What are the Impediments to Adoption of effective Climate Change Adaptation Strategies in the West Mamprusi District of Northern Region of Ghana?

A Research Paper presented by:

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(Ghana)

in partial fulfillment of the requirements for obtaining the degree of

MASTER OF ARTS IN DEVELOPMENT STUDIES

Major:

Agrarian, Food and Environmental Studies

(AFES)

Specialization:

Environment and Sustainable Development

(ESD)

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The Hague, The Netherlands

November, 2015

Disclaimer:

This document represents part of the author's study programme while at the Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

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List of Acronyms

ACB	African Centre for Biodiversity
AEAs	Agricultural Extension Agents
AFSA	Alliance for Food Sovereignty in Africa
AGRA	Alliance for Green Revolution in Africa
CGIAR	Consultative Group for International Agricultural Research
CSA	Climate Smart Agriculture
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
FASDEP	Food and Agriculture Sector Development Policy
FGDs	Focused Group Discussions
GEF	Global Environmental Facility
GHGs	Greenhouse Gases
GMOs	Genetically Modified Organisms
GSS	Ghana Statistical Service
IPCC	Intergovernmental Panel on Climate Change
JICA	Japanese International Cooperation Agency
MDAs	Ministries, Departments and Agencies
MESTI	Ministry of Environment, Science, Technology and Innovation
MoFA	Ministry of Food and Agriculture
NCCAS	National Climate Change Adaptation Strategy
NGOs	Non-Governmental Organisations
OA	Organic Agriculture
PASS	Programme for Africa Seeds System
PHC	Population and Housing Census
SLWMP	Sustainable Land and Water Management Project
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WEMA	Water Efficient Maize for Africa
SSA	Sub-Sahara Africa
TNCs	Transnational Corporations

Abstract

Climate change adaptation is critical to achieving food production goals in Ghana. Using a political economy approach this study explores the ways in which the adoption of 'effective' climate change adaptation strategies by smallholder farmers is impeded in the West Mamprusi district of Ghana. I argue in this paper that farmers' adoption of agro-ecological and organic agricultural practices is fundamentally affected by the promotion of the use of hybrid seeds and chemical fertilizers as adaptation measures. This has implications for the preservation of local indigenous knowledge and practice since farmers are caught in a web of having to depend hybrid seeds and agro-chemicals every cropping season. It was also found that there exist several institutions including MDAs and NGOs which promote several adaptation programmes to farmers. The lack of collaboration amongst this institutions in the implementation of their programmes poses challenges to farmers' adoption levels.

Relevance to Development Studies

The adaptation of smallholder farming and food production systems to climate change has long term implications for food security and livelihoods in peasant societies. By exploring the ways in which farmers' adoption of effective climate adaptation strategies can be enhanced is critical to rural development. This paper thus makes a contribution the literature on climate change and food systems.

Keywords

Climate Change, Climate Smart Agriculture, Food Systems, Smallholders, Adaptation, Sub-Sahara Africa, Food security

Chapter 1

1.0 Background

1.1 Introduction

This study seeks to understand the ways in which the adoption of effective climate change adaptation strategies is impeded in Ghana especially amongst smallholder farmers, within the framework of existing several approaches being promoted by the government, NGOs and other international development agencies. I argue in this paper that farmers' adoption of agro-ecological and organic agricultural practices is fundamentally affected by the promotion of the use of hybrid seeds and chemical fertilizers as an adaptation measure. The study further examines the ways in which existing local indigenous knowledge systems are affected by certain adaptation strategies in SSA such as the use of hybrid seeds and agro-chemicals that are continuously backed and promoted by transnational agribusiness corporations (TNCs).

Climate change is generally a threat to agriculture and food security in the 21st century. As it has become a global concern, the effects of climate change are much more now a regional challenge especially for developing countries which suffer the most from the impacts of climate variability. According to Nellemann *et al.*, (2009) poor agriculture-reliant countries of Sub-Sahara Africa (SSA) are largely impacted due to ineffective coping and adaptation strategies. Farmers, particularly smallholder farmers in SSA countries, who are already in marginalized position, suffer yield losses through the impact of climate change which is increasingly being worsened by the actions of rich and advanced industrial countries. In most cases it is not just ineffective coping strategies, but rather uncoordinated adaptation programmes which are available to farmers in fragments and other impediments in the form of hybrid seeds which limit farmers' adaptive capacities. Climate variability and changes have a direct and often adverse influence on the quantity and quality of agricultural production.

The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report in 2007 emphasizes that climate system warming is unequivocal and this is obvious in observations in increases in global average air and temperatures and rising global average sea levels (IPCC Fourth Assessment Report, 2007). The report also mentions that apart from the variations in temperature increases, heavy rainfalls, severe droughts, cyclones, etc. can also be noticed.

Africa is one of the most vulnerable continents that is most hit and research shows how African countries continue to realize very low yields from agricultural production due to climate induced effects (Boko et al., 2007). 'Sub-Sahara Africa is considered to be the most vulnerable to climate variability, including flooding' (Armah, et al., 2011: 121). Peasants who account for the majority of food produced in African countries are the most susceptible to climate change. The vulnerability of smallholder farmers to climate change 'comes both from predominantly farmers located in the tropics, and from various socio-economic, demographic, and policy trends limiting their capacity to adapt to change' (Morton, 2007: 1).

Adaptation to climate change is already taking place but on a limited basis usually at the farm-level (Boko et al., 2007; Nhemachena and Hassan, 2007). Climate change adaptation has been a major concern in the agricultural sector of Ghana due to the fact that farmers are unable to cope with the climate variability, thus affecting livelihoods. Frequent flash floods and intermittent dry spells resulting from erratic rainfalls are affecting productivity. There is a call for sustainable and "smart" adaptation strategies (FAO, 2010) which include the use of sufficient weather information and relevant agricultural inputs such as improved seeds in the form of drought-resistant varieties as well as required quantities of fertilizers by smallholder farmers in other to adequately adapt to the varying climatic conditions. Smart adaptation practices offer best options for increasing agricultural productivity.

According to FAO (2013) estimates, by 2050, based on the current global consumption and food demands levels, agricultural production will have to increase up to 60% in order to meet our expected demands particularly in

SSA. And Climate Smart Agriculture (CSA) is posited as an alternative to achieving food security and agricultural development goals whiles also maintaining natural resource base under the current climatic challenges. CSA is now a new paradigm and seeks to integrate the attainment of improvement in incomes and agricultural productivity, building resilience to climate change and reducing greenhouse gas emissions (FAO, 2013). This has implications for agricultural policy and food production systems and for that matter climate change adaptation among smallholder farmers in SSA particularly in Ghana.

Agriculture in Ghana is predominantly smallholder in nature with about 90 percent of farm holdings being less than 2 hectares in size. In northern Ghana, these farmers are usually involved in the cultivation of staple grains including maize, rice, millet, sorghum, soybean, cowpea and groundnut, and also engage in the rearing of small ruminants such as sheep and goats (MoFA, 2010). The global seed and fertilizer industries are dominated by a few extremely powerful transnational agribusiness corporations which are seemingly represented in the push for New Green Revolution in Africa (ACB, 2014) as a way of realizing higher yields by farmers and attaining food sovereignty.

The Alliance for Green Revolution in Africa (AGRA), established in 2006 by the Bill and Melinda Gates and Rockefeller Foundations seeks to dramatically modernize agriculture in Africa (ACB, 2015; AGRA website). Proponents of AGRA argue that efforts to move the initial Green Revolution were impeded by the differentiated manner in which African agricultural production systems exist, and peasants' unwillingness to adopt inputs and technologies that are of high capital risk (ACB, 2014). Nonetheless, in reality and practically, smallholder faming systems are unique based on the different agro-ecological zones in SSA and have been producing food under such systems and practices over the years. Thus, the needs of farmers will equally vary in respect of food production and cultural norms which has long term implications for food production.

In as much as AGRA presents a far more different approach to Green Revolution in Africa as compared with previous approaches by the World Bank and other International development agencies, the high capital risk is still a challenge that will affect farmers' adoption decision making. The approach of AGRA is premised on the assumption that the agricultural production systems in Africa are far more 'traditional' and 'inferior' to the commercial-industrial agricultural models practiced in the advanced countries such as the US and other European countries. However, in the midst of this assumption, is this approach workable? The food production systems will continue to be traditional because about 95% of the farmers are uneducated farmers and therefore getting them to understand that the world is fast moving and there is the need to adopt certain technologies might not work for all. AGRA's advocacy for the use of hybrid seeds and more quantities of chemical fertilizers currently has been embraced by the governments and is in full swing of operation.

> *AGRA believes the remedy for this is to increase agricultural productivity through improvements in farming techniques, and the use of improved seeds and fertilizers. But this intervention will require money, or access to credit, and entry into markets before the system can succeed (ACB, 2014:26)*

Obviously, this belief offers opportunities to achieving food security, improvement in incomes of farmers and climate resilience which can be observed in the solutions pushed under CSA. The practices of CSA which are wholly embedded in the works of AGRA has political economic issues in respect of the cost components and benefits for smallholder farmers. For example, the climate smart solutions in the works of AGRA as seen in the implementation of its *Programme for Africa's Seed Systems (PASS)* which offer to provide improved high-yielding seeds resistant to drought and pests and diseases.

