was used to assess the underlying variables that influenced different adaptation needs by gender (Figure 3.4). It revealed that the two dimensions explained the differences in adaptation needs and social status. Dimension 1 (72.9% of variance) showed the relevance and impact of social status, such as gender and income, on respondents' adaptation needs preferences. Dimension 2 (17.7% of variance) showed the range of adaptation needs for livelihood security, from the least important to the most important.

The analysis of these two dimensions showed that the female respondents in low/middle-income groups emphasized the need for financial support. The male respondents in the middle-income group needed access to irrigation facilities, infrastructure, and mechanization. Regarding types of services from extension services, the female respondents needed educational/training opportunities, whereas the male respondents needed technological expertise. The need for farm input was found to be associated with the low-income group, especially the female respondents. This may be due to their limited access to credits and productive lands (Saito et al., 1994; Chant, 1997).

Regarding climate information that is important in supporting adaptation, we found that the female respondents were more likely to show interest in obtaining climate in-formation, but they also showed concerns over a lack of timely information (94%), in-formation that is difficult to understand (85%), and language barriers in communicating about the climate (97%).

The difference between men and women in terms of crop insurance availability was not substantial (29% and 25%, respectively). This may be due to overall financial constraints and affordability of insurance premium for smallholder farmers in general in the study area. The lack of awareness, understanding, knowledge, and accessibility also affected the adoption of insurance.

### 3.3.5 Gender roles and access to resources in adapting to climate change

In the focus group discussion, It was found that farmers were concerned about land acquisition, land preparation, farm maintenance, harvesting, post-harvesting, and marketing. In the questionnaire survey, these activities were highlighted and asked in Likert-scale questions (1 = strongly disagree and 5 = strongly agree). The results showed that 91% of the respondents strongly agreed that women were partially involved in land acquisition and preparation.

About 85% of the respondents agreed that farming practices such as sowing, weeding, and fertilizer application were jointly carried out by men and women. Nealy, all the respondents (97%) strongly agreed that women were dominant in harvesting, post-harvesting activities, and marketing.

Regarding women's access to resources, It was found in the focus group discussion that farmers in the study area needed more land, agricultural input, credit, production technology, storage, and marketing facility. At the same time, It was found that, with the exception of women in the Tindana family (priests of the earth), women were customarily prohibited from owning land. Women can only have access to the farmland allocated by the extended family.

Considering these situations, the questionnaire survey results was analyzed by correlating land ownership with gender. The result showed that women (73%) relied on land allocation/gift and lease (96%). It was found that only men acquired farmland through inheritance (100%). This means that women had very little control over farmland ownership. This is due to patriarchal cultural norms that recognize only men to inherit and own land through lineage. Clan heads are the sole authority to make decisions about land ownership transitions (SEND Ghana, 2014; Antwi-Agyei and Nyantakyi-Frimpong, 2021).

Following the understanding of these socio-cultural constraints for women, an attempt was made to understand how women farmers coped with crop production challenges in adapting to climate change. It was found that 91% of the female respondents emphasized the importance of farmers' mutual-help groups called Susu, which often functions as village saving and loan associations. These organizations provide cash services and share information with female farmers about common farming needs (Table 3.5). The female respondents tended to belong to these groups.

### 3.4 Summary

Overall, it showed that a large proportion of the respondents identified erratic rainfalls (84.5%), drought events (75%), and flood incidents (61%) as the foremost challenges. The respondents also experienced reduced yields, irrigation water shortage, the loss of indigenous varieties, animal feed shortage, and decreasing arable land. Regarding adaptation needs, the correspondence analysis revealed that the female respondents in low- and middle-income groups primarily emphasized their need for financial support (e.g., credit access), whereas the male respondents in the middle-income group needed irrigation facilities, infrastructure, and

farm machinery. Regarding types of services, the female respondents needed education/training opportunities, whereas the male respondents needed technological expertise. Both male and female respondents did not show much interest in crop insurance. Regarding coping strategies, the women respondents tended to organize and join mutual help groups called susu, which often functioned as village saving and loan associations. These strategies were necessary as these women had only access to land without ownership. This is largely due to traditional patriarchal practices that discriminated against women.

Table 3.1 Socio-demographic characteristics of the respondents

| Social Characteristic | Category | Number of Respondents | (%) | Minimum | Maximum | Mean |
|---|---|---|---|---|---|---|
| Gender | Male | 100 | 50 | | | |
| | Female | 100 | 50 | | | |
| Education | None | 110 | 55 | | | |
| | No formal | 24 | 12 | | | |
| | Basic | 36 | 18 | | | |
| | SHS | 24 | 12 | | | |
| | Tertiary | 6 | 3 | | | |
| Age | 20–29 | 20 | 10 | 21 | 85 | 47 |
| | 30–39 | 56 | 28 | | | |
| | 40–49 | 56 | 28 | | | |
| | 50–59 | 36 | 18 | | | |
| | 60+ | 32 | 16 | | | |
| Years in farming | 1–10 | 42 | 21 | 5 | 45 | 17 |
| | 11–20 | 80 | 40 | | | |
| | 21–30 | 46 | 23 | | | |
| | 31–40 | 26 | 12 | | | |
| | 41–50 | 6 | 3 | | | |
| Farm size (acres) | <5 | 141 | 70.5 | 2 | 25 | |
| | 5–10 | 49 | 24.5 | | | |
| | 11–20 | 9 | 4.5 | | | |
| | 21–30 | 1 | 0.5 | | | |
| Farm income (monthly) | High income (GH¢2000+) | 8 | 4 | | | |
| | Middle income (GH¢600–1999) | 28 | 14 | | | |
| | Low income (GH¢50–599) | 164 | 82 | | | |

SHS: senior high school; US$1 = GH¢5.90.