The FAO's concept of Climate Smart Agriculture (CSA) apparently is gaining recognition amongst strategies being promoted as a way of increasing food production amidst climate challenges. This is obvious in the quantum of financial resources that is invested by transnational corporations to sup-

port hybrid and improved seed varieties to farmers in both the global north and south as in the case of AGRA in African countries. CSA advocates for the use of genetically modified (GM) crops and carbon trading which do not represent taking into consideration the cultural and social conditions existing in the heterogeneous farming communities of SSA countries.

Climate smart strategies which are intended to benefit the wider population tends to privilege big commercial farmers and influential elites, while further marginalizing smallholder farmers (Action Aid, 2014). There is almost an obvious need to focus resources in the agricultural systems of SSA from both donor agencies and multilateral corporations. The various ways to approach this comes in different streams. La Via Campesina and other international peasant activists and movements on one hand are more worried about environmental consequences, and have always been in support of agricultural production systems that are environmentally friendly, maintains sustainability, 'social equity and democratic participation and decision making' (ACB, 2015: 6). On the other hand, are TNCs which advocate for same investments, market access and credit, but at the same time for the use of market products from these companies in the form of fertilizers, pesticides, hybrid seeds etc.

The impediments to the adoption of effective climate change adaptation strategies in Ghana is a worrying concern to both the government and its partners. Effective climate change adaptation strategies as used in this study are the organic agricultural systems and practices with combination of modern research that are compatible with smallholder farmers' own practices, less costly and ultimately maintains cultural and environmental sustainability to food production in smallholder farming communities. These are effective practices due to their ability to maintain resilience, agro-ecological balance, sustainability and are inexpensive for smallholder farmers. The institutional actors involve within the domain of climate change adaptation in Ghana will continuously push for their interests in the sector and thus promote varying adaptation approaches to farmers. The logic behind such strategies is driven either by the profit motive or accumulation logic among the various stakeholders with the assumption of helping farmers to raise

their production and income levels, and/or by making agriculture more "efficient" by increasing farm scale and turning some farmers into waged workers.

This paper is organized into six (6) chapters. The rest of this chapter details the problem statement, justification and relevance of the study, the main and specific objectives, and the research questions of the study. Chapter 2 presents the study area, research methodology and sources of data, and risks and ethical challenges. Literature review and conceptual framework and discussions are presented in chapter 3, and the findings are presented in chapters 4 and 5. Chapter 4 looks at the broader framing of climate change adaptation strategies in SSA and links with industrial agriculture globally. It highlights the roles played by TNCs in advanced countries towards climate change, and how these corporations in turn try to influence climate change policies in SSA through their financial investments in the promotion of the use of GM and hybrid seeds, fertilizers and other agro-chemicals. Chapter 5 presents the empirical findings from the study area, West Mamprusi district of Ghana. This looks at the social, political and economic dimensions as well as the institutional dynamics of multiple stakeholder governance of climate change adaptation in Ghana. A description of approaches of stakeholders and actors in climate change adaptation in Ghana, why different approaches, different participation of farmers in climate change programmes. I also discuss how the interplay of these multiple stakeholder governance poses challenges to the adoption of effective climate change strategies by farmers in the study area. The final part of this section discusses and details the various ways the promotion of 'smart' adaptation strategies pose a threat to the preservation of local indigenous knowledge systems of smallholder farmers in the study area. Chapter 6 presents the conclusion and a reflection on the way forward.

1.2 Problem Statement

Agricultural production in Ghana, especially the northern region of Ghana, is largely weather dependent with smallholder farmers being the most af-

fected since they depend largely on rainfall for their agricultural activities and production. In a cropping season, the region experiences prolonged periods of dry spells as well as erratic and insufficient rainfall for crop production and other farming activities, thus shortage of water increasing the risk of food crop failure.

As a result of the politics and socio-economic differences, unequal incomes and wealth of individuals in the society, climate change affects peasants in different ways. Climate change adaptation strategies which recognize the importance of the differences in capacities amongst smallholder farmers in maintaining sustainable food systems, in which not everyone is affected equally is key to successful adaptation to climate change in the agricultural sector in Ghana.

However, proposed and recommended adaptation initiatives from government institutions and other actors (NGOs and donor agencies such as USAID, DFID, etc.) are dominated by the use of hybrid seeds and chemical fertilizers for farmers which have implications for local indigenous seed varieties and put smallholder farmers out of business due to rising seed and fertilizer costs. This poses barriers to participation in such smart agricultural programmes. Also, these initiatives and other efforts are uncoordinated and are available to farmers in fragments which impedes the adoption of the technologies being offered to farmers and are impediments to farmers realizing other more local indigenous effective and sustainable strategies.

This is problematic because the politics around this policy seems one way. On one hand, this programme seems to privilege big commercial farmers and other influential farmers who can access these inputs to the detriment of smallholder farmers who either lack the capacity to participate in such programmes, or unable to pay for the costs of seeds and fertilizers. On the other hand also, this arguably seems to continuously enhance private capital accumulation for both local private companies and transnational agribusiness corporations, whiles also wiping out indigenous seed varieties a very reliable mechanism smallholder farmers have always used to acquire seeds for planting from generation to generation. This leads to commodification of

subsistence where largely self-sufficient peasants come to rely on the market for their means of reproduction (Bernstein, 2010: 65) in the form of seeds and other inputs.

In the light of this, the study seeks to examine and understand the impediments to the adoption of effective climate change adaptation strategies in the agricultural sector of Ghana using West Mamprusi district in rural northern Ghana as a case.

1.3 Justification and Relevance of the Study

This study will reveal the various barriers to participate in climate change programmes by smallholder farmers and the implications for sustainable food production systems in West Mamprusi district of Ghana. It is essential to understand smallholder farmers as a group of farmers in marginalized positions and normally do not get the best out of government policies and strategies meant to support them. Influential commercial farmers end up benefiting from most government programmes.

This study will examine the challenges of the interplay of institutional dynamics and multi-stakeholder governance in climate change adaptation strategies and how this affects the adoption of agricultural technologies in the study area. It will also explore the options of who determines climate change adaptation strategies, what they are, who they are meant for and who actually benefits in the midst of the existing policy environment. In that regard, it will offer alternative ways of incorporating local indigenous knowledge of farmers into formulating sustainable and practical climate change adaptation strategies for the agricultural sector in Ghana. The study will also explore the interplay between government and local private and transnational agribusiness corporations in contributing to further marginalization of farmers whiles enhancing private agribusiness expansion and capital accumulation. It will also contribute to the body of literature in understanding and analyzing issues of climate change in peasant communities. It is envisaged that this study will provide a more in-depth understanding of

climate related stresses on livelihoods of smallholder farmers in particular in developing countries especially in SSA.

1.4 Main Objective:

To examine and understand the impediments to adoption of 'effective' climate change adaptation strategies in West Mamprusi district of Ghana

Specific Objectives

1. To identify who defines climate change adaptation strategies in Ghana and what they are;
2. To explore who (government, TNCs or smallholder farmers) benefits from adaptation strategies
3. To examine to an extent how government-sponsored climate change adaptation programs are exclusionary across class, gender, ethnicity and age.
4. To explore the challenges to adoption of effective climate change adaptation strategies
5. To explore the ways in which government-sponsored climate change adaptation strategies conflict with local indigenous knowledge systems and practice

1.5 Main Question

What are the impediments to adoption of 'effective' climate change adaptation strategies in West Mamprusi district of Ghana?

Sub-questions

1. Who defines climate change adaptation strategies in the agricultural sector?
    a. What are they?
2. Who profits from climate adaptation strategies?

    a. Does profit accumulate with the government? With transnational agribusiness firms? Or with domestic agribusiness firms?
    b. What do those who profit do with the profit?
3. Are government-sponsored climate change adaptation programs exclusionary/ different, and on what grounds?
    a. Income (socio-economic status) or class?
    b. Gender?
    c. Ethnicity?
    d. Age?
4. What are the challenges to adopting these strategies by farmers?
5. In what ways do government-sponsored climate change adaptation strategies conflict with local indigenous knowledge and practice?
    a. Do these strategies displace indigenous knowledge and practice?

Chapter 2

2.0 Study Area, Research Methodology and Sources of Data

2.1 Introduction

This chapter provides information on the West Mamprusi district of the northern region of Ghana, the study area of this research, and the research methodology and sources of data. An elaborate understanding of the study area is very useful to conduct a more informed and engaged analysis. I briefly discuss the location, people, agriculture as well as the research methodology and sources of data. It also discusses the risks and ethical challenges encountered during the study.

2.2 Study Area

2.2.1 Location

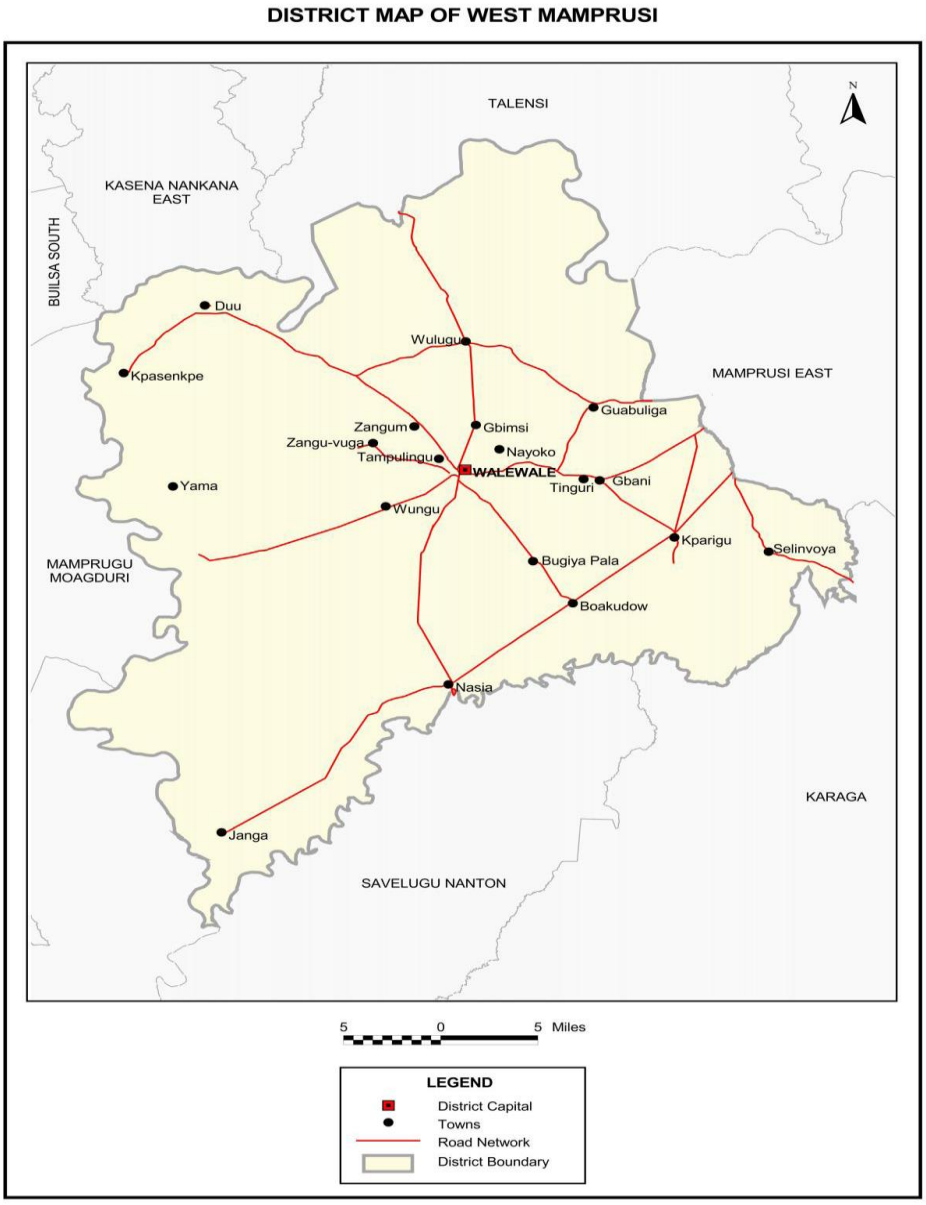
The West Mamprusi district is one of the twenty-six districts in the northern region of Ghana with Walewale as the district capital along the Tamale-Bolgatanga trunk road. It is located approximately within longitudes 0°35'W and 1°45'W and Latitude 9°55'N and 10°35'N. The district has a land area of 5,013 km² which accommodates 121,117 people representing 4.9% of the region's total population in the region (GSS, 2014) according to the 2010 Population and Housing Census (PHC). Its boundaries are shared with a number of other districts and two regions (Upper east and west regions of Ghana). Other districts it shares boundaries with are the East Mamprusi and Gushegu, Districts to the East, the West Gonja, Karaga, and Savelugu-Nanton districts to the south, Builsa, Kassena-Nankana and Talensi/Nabdam districts to the north and Sissala and Wa East districts to the West. The study communities, Tiguri and Kparigu are easily accessible with either trucks on the Walewale market days or with hired motorbikes on any other day. The roads become difficult to use during the rainy season. Below is a Map of the study district with the study communities: Tinguri and Kparigu.

Map 2.1: Map of Ghana

Map 2.2: Map of Northern Region

Source: liveworklearnbrianinghana.wordpress.com

Map 2.3: District Map of West Mamprusi



Source: Ghana Statistical Service, GIS

2.2.2 The People

The main ethnic group of the people in the West Mamprusi district are mainly Mamprusis with a few Frafras and Dagombas. The Frafras are the ethnic groups migrated from Bolgatanga and Tamale respectively and are now settlers in the area. They are predominantly subsistence farmers with a few who sell their little surplus at the Walewale Market. According to the 2010 Population and Housing Census, more than 6 in every 10 people live in the rural areas of the district. The population of the district is 121,117 people representing 4.9% of the region's total population with 49.2% males and females representing 50.8% (GSS, 2014). The household size of the district is 8.4% with children constituting the largest proportion of the household structure. Islamic religion dominates all other religions in the district with about 79.4% whiles Christianity and Traditional religions constituting 15.6% and 3.7% respectively (GSS, 2014).

2.2.3 Agriculture

Agriculture constitutes the largest occupation of the rural settlements in the district and they are predominantly engaged in subsistence agricultural production. About 85% of the households in the district are engaged in agriculture (GSS, 2014). Most of the people are engaged in crop farming with a few involve with livestock rearing and fisheries. Sheep, goats, chicken and cattle are the dominant animals reared in the district.

There is a single rainy season in the district that starts with relatively little towards the end of April. The maximum rainfall of the area falls around July-August and reduces an end in October-November. However, as a result climatic variability resulting from climate change and its effects, sometimes one could count the number of rainy days in a year. According to reports form the district administration, the area experiences occasional storms, which have implications for base soil erosion depending on its frequency and intensity especially when they occur at the end of the dry season.

2.3 Research Methodology and Sources of Data

This section looks at and discusses the methods, techniques and sources of data collection employed in the study. The research used primary data gathered within four weeks, from 5th August to 4th September, 2015 as well as reports, policy documents from government Ministries, Departments and Agencies (MDAs) and NGOs, and academic literature. Senior level staff of the Ministry of Food and Agriculture (MoFA), the Environmental Protection Agency (EPA), The Forestry Commission (FC) were purposively selected for the study. The MoFA was selected because it has the mandate of ensuring food security and nutrition in Ghana as well as sustainable agricultural production especially in pro-poor communities. It engages in the implementation of a number of projects that seek to promote climate change adaptation strategies to farmers in Ghana, especially in the northern region. The EPA under the auspices of the Ministry of Environment, Science, Technology and Innovation (MESTI) is the lead agency that oversaw the preparation of the National Climate Change Adaptation Strategy (NCCAS) in the country and also currently implement a few projects which seek to promote climate change adaptation strategies to farmers. The FC is the lead institution tasked with the responsibility of protecting forests and forests products of the country. These two agencies work hand-in-hand to ensure sound environmental management and the maintenance of tree cover and vegetation in the country. Snowball method was used to select Farmers in Tinguri and Kparigu communities in the West Mamprusi district. This method was useful in identifying farmers who have participated/participating various climate change programmes. All these communities have participated or are participating in various climate change adaptation programmes being implemented by MoFA, EPA and other NGOs operating in the area.

To ensure that triangulation is adequately catered for, a lot of techniques were used to collect data for this study. Observation was used to obtain first-hand information of areas being cultivated by farmers, crops grown, and the rainfall pattern of the study area and number of rainy days. This method was

very essential, as O'Leary (2009) indicated, for obtaining a sense of reality and validating information gathered from other sources.

Two separate focus group discussions (FGDs) were conducted with farmers in each of the two communities. In Tinguri, the discussions were held with seven-member groups consisting of men and six-member group consisting of women. This was in line with the usual practice of organizing meetings in these areas that are predominantly Muslim communities. However, in Kparigu, each of the two member focus group discussions consisted of both women and men because the men did not have a problem of mixing with the women. Essentially, this technique was very useful in Tinguri to avoid the influence of male dominance on women's contribution in discussions involving both sex and gathering information from women especially in respect of how their income from sale of small ruminants is used or can be used in the household.

The challenge encountered in using this method was language barrier because I do not speak Mampruli, the main language spoken in the study area. I made use of a senior high school student who was on vacation in the summer as an interpreter in FGDs. One main challenge possibly compromised the richness of data gathered through this method is that some of the information could have been lost in the process of translation. However, since this method is very useful for the study, use of interpreters was inevitable. The use of the student who is a native from the community and known to the farmers helped to dig more to avoid withholding information from the researcher, who otherwise might have been seen as an outsider.