Table 3.2 Mann-Kendall trend test for 20-year average annual rainfall (mm)

| Parameter | Value |
|---|---|
| Kendall's tau | -0.343 |
| S | -65.000 |
| Var(S) | 949.000 |
| p-value (Two tailed) | 0.037 |
| Alpha | 0.05 |
| Sen's slope | -13.727 |

Table 3.3 Gender and smallholder farmers adaptation practices cross-tabulation

| Adaptation Practices by Gender | Male % | Female % | $\chi^2$-Value | Significance Level |
|---|---|---|---|---|
| Changed cropping patterns | 76 | 95 | 14.559 | 0.001 |
| Changed sowing and harvesting time | 97 | 93 | 1.684 | 0.194 |
| Adopted early maturing variety | 96 | 76 | 16.611 | 0.001 |
| Soil fertility management | 69 | 96 | 25.247 | 0.001 |
| Pest and disease management | 47 | 32 | 4.708 | 0.030 |
| Livelihood diversification | 64 | 87 | 14.299 | 0.001 |

(df =1, Significant at $p < 0.05$).

Table 3.4 Ranking of smallholder farmers' adaptation needs

| Key Adaptation Needs/Priorities | **Mean** | **Ranking** |
|---|---|---|
| Extension service | 7.10 | 1st |
| Financial support (Credit/loan) | 6.22 | 2nd |
| Access to inputs | 4.64 | 3rd |
| Access to climate information | 4.48 | 4th |
| Access to irrigation | 4.35 | 5th |
| Mechanization services | 3.41 | 6th |
| Infrastructure (storage facilities, market space) | 3.29 | 7th |
| Crop insurance | 2.52 | 8th |

(n=200, Kendall's W[a] = 0.401, Chi-Square = 561.658, df = 7, Asymp. Sig = 0.000)

Table 3.5 Farmer's membership in mutual-help groups

| | Gender | Farmer Based Organization (FBO) | Village Savings-Loan Association (VSAL) | Local Cash Service or Susu | None |
|---|---|---|---|---|---|
| % within Category | Male | 35 | 12 | 13 | 40 |
| | Female | 40 | 28 | 23 | 9 |
| *n* = 100 | Total | 75 | 40 | 36 | 49 |
| % by gender | Male | 45 | 30 | 36 | 80 |
| | Female | 55 | 70 | 63 | 20 |
| *n* = 200 | Total | 100% | 100% | 100% | 100% |

Note: FBO is locally organized farmers who share ideas and extension services. VSAL is a self-managed and self-capitalized group that uses member fees to lend money. Susu is a traditional rotating saving group observed widely in Ghana. Group members contribute an equal amount of money either weekly, bi-weekly or monthly. The total contribution is paid to one group member on a previously agreed schedule.

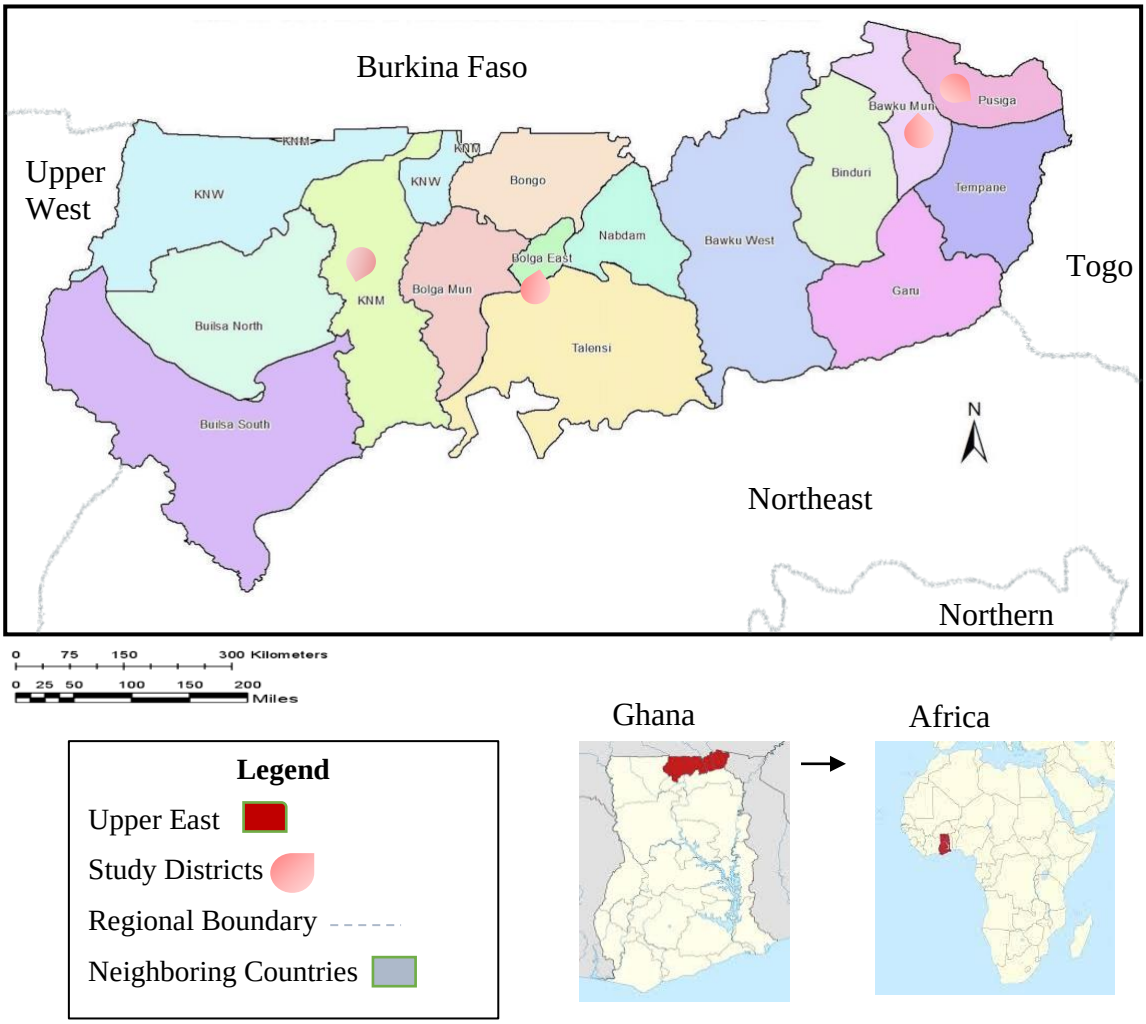


Figure 3.1 Study area

Note: The figure shows the selected districts where the survey was conducted.

How would you rate the occurrence of the following hazards as a result of the weather changes for the past decade? Please rate occurrence from scale 1 to 3. (Occurrence: 1 = rare, 2 = occasional, 3 = frequent).