An open-ended questionnaire was also used to gather data from individual farm households during interviews with individual farmers. During interviews with individual farmers I was able to elicit information about personal incomes of farmers which they were hesitant to talk about during the FGD sessions. This technique was very useful collecting very relevant information which the other techniques described above could not appropriately capture. Also, the technique was used to collect some relevant information which the researcher did not originally envisage.

Secondary sources constitute an essential part of the research. These include reports, agricultural policy documents, climate change adaptation policy and strategic documents, articles and books. These sources are especially important because most information about implementation of climate change adaptation strategies in these area are in the form of reports. The challenge in using project reports as the main source of data is that these are subject to censorship due to power relations between researchers and organizations which commission studies into the production of such documents (O'Laughlin 1998). The use of academic literature and primary sources were very critical in minimizing this challenge. The data was analyzed qualitatively, using the conceptual framework outlined in chapter 3.

2.4 Risks and Ethical Challenges

This section briefly describes the risks and ethical challenges faced in the study.

It was a challenge getting government and ministry officials especially the Ministry of Food and Agriculture has a lot of bureaucracies. I had to write letters officially to the director before they allowed officers to respond to my questions. Having this in mind, I worked in advance to ensure I met all their obligations which allowed me to get the information required.

I have worked with farmers in the region before coming for my studies and one key challenge I envisaged before going to do the fieldwork was the fact that mostly farmers only agree to discuss issues about their farming activities when they perceived that they stood to gain something immediate. Having this in mind, I ensured that I worked closely with Agricultural Extension Agents (AEAs) in the operational areas where the study was carried out and I will say they helped me in getting past this challenge.

The study district is 105 kilometers away from the regional capital, where I live. Travelling to the communities to collect data was be a challenging task in terms of transportation especially to farming communities. However, in

some communities where people rent motorbikes used to commute between the district capital and the communities.

The period of data collection took place during the summer, which was the peak of the farming season in the study area and there was a difficulty in getting some farmers especially farmers who participate in climate change adaptation programmes. I found a way to work around these challenges.

Chapter 3

3.0 Literature Review and Conceptual Framework

3.1 Introduction

This research seeks to understand the ways in which the adoption of effective climate change adaptation strategies is impeded in Ghana in the midst of several mechanisms being promoted by the government, NGOs and other international development agencies. Particularly, it explores the ways in which the promotion of hybrid seeds to farmers as 'smart' (FAO, 2013) adaptation strategies impedes their level of adoption. To understand this topic and the issues at hand and subsequent emerging issues, it is very essential to provide a framework that will guide in the analysis of the emerging issues in the study vis-à-vis the empirical evidence. This section defines and discusses the key concepts and debates in the literature. These include Climate Smart Agriculture, Organic Agriculture and Climate Change, Corporate Improved Seeds and Intellectual Property Rights and lastly, Local Indigenous Knowledge and Climate Change. These concepts are used as analytical lens to enhance my analysis and understanding of the issues emerging from the study.

3.2 Climate Smart Agriculture

The effects of climate change on agricultural systems especially that of Sub Saharan African (SSA) countries are far more enormous. It is anticipated that crop yields, especially cereal crops such as maize and millet will be affected negatively (IPCC 5th Assessment Report). There is a worrying concern amongst governments as to the best strategies to adopt whiles also enhancing ecological sustainability and balance. The FAO's concept of Climate Smart Agriculture (CSA) emerges as an alternative to increasing food production in African countries to feed the rowing population.

CSA as a concept first emerged in the works of the United Nations Food and Agriculture Organisation (UNFAO) in 2010 at the Hague conference on agriculture, food security and climate change. CSA as defined by FAO encompasses all the three dimensions of sustainable development, i.e. economic, social and environmental dimensions by focusing on climate variability and food security. Essentially, the most critical aspects that are worth emphasising are its potential for the maintenance of sustainability and resilience of production systems. The original definition as used by FAO encompasses three main pillars built around achieving food security, adaptation and mitigation. It is defined as:

> *Sustainably increasing agricultural productivity and incomes (food security), adapting and building resilience to climate change (adaptation), reducing or removing greenhouse gases emissions (mitigation), and enhances achievement of national food security and development goals* (FAO, 2010; 2013).

However, the most important dimensions of sustainable development widely captured in the definition of CSA are very essential to improving food security, help communities to adapt their agricultural production systems to climate challenges. By adopting the necessary and appropriate practices communities will in a way be contributing to mitigation of climate change. Interestingly, by this definition, how will the adoption of CSA by smallholder farmer help in the mitigation of climate change? The responsibility of mitigation should not be pushed to smallholder farmers because they contribute less to global climate challenges. The responsibility to cut down emissions in GHGs is expected to be the burden of advanced countries and TNCs.

The proponents of CSA are the FAO (lead promoter), AGRA and the CGIAR and this is observed the works of these institutions. FAO (2013) highlighted six CSA success stories from Africa, which integrated biodiversity and gender issues in their implementation. Nevertheless, these successes may be limited to a few locations that do not have a wider coverage as far as smallholder beneficiaries are concern. Thus, generalization of such successes for wider locations can be problematic.

As emphasized in the Consultative Group for International Agricultural Research (CGIAR) working paper 2014 'CSA practices and technologies include a variety of integrated options that build on the diversity Africa's farming systems and fisheries. These integrated options include agro-ecological approaches, sustainable natural resource management, and ecosystem management that are central to climate change adaptation' (Nyasimi *et al*, 2014: 8). The authors argue for CSA by showcasing the capacity of successful CSA practices to increase productivity and build resilience of smallholder farmers. Amongst these successful practices and cases conducted in Ghana are *the drought tolerant maize case and the programme for Africa seeds system.* The drought tolerant maize practices in Ghana were to increase crop resilience to drought and increase crop productivity. Also, Cooper et al (2013) identified 16 successful agricultural adaptation and mitigation cases, half of which were from Africa, and presents evidence of large-scale initiatives that can achieve the triple win scenario.

Amongst the plethora of solutions to solving Africa's food security and climate challenges, CSA is rated amongst the false solutions by the Alliance for Food Sovereignty in Africa (AFSA) and the African Centre for Biodiversity (ACB). These organisations are skeptical about the ability of CSA to offer the opportunities of adapting to climate change without consequences for the environment. Further, CSA advocates for the use of genetically modified (GM) crops and carbon trading which do not represent taking into consideration the cultural and social conditions existing in the heterogeneous farming communities of SSA countries. Worryingly, if smallholder farming communities exist in different agro-ecological conditions, how then will it be possible to assume certain measures will work for all these different conditions?

The FAO as the main proponent of CSA and some of the key players in the CSA movement have consistently demonstrated successful cases of CSA projects and programmes, some in African and Asian countries. (CGIAR, 2013). The formation of the Global Alliance on CSA, which is led by the

governments of the Netherlands and United States of America (USA) with the World Bank, FAO and the CGIAR further reinforces the importance attached to the new paradigm to limiting climate induce stresses in the agricultural production systems of smallholder farmers in SSA. This also led to some governments in Africa such South Africa to adopting and giving its blessings to this initiative (ACB, 2015). One reason for this might be as a result of the accompanying financial grants and supports for investments in other areas other than agriculture or environment. Be it as it may, this initiative with the support of the US, which largely dominates the global seed and fertilizer industry with its major transnational agribusiness companies will continue to push for the interest of these companies.

Although the principles of CSA are firmly in cognizance of environmental sustainability and smallholder farming systems resilience, 'CSA is firmly rooted within a Green Revolution paradigm in which privately owned technologies promoted by agribusiness are accepted uncritically' (ACB, 2015: 6). This also gives rights to powerful corporations in the global north to be able to buy more rights to pollute to continue to pollute with the free market carbon trading system. For example, the highest bidder can buy more rights on the carbon market which allows him to continue to release as much pollutants into the atmosphere. The power relations which exist here will go a long way to further increase the burden on the vulnerable smallholder farmers in the global south whiles allowing big transnational agribusiness corporations to increase their profit.

Due to these reasons, and the full participation and involvement of the giant agribusiness corporations in the promotion of CSA most Civil Society organisations and other NGOs stand against the Global Alliance and the principles of CSA in the global north. This strand of proposition argues that since it is obvious by the involvement of these corporations such as Yara and Monsanto in the promotion of CSA principles, there is a hidden interest of these resourceful corporations under the disguise of using CSA to promote unsustainable and environmentally damaging practices. Also, the

smallholder farmers who are rather the less contributors of climate change and consistently receiving the burden of climate variability are made to hold the responsibility of climate change mitigation. This leaves out the big companies to continue making and re-investing their profit without having to worry about the burden of mitigation.