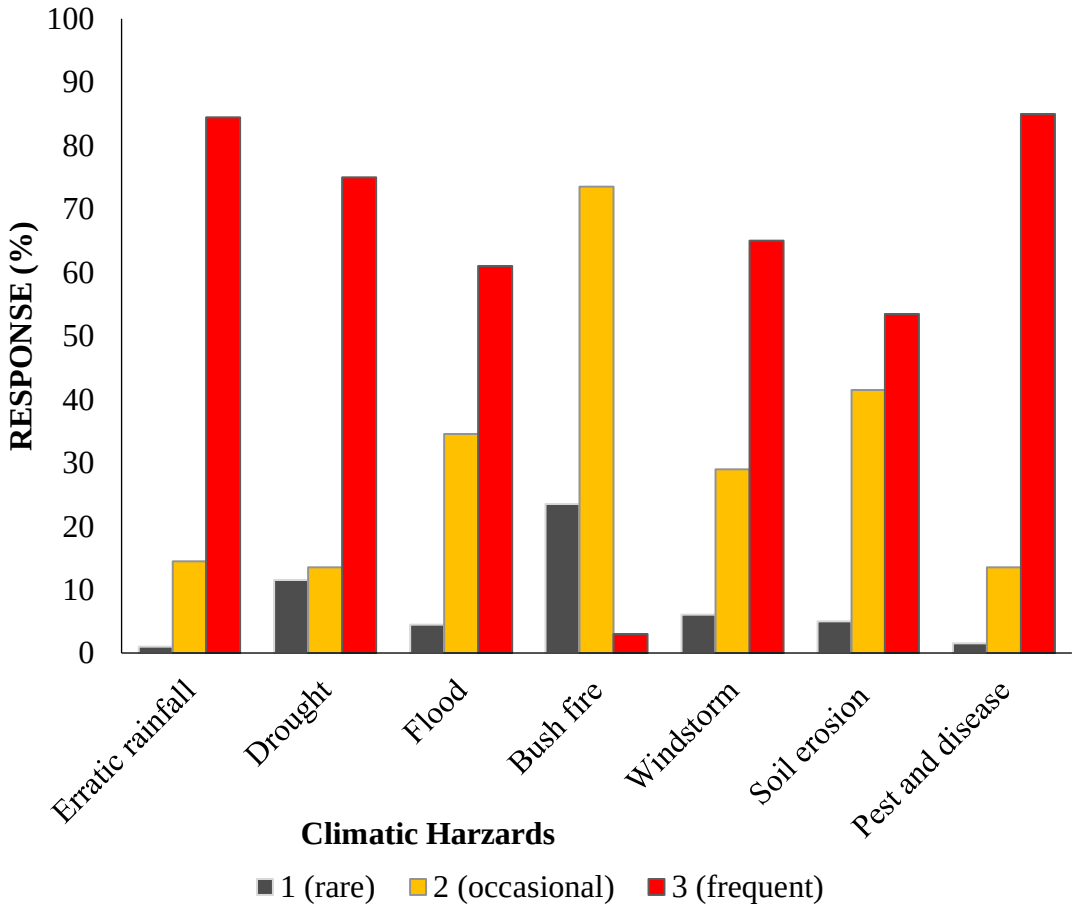


Figure 3.2 Rate of occurrence of climatic hazards

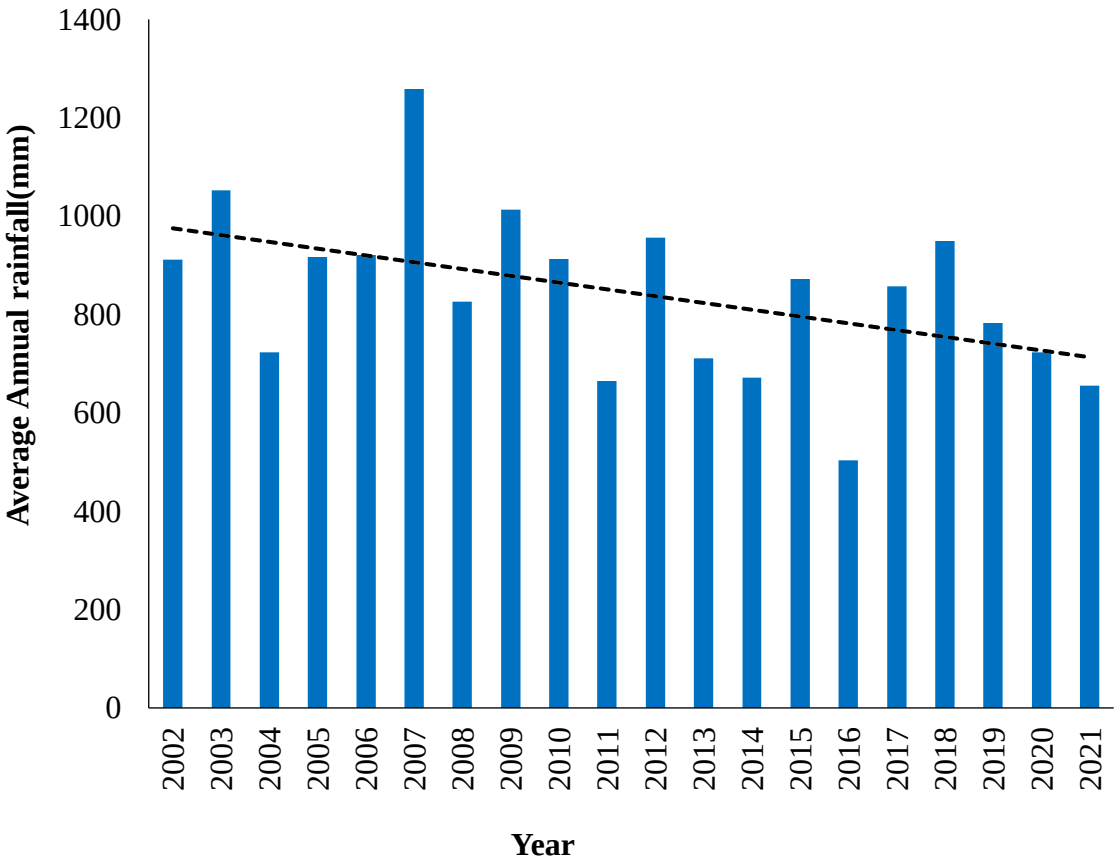


Figure 3.3 Trend in a 20-year average annual rainfall (mm)

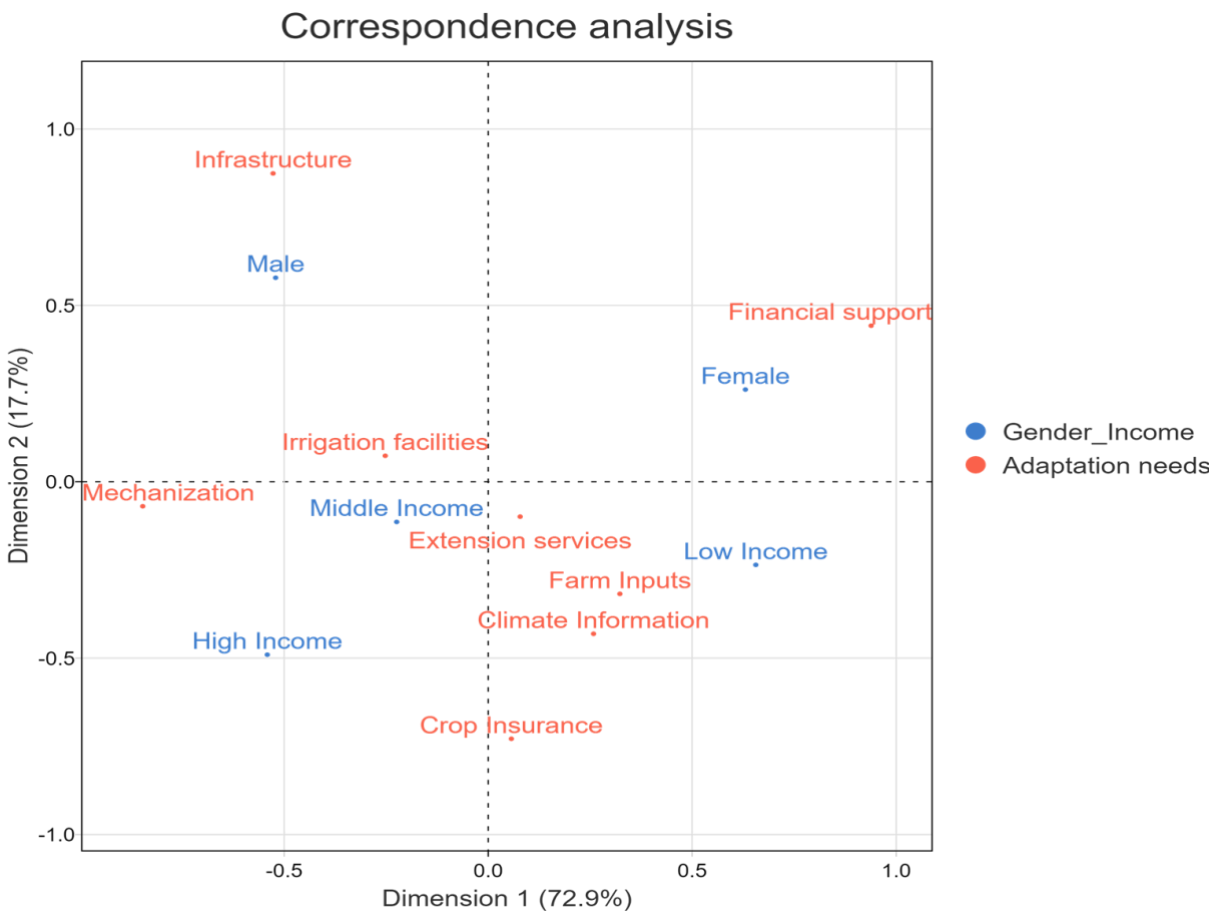


Figure 3.4 Perceptual map of correspondence analysis showing the relationship between adaptation needs and social status (gender and income)

# Chapter 4 Climate Change Adaptation Interventions in Agriculture through South-South Cooperation in Sub-Saharan Africa

## 4.1 Introduction

According to the IPCC (2022), rising weather and climate extremes have exposed millions of people to food insecurity. Agriculture is one of the most climate-exposed sectors on which developing and least-developed countries of the global south rely heavily (Buelow and Cradock, 2016).

Improving climate change adaptation for African agricultural development is a task that cannot be accomplished by a single researcher, organization, or government. It will require the collaboration of agricultural and climate change stakeholders. Planning and implementing agricultural climate change adaptation policies require a similar level of collaboration (Chambwera & Anderson, 2011).

Previous studies emphasized the need for international cooperation in Africa's response to climate change. For example, in their study, Jensen and Large (2013) highlighted that international cooperation is critical to averting dangerous climate change because its effects extend beyond the jurisdiction of individual countries. International good practices, regional agreements, and policies recognize that regional integration, cooperative governance, and benefit-sharing approaches are Africa's cornerstones of adequate resource security and climate change responses (Dombrowsky and Hensengerth, 2018). Climate change adaptation in agriculture necessitates integrated responses that address the complex and interconnected nature of global resource systems. These integrated responses facilitate the exchange of technologies that countries accumulate as part of their development processes that are more accessible, adaptable, and affordable (Vazquez and Lucey, 2016).

In order to respond to the growing pressures of climate change on resource systems, developing countries are expected to help each other for achieving more cost-effective adaptation technologies, implementing national adaptation plans (NAPs), and meeting nationally determined contributions (NDCs) (Aggarwal, 2011). This so-called South-South Cooperation (SSC) offers a new opportunity for partnership between nations in the south. These countries can share resources, and utilize unique strengths and move beyond a traditional status of aid recipients. According to the OECD’s Task Team on South-South Cooperation (2011), effective collaboration should go beyond financial contribution and technical assistance. It develops ground-breaking solutions to socioeconomic and environmental issues like climate

change, poverty, and education. Knowledge sharing, one of the most innovative components of SSC, has developed into the third pillar of development cooperation, complementing technical assistance and financial support. Here the concept of “horizontal partnerships,” with a focus on equity, trust, mutual benefit, and long-term relationships, emerged.

Considering these emerging trends, more studies must be conducted on developing partnerships among countries, particularly in sub-Saharan Africa, to collaborate to implement local climate change adaptation interventions in agriculture. This chapter looked at the good practices, opportunities for cooperation, and partnerships to help shape future agricultural and climate change policies among African nations. In doing so, it examines the potential of South-South cooperation for adaptation measures and agricultural development in Sub-Saharan Africa. It attempts to answer the following two main research questions:
(1) In what forms does South-South cooperation take place in Sub-Saharan Africa for agriculture and climate change adaptation? (2) What are the opportunities and challenges for cooperation and partnerships among African nations for agriculture and climate change adaptation?

### 4.2 Methodology

A literature review and content analysis of past studies and reports were conducted to understand the potential of South-South cooperation in relation to adaptation action for Africa's agriculture. I identified some SSC principles and modalities based on the Food and Agriculture Organization's (FAO) Quick Guide to South-South Cooperation to identify regional and national initiatives of SSC in Sub-Saharan Africa. The program documents of the initiatives identified were subjected to content analysis to determine the linkage of program objectives in support of the principles and modalities of SSC in climate adaptation action and agriculture development. The UNFCCC Technology and Executive Committee Report assisted me in clarifying the barriers to and enablers of SSC on climate technologies, as well as recommendations for better leveraging SSC potential for climate adaptation and agricultural development.

### 4.3 Definition of south-south cooperation

South-South cooperation has emerged as an essential component of the global development landscape. The United Nations Office for South-South Cooperation defines it as "a broad framework of cooperation among developing countries in political, economic, social, cultural, environmental, and technical domains in which developing countries share knowledge, skills, expertise, and resources in order to meet their development goals through coordinated efforts"(UNOSSC,2016, p.5). SCC is a tool used by governments, international organizations, academia, civil society, and the private sector to collaborate and share successful initiatives in specific areas, such as agriculture and climate change adaptation, to complement North-South Cooperation (UN, 2019; FAO, 2022).

South-South Cooperation primarily revolves around capacity development and knowledge/technology share. FAO's South-South Cooperation (SSC) aims to bridge knowledge or technological gaps between nations. SSC is based on the premise that developing countries have innovative solutions. Decentralized efforts make up the majority of SSC initiatives (FAO, 2019).

### 4.4 South-South Cooperation principles, pillars, and modalities for partnership

The initiatives for South-South Cooperation are determined by the countries of the south and guided by some fundamental principles, such as (1) solidarity or mutual support for the initiative that benefits the cooperating countries and contributes to it on favorable terms; (2) national ownership of initiatives that are in line with developing countries' priorities and strong participation of stakeholders in their implementation; (3) launching mutual exchange between developing countries based on equal partnership and a horizontal relationship; (4) respect for national sovereignty through initiatives that do not influence the political processes of the developing countries involved; and (5) complementary to initiatives that use new ways of approaching developmental issues, with an emphasis on replicating innovative experiences already implemented in developing countries.