Furthermore, in various discourses, CSA is gaining grounds in the works of influential bodies, notably amongst them is The Alliance for Green Revolution (AGRA) currently implementing a number of activities in SSA countries. In its African Agriculture status report for 2014, AGRA devotes a whole chapter (3) to discussing CSA for food security and resilience in SSA. It details the origin of CSA and provides a synthesis of its current state of adoption and the challenges in SSA (AGRA, 2014). Since its conception, CSA has been expanded to include building resilience for communities to be able to cope with climate change and be able to realize good yields in their agricultural production.

The key practices which underpin the concept of CSA which AGRA emphasized amongst others include ecosystem approach to water resources, agroforestry, restoring degraded lands, conservation of local indigenous practices and knowledge systems, best management of animal residue, strengthening women's capacity for climate smart practices, intercropping, conservation agricultural practices, integrated crop-animal production systems, early warning systems amongst others (AGRA, 2014: 79). These practices are expected to build resilience of smallholder farming systems, increase agricultural productivity within the current emission levels, facilitate sustainable management of agricultural and natural resources amongst other benefits. Scaling-up of CSA practices and technologies has been a challenge if not the main one in successful climate change adaptation in SSA. SSA countries tend to depend largely on donor supports to scale-up programmes to larger smallholder farmer target group because governments do not have enough internally generated financial resources to do that.

3.3 Organic Agriculture under Climate Change

Climate change as defined by the United Nations Framework Convention on Climate Change (UNFCCC, 1992: 7) 'means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'. This definition differs from the usage of climate change in the third assessment report (2001) of the Intergovernmental Panel on Climate Change which defines climate change as change in climate over time, due to whether natural variability or human activity. These changes in climate and variability which is a global concern has especially now become a regional challenge for developing countries in Africa and Asia.

Sub-Saharan African countries which suffer the most specifically in the agricultural sector where there is estimated decline in yield of farm household production however, rather contributes insignificantly to the phenomenon of climate change as compared to northern developed countries which contribute huge significant emissions of Green House Gases (GHG) into the atmosphere. Organic agriculture offers reliable opportunities for the maintenance of biodiversity and food system resilience in Africa.

Organic agriculture as defined by The Codex Alimentarius Commission (2001) as cited by Borron (2006) includes:

> *Organic agriculture is a holistic production management system which promotes and enhances agroecosystems health including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, cultural, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system* (Borron, 2006:6)

This definition includes the important elements that OA seeks to encompass as far as applying its principles and practices are concerned. Nonetheless, OA brings together the efforts of smallholder farmers into sustainable man-

agement of soils, carbon sequestration, limited GHG emissions and the use of local inputs. Farmers do not have to worry about the cost of using chemical fertilizers and pesticides which increase the loss of biodiversity as in industrial agriculture. Scialabba & Müller-Lindenlauf (2010) argue that organic agricultural systems have the potential for climate change adaptation and mitigation in smallholder communities and could enhance agricultural productivity drastically.

They indicate that apart from its capacity for carbon sequestration in the soils, for the case of adaptation OA could build the resilience of food production systems during uncertainties through farm diversification and organic manure in building soil fertility (Scialabba & Müller-Lindenlauf, 2010). Since this system of farming requires less external inputs, what is fundamentally required of farmers to adequately reap the benefits under climate challenges is their efforts to work on their farms. Borron (2006) also argues that though organic agriculture is often ignored in the discourse of climate change mitigation, it offers good opportunities for adapting food systems to climate change. In this regard, OA is essential in developing and maintaining resiliency in the production of food and maintenance of ecological balance. Thus, the low cost of these farming system makes its implementation much easier amongst smallholder farmers. The purchase of external seeds will be eliminated allowing farmers the opportunity to save the little money for other household expenses like health care and children's education fees.

3.4 Corporate Improved Seeds and Intellectual Property Rights

Susan K. Sell (2009: 187) indicates that 'seeds are at the center of complex political dynamic between stakeholders. Access to seeds concerns the balance between private rights and public obligations, private ownership and the public domain, and commercial versus humanitarian objectives'. TNCs such as Monsanto and Yara have over the years succeeded in registering to their name the intellectual property governance of hybrid seeds and agrochemicals. This gives these TNCs sole rights and patent to utilize these

seeds as well as their reproduction and sale. This gives the powerful players an advantage to control the market with their product and determine how far this should go (Susan, 2009).

The push for the "new" Green revolution in Africa as a sustainable way of ensuring food production and elimination of hunger, especially among smallholder farmers has gained grounds amongst SSA countries and there is optimism that this will enhance Africa's self-sufficiency in food production (Sanchez, 2009), thus ensuring food security and enhancing smallholder farm household incomes. This is largely due to support to smallholder farmers in SSA from both national and international policy frameworks. Its consolidation is seen in policy frameworks of governments for their respective agricultural sectors as enshrined in declarations of which they made commitments to.

For the past two decades powerful philanthropic donors have argued that the market-based instruments would be enough to enhance agricultural transformation in Africa (Sanchez, 2009). This strand of argument is seeing a shift towards a new policy paradigm which calls for African governments, civil society, donors and the private sector to form partnerships and synergize efforts towards the uptake of improved agricultural practices at a national and local scales. This is seen in substantial investment being made by multinational agribusiness corporations towards seed improvements and private-sector and public delivery systems (Scoones and Thompson, 2011). The political economy of this policy agenda is very essential to ensuring that the local people really gain the benefits of the programmes to be implemented within their communities. In the midst of these policy frameworks, the questions of who wins, who loses and whose interests are being served are critical to ensuring that policies take into consideration the local diverse needs and diverse ecological conditions within peasant societies.

The Alliance for Green Revolution in Africa which is consistently advocating for the use of drought-resistant seed varieties and chemical fertilizers by peasants as climate change adaptation strategy is seen as conspicuous way of pushing the neoliberal order of the World Bank and its allies, thus pro-

moting private property and market-led profit accumulation for transnational agribusiness corporations. The global food system has now become an integrated system which in one way or the other affects all areas and regions of the world (Clapp and Fuchs, 2009). Transnational agribusiness corporations are dominant key actors in shaping the global agri-food systems; ranging from influence in development of policies for agricultural transformation and development to trade and market-based policy dimensions.

As this paradigm exist today, the domination of transnational corporations (TNCs) in agri-food systems, it is imperative to be weary of this fundamental change in our food production systems and its implications for food production globally, especially ecological consequences in the global south (Clapp and Fuchs, 2009). This is increasingly becoming a worrying concern since TNCs have the sole patent rights to certain inputs such as hybrid seeds, synthetic fertilizers, herbicides, pesticides, etc. Kloppenburg (2005) also discusses how capital has come to dominate plant breeding and seed production market 'to the extent that it does demands attention to broad social dynamics as much as to the technical rationale behind the development of specific scientific techniques or technologies' (Kloppenburg, 2005: 8). The fundamental issues emerging will involve the separation of peasants from their means of production and the disposed peasant to a commodity relation.

TNCs with sole patent rights of producing improved seed varieties through biotechnology and genetic engineering processes focuses on releasing their seeds to the developing world through market-led transactions. This reinforces their legitimacy to continue to sell their seeds and convince vulnerable countries to get trapped in the use these seeds whiles creating market for these corporations. As dominant actors and players in the global food system they consistently play major role in the formation of rules, norms and institutions that govern our food production systems (Clapp and Fuchs, 2009). TNCs have exercised the power to do this in many regards, ranging from influencing structural agricultural and trade policies globally. The interaction between state-based and private partnerships are not left out. Scoones and Thompson (2011: 7) indicates that 'in the process, networks,

institutions and wider agrarian politics are reconfigured. This political process therefore defines particular pathways for the future, while blocking others. Whether intentional or not, the result is the shaping of particular agrarian futures in ways that have important political economic implications'. This has a lot of implications for agrarian and food production systems especially in SSA.

The informal sector dominates the seed supply system in SSA. Scoones and Thompson (2011: 8) defines 'seed system' as 'the sum of physical, organisational and institutional components, their actions and interactions that determine seed supply and use, in quantitative and qualitative terms, and include formal, informal and seed aid elements'. Local seed markets in peasant communities have been vital for sustainable local economic and agri-food system and the preservation of seed lines that do well in site-specific locations. Thus, for effective adaptation strategies, smallholder farmers need to play a key role in adaptation planning and for seeds which have the potential to do well in local conditions. In recent times however, the use of improved and hybrid seed varieties has an accompanying requirement for the use of huge quantities of fertilizers.

This has become very challenging for the landless farmers and peasants of low socio-economic status to access these inputs especially all year round judging by their low financial status. In most cases the few who are able to access these seeds are ensnared in a web of the purchase because they cannot save from them and use for planting the next season since they are hybrid seeds. Thus, 'recognising the importance and potentials of informal systems is essential to Africa's agricultural future and a narrow focus on the formal system to drive a new Green Revolution in the region may mean missing out on the largest, most vibrant area of technological development and potential transformation' (Scoones and Thompson, 2011: 8). The use of these biotechnology seeds further limit the productive capacities of smallholder farmers whiles also accruing profit for big transnational agribusiness firms.