The implementation of SSC initiatives to achieve climate change adaptation and agricultural development is based on various flexible exchange modalities, including high-level policy dialogue, institutional support, technological transfers, and knowledge sharing at the grassroots level. The SSC fosters a favorable policy environment while allowing countries in the global south to collaborate on common development goals (FAO, 2015). Facilitating high-

level policy dialogue is one way to achieve this goal. Fostering an enabling environment for effective SSC requires internal and external institutional support. This includes broadening partnerships and strategic alliances and mobilizing adequate, long-term resources. Demand-driven and responsive SSC initiatives at the regional and national levels are required to exchange development solutions at the grassroots level because they enable the deployment of experts for educational and technological transfers. In order to identify and assess initiatives based on South-South Cooperation, these principles and modalities for agriculture and climate change adaptation were taken into account in this study (See Figure 2.1).

### 4.5 Regional and national initiatives in Sub-Saharan Africa aligned with South-South Cooperation for climate change and agriculture

Reviewing the literature reveals that there are numerous ongoing initiatives and development modalities aligned to South-South cooperation (SSC) in Sub-Saharan Africa. Climate change adaptation initiatives in agriculture are taking place at the bilateral and multilateral levels among countries in the global south, facilitated by international organizations such as the World Bank, the Food and Agriculture Organization (FAO) and the African development bank.

SSC opportunities align with critical regional frameworks like the Africa Adaptation Acceleration Program (AAAP) and the Comprehensive Africa Agriculture Development Program (CAADP). The African Development Bank and the Global Center on Adaptation are collaborating on the Africa Adaptation Acceleration Program (AAAP), an African-led initiative. The Climate Smart Digital Technologies for Agriculture and Food Security action area is one of the four areas of focus for the AAAP. It aims to increase access to climate-smart digital technologies and related data-driven agricultural and financial services for at least 30 million smallholder farmers in Africa, support food security in 26 African countries, and lessen malnutrition for at least 10 million people (AfDB, 20219). The program intends to integrate some initiatives to establish climate-smart agriculture and resilient food systems in the region.

The Comprehensive Africa Agriculture Development Program (CAADP) aims to improve food security and income in Africa's predominantly farming-based economies. It intends to achieve this by increasing agricultural productivity by at least 6% per year and public investment in agriculture to 10% of national budgets per year (Schulz, 2010). CAADP interventions are organized around SSC-relevant modalities such as improving agricultural research, technology dissemination, and adoption, all of which are critical to climate change

adaptation. Academic and professional training and assistance to farmer associations are among the modalities directly relevant to SSC (AFSA, 2016).

Learning from the successes of smallholder private irrigation projects in Burkina Faso, Mali, Niger, and Nigeria enables developing nations aligned with SSC to share the potential and effects of new technologies. More sophisticated drilling, pumping, and water distribution techniques have been introduced and are now practiced in 55 % of the irrigated area in Niger and 75% of the currently irrigated area in Nigeria (Abric et al., 2011). Farmers in Niger and Nigeria adopted manual drilling due to its low cost. There are more than 18,000 manually drilled tube wells in Niger and more than 100,000 manually drilled tube wells in Nigeria (UNICEF, 2009). Manual drilling was also promoted through projects in Senegal, Mali, Burkina Faso, Ghana, and Benin.

The Adaptation Learning Program (ALP), a community-based initiative, aims to improve vulnerable households' ability to adapt to increasing and uncertain climate change in Sub-Saharan Africa. The ALP collaborated with government agencies and civil society organizations in Ghana, Kenya, Mozambique, and Niger, in addition to other African countries. Gender equality, access to useful climate information, multi-stakeholder decision-making, and facilitation of learning for climate-resilient agriculture, risk reduction, and resilience are all priorities for ALP (Care International, 2015).

### 4.6. South-South Cooperation's potential for integrating climate change adaptation in Africa's agricultural development

Considering the impact of climate change and the need for incorporating climate change adaptation into agricultural development policies, this section highlights the potential of SSC in fostering cooperation and local engagement to leverage agricultural development.

SSC can foster a good policy environment for partnerships in agricultural development research by countries in sub-Saharan Africa. Cheru, Modi, and Naidu (2014), in their research, argued that the rise of SSC is creating spaces for new critical engagements in which African states have more choices and the ability to influence development policies and negotiate more favorable outcomes. An example is the African, Caribbean, and Pacific Group of States, the SSC Women and Youth Empowerment Forum for Agriculture, and Integrated Rural Development (ACP, 2016).

In the previous section, some projects and programs were found to be implemented based on cooperation by African countries at the regional level. At the regional level, SSC can provide an opportunity to identify regional frameworks and enable countries to identify opportunities in line with their priority areas. This approach can support the exchange and uptake of development solutions (FAO, 2015). Engaging in SSC activities offers opportunities for countries to develop joint solutions to their common developmental challenges. For example, the transfer of adaptation technologies within the sub-region will be more locally appropriate, given the similar climatic conditions and geographical and cultural proximity shared by African countries. For example, IFAD's Adaptation for Smallholder Agriculture Programme (ASAP) in Africa seeks to use "tried and tested approaches to rural development with relevant adaptation know-how and technologies from different realities" (i.e., conservation agriculture in Ghana and drip irrigation technologies in Nigeria). These efforts entail South-South cooperation and cross-country exchange of experiences, technologies, and practices (IFAD, 2015).

SSC can effectively mobilize and engage a broad range of stakeholders, such as civil society, the private sector, academia, and local communities, in climate action, including climate technology cooperation. Such engagement is crucial for effective partnerships and local engagements (TEC, 2017). SSC initiatives prioritize more structured capacity-building. Delivery modalities and instruments that transfer knowledge and develop capacities (i.e., training programs, joint research activities, and knowledge and technology network platforms) are beginning to gain traction (UNDP, 2017). An example of a more structured initiative includes the West African Agricultural Productivity Program's (WAAPP) effort to transform West African agriculture by boosting productivity and sustainability, reducing hunger, improving nutrition, creating jobs, and supporting collaboration across borders (World Bank, 2016).

### 4.7 Challenges to south-south cooperation and implementation of agriculture and adaptation action

Despite all these growing interests in SSC, some studies point out challenges to promoting it, including a power imbalance between providers and receivers in SSC. According to Waisbich (2021), the major developing countries, such as China, India, South Africa, Brazil, and Turkey believe they have nothing to learn from other developing countries, a departure from early SSC

articulations that emphasized mutual knowledge transfer as a critical feature. According to Kakonge (2014), the primary shortcoming of SSC is a lack of funding. A UN agency or a bilateral donor is usually involved, resulting in triangular cooperation. Transfer and scaling of new practices and innovations from one country to another is hampered when partners do not speak the same language. As a result, the SSC programs' scope is limited.

Although many fruitful SSC initiatives involving the development and transfer of climate technologies are underway, information on the initiatives, including the approaches, mechanisms, and tools used to initiate, design, and implement them, remains limited and difficult to obtain. In addition, low local ownership, the lack of regulatory frameworks for technology transfer and intellectual property management discourages organizations from investing in SSC (UNFCCC/TEC, 2017).

### 4.8 Summary

In order to plan agricultural and climate change adaptation interventions for sustainable development in sub-Saharan Africa, this study emphasizes initiatives and opportunities for South-South cooperation. Reviewing regional and national SSC initiatives have made it possible to identify several opportunities and challenges that require attention if the SSC is to reach its full potential as a solution for the need to incorporate climate change adaptation into agricultural development through co-operation and partnerships in sub-Saharan Africa.

SSC offers an opportunity to uptake joint development solutions for agriculture, i.e., the transfer of adaptation technologies within the sub-region will be more locally appropriate, given the similar climatic conditions and geographical and cultural proximity shared by African countries. SSC can foster a good policy environment for partnerships in agricultural development research that provides opportunities for regional frameworks and the identification of priority areas for adaptation at the national level. SSC encourages increased participation of stakeholders, including local communities, the private sector, academia, and civil society, in climate action that places a higher priority on more structured capacity-building. The potential of SSC is mainly untapped due to challenges such as government engagement and political commitments, power imbalances between providers and receivers, funding, language barriers, a low level of local ownership, and limited communication and information sharing.

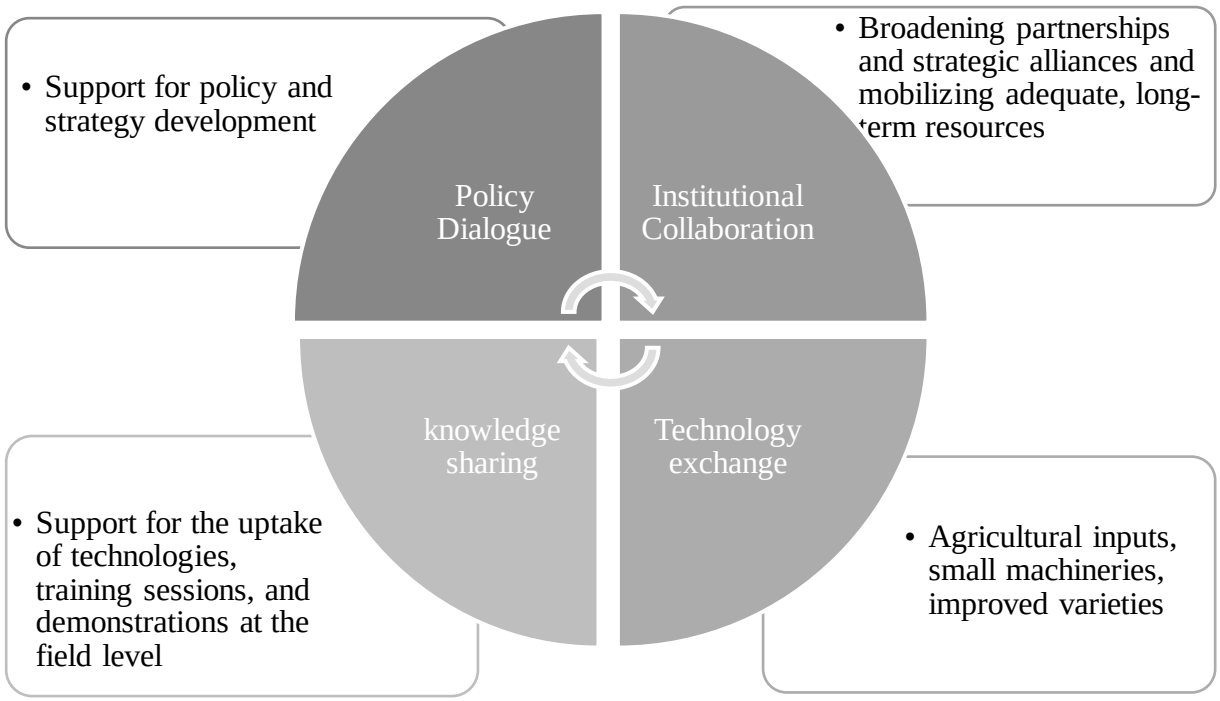


Figure 4.1 Diverse and flexible SSC modalities at the institution and grassroots levels

Source: FAO (2015)

# Chapter 5 Conclusion and Recommendation

This chapter discusses the main findings from the previous chapters and gives recommendations for adaptation policy improvement. The findings and recommendations inform the adaptation needs of smallholder farmers that require policy attention. The necessity of cooperation in incorporating climate change adaptation into agricultural development policy-making at the regional, national, and local levels of governance is also emphasized.