3.5 Local Indigenous knowledge and Climate Change

The term 'indigenous' has been used to refer to a particular group of people who are of similar ancestral lines, 'collective cultural configurations' and historical location. More broadly, Purcell (1998: 260) defines indigenous knowledge as 'the body of historically constituted (emic) knowledge instrumental in the long-term adaptation of human groups to the biophysical environment'. Agrawal (2002) also indicates that the concept of indigenous knowledge is a type of "dividing practice" which over-writes a history of interaction and contestation. A group of people with a common shared system of norms and accepted values, and co-exist from one generation to the other.

Local peasants or indigenous people often live in economically marginal areas where their livelihoods are largely dependent on natural resources which is impacted by climate stresses and variability. 'Their livelihoods depend on natural resources that are directly affected by climate change, and they often inhabit economically and politically marginal areas in diverse, but fragile ecosystems' (Salick and Byg, 2007: 4). Peasants have a deeper knowledge of their immediate environment in so many ways which they have inherited from generation to generation and thus active roles in their ecosystems and ultimately help to enhance the resilience of their ecosystems.

This is often neglected in policy frameworks meant for supporting peasant farm household production systems in combating climate change and enhancing resilience of food production systems. However, effective adaptation of the agro-ecological systems of peasants to climate change is very much dependent on their local indigenous knowledge and the ability of the scientific community and policy makers to combine these with scientific knowledge systems in order to be able to reduce their vulnerability.

Nyong *et al.,* (2007: 787) emphasized that 'incorporating indigenous knowledge can add value to the development of sustainable climate change

mitigation and adaptation strategies that are rich in local content, and planned in conjunction with local people'. Peasants often have localized understanding and explanations of the changes in the climate in ways outsiders perceive. Their capacities to cope with it is equally differentiated amongst the peasants. Peasants who own and have access to productive resources such as land and capital to purchase inputs have the capacity to cope with climate stresses than small peasants who do not have access to these resources. They sell their labour power on other people's land to earn a living. In times where there is crop failure they have to engage in other coping strategies to survive and be able to cater for their families. Thus, farmers' existing knowledge systems and practices help in designing better adaptation strategies well suited for local ecological systems.

The use of hybrid seeds affects peasants in a lot of ways. There is reduction and complete elimination of seed lines from which farmers in the past saved seeds and kept for sowing in the next season. The value of indigenous knowledge has thus received little but a growing attention in incorporating with modern knowledge (Nyong *et al.*, 2007; Biodiversity, 2009). This has implications for food production in SSA where a lot of imposed improved and hybrid seeds are dumped.

Engaging with the issue in a multifaceted approach and being conscious of all these will to a large extent enhance adaptation strategies for local peasants. 'Most of the adaptation strategies devised by farmers fitted with their perceptions of the problem of climate change and its impacts on dimensions of their farm operations and other livelihoods' (Yaro, 2013: 1267). It is very important to see local indigenous knowledge and the continuous use of hybrid seeds conflict with these knowledge systems and changes as contingent in formulating the sustainable adaptation strategies for peasants.

Chapter 4

4.0 Climate Change Adaptation and Global Industrial Agriculture

> *Industrial agriculture is a dead end. It claims to have raised yields in places but it has done so at great cost, with extensive soil damage, huge biodiversity loss and negative impacts on nutrition, food sovereignty and natural resources* (AFSA, 2015)

4.1 Introduction

Climate change is definitely a threat to global food production systems particularly that of SSA countries. African farmers particularly smallholder farmers are the most hit in terms of the effects and impacts of climate variability. Arguably, farmers in these regions are burden with the responsibility of mitigation. The role of all stakeholders in the agricultural sector in SSA at the local, national and international levels is key to identifying sustainable and practical adaptation strategies and technologies for farmers to adopt. This chapter discusses the framing of climate change adaptation strategies in SSA and links with industrial agriculture. It highlights the roles played by TNCs in advanced countries towards climate change, and how these corporations in turn try to influence climate change policies in SSA through their financial investments in the promotion of hybrid seeds, fertilizers and other agro-chemicals.

4.2 Climate Change and Global Food Production

Arguably, all countries continue to advance economic growth, infrastructural expansion through industrialisation. This move is to improve the welfare of the people and enhance sustainable economic development. However, this situation continuously raises environmental and ecological concerns which has implications for the future of the planet. Huge emissions such as methane and Greenhouse Gases (GHG) from industrial agriculture are continuously released into the atmosphere which increasingly deplete the ozone

layer creating global warming. This further alters the climate in the form of rising temperatures and sea levels. The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report in 2007 emphasizes that climate system warming is unequivocal and this is obvious in observations in increases in global average air and temperatures and rising global average sea levels (IPCC Fourth Assessment Report, 2007).

Despite calls for commitments from advanced countries to cut down emissions by adopting sustainable renewable energy sources, this call is yet to make enormous impact in GHG emissions reduction. The varied and unequal distribution of the effects and impact of climate on all countries is a worrying trend for all especially international development agencies. SSA countries which contribute less in terms of GHG emissions rather have their agricultural production systems affected the most by climate change due to low capital investments in adaptation by their governments. There is the need for SSA countries to identify ways of developing adaptation strategies that make them suitable for local conditions to be able to enhance resilience of their food production systems whiles also maintaining ecological balance. This will ensure a sustainable food secure future for the growing population of Africa and the world at large.

On the other hand however, global human population is increasingly expanding, and the United Nations (UN) projects that the global population is expected to reach 9.7 billion people by 2050. Overcoming the challenge of feeding everyone in the midst of climate challenges is still far-reaching. Especially for least developed countries with little resources to be able to overcome this recurring climatic challenges and enhance food production systems. Many proponents see plant biotechnology as the solution to Africa's current food crisis and overcoming climatic challenges. This however has been successful in the advanced world where food production systems is controlled by improved seed varieties and technologies from TNCs is mainly used. This has improved food production systems and the availability of food. This is still a concern for SSA and critiques of Monsanto and the likes.

To be able to achieve self-sufficiency in food production and adapt Africa's agro-ecological systems to climate change, in order to transform agricultural production into modernized food systems, there is call for adaptation to climate change with proposed effective strategies to agricultural production that will increase yield and at the same time limiting GHG emissions from industrial agriculture.

These adaptation strategies come in the form of promotion of the use of hybrid seed varieties and Genetically Modified (GM) seeds with their accompanying synthetic fertilizers. Giant TNCs such as Monsanto, Syngenta and Yara which control the seed and fertilizer market globally disguisedly make investments in the form of aid and Corporate Social Responsibility (CSR) to SSA countries in the name of modernizing Africa's agricultural systems to ensure food security. Examples of such gestures are the Water Efficient Maize for Africa (WEMA) and the GM drought-tolerant Maize programmes funded by Monsanto (ACB, 2015) and the Smallholder Programme (SHP), also an initiative of Monsanto (Glover, 2007).

These TNCs especially Monsanto controls the global seed market and as a profit oriented corporation they are looking to increase their annual turnovers instead of the aim of assisting smallholder farmers to adapt their agricultural systems to climate change. This further explains the penetration of capital into agricultural production systems to try to dominate and control by way of separating farmers from their means of production (Kloppenburg, 2005) and getting them ensnared in a web of having to always go back and purchase seeds from TNCs. The processes of accumulation by TNCs is driven by their quest to reinvest profits back into the production system and focusing on market development for their product. It is thus essential to consider the tradeoffs in the solutions being promoted by these corporations to farmers and weigh which strategies offer a sustainable future. There are certainly alternative options to choose by smallholder farmers especially in SSA.

Despite the fact that supporters of the use of GM crops and hybrid seeds see it as a solution to Africa's food challenge continue to promote these

measures, there are indeed better practices amongst them in relation to enhancing the agricultural production of smallholder farmers that are worth adopting. Uzogara (2000) discussed that the use of hybrid seeds has the potential of improving the quality and nutritional value as well as increase the availability of variety of foods for human consumption, and waste management. There has been also advocates for smallholder farmers to incorporate organic farming alongside the use of these hybrid seeds. This is believed to also allow farmers the opportunity to weigh in which technologies stand to offer better yields. In as much as the promotion of hybrid seeds is likely to give higher yield to farmers, environmental concerns and the cost of the accompanying inputs is a barrier to smallholder farmers. Smallholder farmers produce purposely for subsistence and also to sell the remaining little surplus in the market for other family needs. They lack the financial capacity to purchase the necessary accompanying inputs that will allow them to realize the required yield of these improved seeds. Thus, the future of sustainable food systems is still far-reaching.

4.3 The Dilemma of Food Security under Climate Change

The promotion of hybrid seeds and GM crops by TNCs in the global south as effective ways to adapt to climate change is very critical to the market development of these corporations. These technologies in one way or the other come with both potential benefits and side-effects in respect of enhancing food systems of smallholder farmers. One important key benefit worth mentioning is the fact that these hybrid seeds have beneficial characteristics such as drought-tolerant, resistance to pests and diseases. In the events of pest and diseases outbreak or long dry spells, hybrid and GM seeds have the potential of overcoming these challenges and ensuring good harvest for peasants (Egelyng, 2000). Thus, farmers will be able to produce enough even under climate stresses with the use of GM seeds in order to meet their subsistence needs whiles also selling surplus produce on the market.

Furthermore, some hybrid seeds limit the use of pesticides and herbicides because of their pest resistance. This is very essential because often, smallholder farmers do not have the financial capacity to afford such chemical inputs for their farms (Egelyng, 2000). They will therefore need not have to worry about purchasing pesticides or herbicides for pest and disease control. This will enable smallholder farmers save their little income for other household needs such as health care, children education, etc.

Despite these benefits, the advantages of organic farming and farmers own local practices are enormous in enhancing a sustainable future for food production. A lot of the hybrid seeds and GM crops necessarily require certain conditions to thrive and be able to produce the expected yield which are lacking in the localities of farmers. Smallholder farmers own seeds and practices are already used to the local conditions and do not need to adapt to do well. The accompanying practices of organic farming are ecologically sound and maintains environmental sustainability, thus enhancing the resilience of food production systems under these conditions.

These practices are also easy for smallholder farmers to handle since they do not require any technical training to be able to apply practices very appropriately. Unlike organic farming, the use of hybrid seeds and GM crops require technical know-how to handle. Considering the fact that most smallholder farmers in SSA are illiterates, it is difficult to get the optimum usage of these technologies. It therefore requires high capital and technical know-how for smallholder farmers to undertake, thus poses a constraint to implement.

Also, one constraint identified in the promotion of these hybrid seeds is that the technologies are likely not to get to the targeted poor smallholder farmers due to the privatization of the rights to the implementation and using the technologies (Azadi and Ho, 2010). Global intellectual property regimes give rights to TNCs which developed the technologies where rights are given to cover plants and animals including the genetic make-up of these, thus making these technologies inaccessible to smallholder farmers who are al-

ready in a marginalised position in terms of resource access and use (Egelyng, 2000).

There exist inequalities in the agricultural and food production systems in Ghana, especially in respect of whose interests features in climate resilient policies. Based on empirical data, the next chapter discusses the socio-political and economic dimensions of climate change adaptation as well as the institutional dynamics of multiple stakeholder governance in Ghana.

Chapter 5

5.0 Institutional Dynamics of Multiple Stakeholder Governance in Climate Change Adaptation in Ghana

5.1 Introduction

In this chapter, I discuss the socio-economic and political dimensions as well as the institutional dynamics of multiple stakeholder governance of climate change adaptation in Ghana based on the data collected from various sources. I also discuss how the interplay of these multiple stakeholder governance poses barriers to participation and adoption of climate change programmes by farmers in the study area. The final part of this section discusses and details the various ways the promotion of 'smart' adaptation strategies are themselves impediments to farmers realizing their own 'effective' measures and the preservation of local indigenous knowledge systems of smallholder farmers in the study area.

5.2 Institutional Dynamics in Implementation

Climate change adaptation in Ghana in the past has often been reactive, which tend to be very costly and fails to put in place adequate measures to reduce the effects of climate hazards on rural farmers in particular and the citizens at large. Several climate change adaptation programmes/strategies exist which come from several different stakeholders such as the government of Ghana through its Ministries, Departments and Agencies (MDAs), NGOs and international development agencies such as USAID, DFID, etc. The official position which comes from government through MDAs seems to be overshadowed by adaptation strategies promoted by civil society organisations (NGOs) and other partners. This is due to the fact that government MDAs lack the required finance and/or unwillingness to release financial resources for grassroots level implementation of climate change projects.

From field interviews with senior level MDAs officials, the table below presents the different government and non-governmental institutions engaged in the promotion of climate change adaptation strategies to farmers in the study region.

Table 5.1: Government and Non-Governmental Institutions engaged in Climate Change Adaptation the study area

MDAs/NGOs	Number of Staff Interviewed	Position
MoFA	5	Senior level staff
EPA (N/R)	3	Senior level staff
FC (N/R)	2	Senior Level staff
CARE International (NGO)	2	Senior Level Staff

Source: (Field Data, 2015)

The discussion of the main findings draws on the responses from the respondents interviewed based on the climate change policies and experiences of senior level staff working to implement the various climate change adaptation programmes of their institutions – MDAs and NGOs. The approaches of these multiple stakeholders to climate change adaptation come in various different forms and thus exist and are uncoordinated as far implementation is concerned. About 90% of their institutions are implementing climate change programmes for farmers since it has become a phenomenon the impacts agricultural production greatly. However, the major setback is the lack of collaboration among various institutions. Some of the senior staff especially from government agencies lament how it is difficult to visit farmers in most times of the year due to inadequate funding. Frequent visits to farmers would be useful in some many ways. Technical officers will be able to make direct visits to farmers instead of relying on AEAs who are also cash trapped to disseminate technologies in farming communities. Also, if NGOs collaborated with government agencies, this will do away with replication of

efforts and similar technologies but with different measures in achieving the results.

This becomes a problem to peasants who are the recipients of these strategies, especially the best ways of synergizing efforts. As I argue in this paper, fundamentally, the promotion of hybrid seeds and other agro-chemicals pose challenges to smallholder farmer in adopting practices. This has implications for both smallholder farmers who get to participate in such programmes and those who do not. It is therefore important to give a brief description of these different stakeholders and their approaches, and the policy and institutional environment (logic) under which they are promoted. Drawing on secondary data, this section also describes the works of these institutions in the study area in respect of tackling climate hazards and supporting smallholder farmers to enhance the resilience of their food production systems. This is expected to increase yields of farmers and also improve household incomes and food security. Based on the review of secondary data from government ministries, the next section describes in brief Ghana's National Climate Change Adaptation Strategy (NCCAS) and the principles that drive its implementation.

5.3 National Climate Change Adaptation Strategy (NCCAS)

Not until 2010, when a National Climate Change Adaptation Strategy (NCCAS) was developed, climate change adaptation efforts especially in Ghana's agricultural sector had dominantly been reactive which tends to be more costly and lacked focus. The NCCAS is a ten year (2010 – 2020) blue print which was developed from a broad national development planning framework and seeks to adjust the economy of Ghana to future and expected climatic hazards and their effects. This strategy document is expected to guide and inform the planning, design and implementation of all climate change adaptation activities and programmes in Ghana because this will ensure effective governance and synergise efforts of different stakeholders in the sector. Thus, its preparation stage involved the input and consultation of all stakeholders.

The goal of the NCCAS is:

> *To enhance Ghana's current and future development by strengthening its adaptive capacity with regard to climate change impacts and building the resilience of the society and ecosystems* (NCCAS, 2010: vi).

This seeks to achieve a number of objectives with a well outlined proposed projects and programmes in achieving them. Among others the NCCAS (2010: 13) has the following objectives:

1. *To improve societal awareness and preparedness for climate change*
2. *To enhance the mainstreaming of climate change into national development planning*
3. *To increase the robustness of infrastructure development and long-term investments*
4. *To enhance the adaptability of vulnerable ecological and social systems by increasing their flexibility and resilience*

Proposed programmes are mainly to minimize vulnerability and enhance the resilience of smallholder farmers' production systems and the rural poor to the impacts of climate change. A very essential element of the strategy document is to "reduce vulnerabilities in the long-term and to ensure the development of a more holistic and integrated national adaptation strategy" (NCCAS, 2010: vi).

The challenge for the implementation of this policy is a reliable and sustainable funding source. Though the government of Ghana through the Ministry of Environment, Science, Technology and Innovation (MESTI) does not have enough funds for the implementation of the entire programme, the potential sources of funding identified for the implementation include: the National Adaptation Fund (NAF), Global Environmental Facility (GEF), Global Adaptation Fund (GAF), multilateral agencies such as UNDP, FAO, WMO, UNEP, etc. However, it is not always the case of lack of funds that makes the implementation of some of these policies, but rather the political will of the government of the day and its commitment to supporting climate related programmes. When governments depend on the World Bank and IMF for funding for climate change adaptation, there is the likelihood of

these organisations suggesting other ways that will not involve organic production methods but rather the use of hybrid seeds and fertilizers which have to be imported. There is no doubt this will create a situation involving winners and losers. The losers will in no doubt again be smallholder farmers. Thus, if the governments want farmers to increase their production sustainably, there should be conscious efforts to commit investments into organic agricultural production systems for farmers.

Furthermore, the NCCAS is expected to be executed through a participatory and decentralized system by all stakeholders especially government Ministries, Departments and Agencies (MDAs) at the national level as well as by the National Climate Change Committee (NCCC). This document is expected to inform the development and implementation of all climate change adaptation programmes by all development partners as well as Civil Society Organisations (CSOs) in Ghana. It as well outlines a proposed mechanism where development partners and NGOs involved in developing climate adaptation measures are expected to coordinate with all the appropriate institutions identified in the NCCAS, and at all levels in the implementation of their programmes. As indicated in the NCCAS (2010: vii) "Collaboration among all the sectors of the economy is emphasized to ensure the effective implementation of the NCCAS".