## 5.1 Integrating climate change adaptation into agricultural development policies

Chapter 2 emphasized integrating climate change considerations into agricultural development policy-making using Ghana as a case study country. Ghana's agricultural sector was discovered to be the foundation for the nation's economic growth. As a result, the threat of climate change to agriculture affects smallholders' livelihoods and the economy. It was discovered that in Ghana, decentralization is a critical entry point for local adaptation, focusing on incorporating climate change adaptation into national and subnational structures, including district development plans.

Agriculture and food security are the first of five focus areas of the National Climate Change Policy (NCCP). The NCCAS contributes to integrating climate change and disaster risk reduction into national development plans; major agriculture strategies include raising climate awareness, developing and strengthening extension officer capacity, and strengthening local farmer capacity. The National Agricultural Investment Plan (IfJ) is implemented to operationalize the agriculture transformation agenda articulated in the National Medium-Term Frameworks. It was discovered that the flagship initiatives for agriculture sector development policies are geared toward fostering rural growth and assisting with climate change. However, agricultural adaptation program implementation at the local level is hampered by an insufficient response to local needs, low institutional capacity, resource constraints, a top-down approach to policy planning, and limited coordination.

## 5.2 Social power relations and adaptation needs of smallholder farmers

Chapter 3 looks at the intersection of social relations that could better understand the adaptation needs of smallholder farmers at the local level and inform policy decision-making. Differences in adaptation needs between men and women smallholders were influenced by income status, access to resources, and socio-cultural norms. Most women farmers have low

incomes, which are exacerbated by a lack of productive resources and the impact of climate change on their farming. Regarding adaptation needs, women in the low- and middle-income groups emphasized the importance of financial assistance (e.g., credit access). In contrast, men in the middle-income group emphasized the importance of irrigation facilities, infrastructure, and farm machinery. In terms of the services provided by extension, women require education and training opportunities, whereas men require technical expertise. Women require more farmland, agricultural inputs, credits, production technology, storage, and marketing facilities to assist in their farming. The need for farm input was associated with the low-income group. These may be due to their limited access to credit and productive lands, in line with the findings by Antwi-Agyei and Nyantakyi-Frimpong (2021).

### 5.3 Cooperation in integrating climate change adaptation into agricultural development policies

In Chapter 4, it was emphasized that for countries to implement climate change adaptation at the local level of governance, cooperation and partnerships were required. South-South Cooperation has been found to be an effective tool for incorporating climate change adaptation into agricultural development policies. SSC was found to support a favorable policy environment for the development of a regional framework for climate change adaptation programs and the identification of priority areas at the national levels. This finding is supported by Cheru, Modi and Naidu (2014). It was discovered that SSC can provide the opportunity for the uptake of joint development solutions and encourages increased participation of stakeholders, including local communities, the private sector, academia, and civil society, in climate action that places a higher priority on more structured capacity-building, sharing of knowledge and technology transfer. This builds effective partnerships and local engagement for effective planning and implementation of adaptation policies.

### 5.4 Policy recommendations for climate change adaptation planning and implementation

This research has clarified local adaptation needs and the need for future collaboration for African countries, including Ghana, to incorporate climate change adaptation action into agricultural development policymaking. Building on previous research on climate change integration into development policies (e.g., Pearse, 2016; Mogelgaard et al., 2018; Resurreccion

et al., 2019; Afogkpe et al., 2022), there is a clear need for incorporating adaptation into sector-specific development policies, including agriculture.

The findings in this research imply that policymakers need to prioritize and incorporate the adaptation needs of smallholder farmers by overcoming the barriers at local, national, and regional levels of governance.

Decision-making should be more responsive to smallholder farmers' needs, considering targeted adaptation action aimed at women. Income generation opportunities should be considered, focusing on new forms of diversification and alternative livelihood schemes, including the rearing of small ruminants and poultry, shea butter and groundnut processing, beekeeping, pottery, weaving, and market opportunities. The collective action of men and women farmers working as a group to share resources and financial support should be encouraged.

The capacity-building of the local governance structure should be strengthened. Delegating tasks to local entities and enhancing the involvement of stakeholders in adaptation planning should increase local ownership and the effectiveness of adaptation interventions. Approaches that support knowledge sharing, collaboration between farmers and research organizations, and the development of joint innovations for adaptation should inform policymaking.

Alternative integration approaches to climate change policy are driven by knowledge sharing, technology adoption, and social change. These can be achieved through South-South cooperation by adopting cross-regional, cross-country, and cross-sectoral approaches to climate adaptation, especially for agriculture. SSC can support a favorable policy environment for developing a regional framework for climate change adaptation programs and identifying priority areas at the local and national levels. Policymakers and researchers should implement policies by providing mutual support with concrete action through agricultural cooperation in climate research and capacity building.

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