Some of the guiding principles on which the NCCAS operates in the implementation of climate change programmes in the country as outlined in the NCCAS policy document (NCCAS, 2010: 4) include the following:

> (a) *Adaptation policies must be addressed in the broader context of National Development Policy Framework*
>
> (b) *Stakeholder participation should be at all levels because it is central to the formulation and implementation of the NCCAS to ensure ownership*
>
> (c) *Promotion of sustainable development and poverty reduction are focus areas of the adaptation strategy*

In the light of these, climate change are expected to gender sensitive, cross-sectoral and flexible so as to involve all at varying ecological locations in the country. Indeed, one would ask why government MDAs that are current-

ly implementing various climate change adaptation programmes in the agricultural sector of Ghana which involves rural peasants to enhance their resilience and reduce their vulnerability to the hazards of climate change do not follow these. It still fundamentally indicates that MDAs which receive funding from international development agencies to implement climate change programmes do so to comply with funding conditions, instead of their own country guiding principles. These guiding principles just exist on paper because they are yet to be followed, thus collaboration and coordination even amongst government institutions and actors is still far-reaching. Climate change adaptation programmes still exist and available to farmers in fragments. Interestingly, there is replication of the same programmes and activities by different organisations and actors within the agricultural sector and in some cases within the same communities.

This is a worrying concern because the challenge of having to receive information on agricultural practices from different quarters is ineffective. All organisations involve have their own improved practices for farmers which their underlining interests. For instance, the ministry of food and agriculture will promote the use of hybrid seeds because of bilateral negotiation between the government of Ghana and Norwegian government to allow agricultural companies to bring into the country seeds and fertilizers. Also because farmers are at the receiving end and as a matter of urgency need these support have no option than to receive them in good faith. This obviously has implications for their agricultural production systems. To better adapt Ghana's agro-ecosystems to climate change, there is the need for adherence to the NCCAS which has the road map for effective and practical modules for climate change adaptation in Ghana especially in the agricultural sector.

5.4 Climate Change Adaptation Strategies from the Ministry of Food and Agriculture (MoFA)

Climate change adaptation is of utmost importance to the government of Ghana. From the field study the official government position through the ministry of food and agriculture in Ghana, which has the mandate of ensuring food security in the country and reducing other climate-related yield los-

es promotes the inclusion of climate change adaptation programmes into ongoing and future projects of the ministry. The ministry currently implements several climate change adaptation projects, of which I will limit my discussion to the activities and practices of one project currently underway in the study area: **The Sustainable Land and Water Management Project (SLWMP)**.

From field interview with staff of MoFA involved in the implementation of these projects, it was revealed that the specific adaptation strategies currently being promoted by the ministry under these projects amongst others include conservation agriculture practices, sustainable land use systems, watershed management, the use of hybrid and improved seed varieties (early maturing and drought-tolerant varieties), promotion of early planting, water conservation structures (on-farm) such as bunding, levelling, etc., early warning systems, tree planting and agroforestry, promotion of the use of energy-efficient resources and organic manure on farms, bushfire prevention and advocacy, amongst others. The promotion of these practices are also informed by the implementation of the ministry's second Food and Agriculture Sector Development Policy (FASDEP II, 2007). This policy document has several environmental considerations which underpin its implementation. The lack of collaboration between projects operating in the same area from the same ministry makes it more problematic in the achievement of the project objectives. These projects can draw synergies in their implementation and agreement plans with local communities to attain maximum output in terms of impact on the livelihoods of farmers.

5.4.1 The Sustainable Land and Water Management Project (SLWMP)

The SLWMP is a five (5) year duration project started in 2010 by the MoFA and the MESTI with extension for additional two (2) years. It is being funded by the GEF as support grant to the Government of Ghana (GoG) to improve existing land use and management systems and to enhance the maintenance of biodiversity and agricultural productivity amongst rural peasants in northern Ghana. In the implementation manual and structures of the project, stimulating community-led initiatives in climate change adaptation is expected to dominate and thus strengthen the resilience of peasants'

production systems. The specific strategies promoted under the SLWM project include amongst others tree planting and agroforestry, promotion of the use of energy-efficient resources and organic manure on farms, bushfire prevention and advocacy, sustainable land use systems, watershed management, the use of improved seed varieties, water conservation structures such as bund construction, etc.

It was observed that these strategies have been developed and determined overtime through consultative forums with stakeholders, including researchers, farmers and other partners and NGOs. Ministry staff indicate that the design and implementation of these programmes have been guided by not only the principles outlined in the NCCAS document, but also guiding principles and implementation agreements from the donors. This is so because the project is an official government approach to promoting climate change adaptation in Ghana with the support of its development partners.

The research findings show that about 70% of farmers interviewed confirm that they have been involved prior to the implementation of the project activities. In this way, baseline surveys and resource mapping were conducted with local indigenous people themselves which reveal the need for certain specific adaptation strategies to be incorporated into policies and for farmers to use in their production. However, despite the fact that some of these technologies have been proven to be very effective in increasing agricultural yields through research and on-farm demonstrations, the level of adoption by farmers is still a challenge as lamented by the senior level staff of the ministry of agriculture interviewed.

Some of the reasons for this are that, new technologies promoted are still expensive for smallholder farmers to afford as compared to the indigenous traditional practices which require little or no capital. Farmers reveal that the sometimes programmes offer different technologies or similar technologies in adoption. They are given in bits and they have to try this and that for some reasons. AEAs easily get lost as to which practices to give due to the lack of coordination of the programmes. These themselves are barriers to adoption of their own organic practices they have been involved in all these years. Furthermore, the level of education of farmers is a key limiting factor

to adoption since it is technically a challenge. It was found in the field data that about 90% of farmers interviewed had no education, with just a few having little primary education. The level of illiteracy amongst farmers impeded the adoption and proper application of new technologies introduced to farmers and this end up not producing the required yield. In addition, low adoption rate is due to cultural and belief systems in some farming communities. Cultural relativism is an essential component when implementing rural development intervention to smallholder farmers. Farmers need to be comfortable with the strategies being promoted and be assured that this respects their norms and traditions. They do not want to move away from their cultural values. Though some farmers agree that these adaptation strategies promoted by MoFA have increased their yields over the years, not all of them benefit. This is because some of them are unable purchase the accompanying inputs.

Agroforestry and tree planting is one of the strategies adopted under the project for farmers to engage in. Land degradation and desertification is one of the ways of combating climate change. And in recent times, the concern has been to replenish the millions of trees lost through deforestation and felling of timber for lumber to be exported to other countries. Apart from the fact that trees and forests are noted in the storage of carbon and brings about rainfall, they also help to replenish the soil with soil organic manure with the drops of the leaves. The highest rainfall realised in the Amazon rainforest is due to thick forest which exist in the locality. Under this module, farmers are guided and supported to come out with community-led plans and proposals for tree planting. Also, they are supported with tree plant varieties to engage in agroforestry in their own fields to enrich their soils, reduce soil erosion whiles also maintaining biodiversity and ecological balance. This is expected to ensure the retention of soil moisture available for plant uptake even when there is long dry spells as a result of climatic variability.

However, problematic with this strategy is that all the tree varieties given to farmers come from outside farmers own environment and localities. This makes it very difficult for tree plants to cope with their environmental con-

ditions and adapting. In some cases, as indicated by farmers, such tree species sometimes do not survive at all in the long run. Thus the aim of promoting such strategies one way or the other is not realised. Natural regeneration will be the appropriate strategy to adopt in most cases. These are tree shrubs that are already growing in these localities. And it is sustainable to make use of tree varieties that are already growing in these areas since it will be very easy to adapt to local conditions.

More so, farmers reveal that the use of hybrid seed varieties, particularly maize seeds, is another climate change adaptation strategy being promoted under the SLWM project. Farmers are supported with hybrid seed varieties (early maturing or drought-resistant varieties) during planting and they pay back the cost in the form of produce to the ministry. This is expected to cushion farmers against the shocks of climatic hazards in times of flash floods or long dry spells. Crops will do well when farmers plant within the period of short rains or they are able to stand long droughts, thus high yields. However, when asked why farmers have to pay back the cost of the seeds, the ministry staff indicate that it is to enable MoFA pay back the cost of the seeds to agribusiness companies.

Essentially, the use of these improved varieties is accompanied by the use of huge quantities of fertilizer and other agro-chemicals in order to realise the benefits of the seeds. Farmers confirmed this sometimes becomes a challenge to them in most cases because they are unable to afford these quantities of fertilizers and so are unable to realise the necessary yield. The logic of this approach serves the needs and interests of local agribusiness companies and private property. It seeks to promote private capital accumulation amongst local companies as well as transnational agribusiness companies.

From the field study, the findings show that farmers' existing local knowledge systems are taken into consideration to some extent when designing adaptation strategies for farmers in the agricultural sector. However, the programmes administered to farmers are top-down driven. This is a challenge. If we do not take into consideration what farmers are already do-

ing in their own small ways to adapt to climate change in their fields, the top-down approaches only go a long way to compound the complex situation in which farmers already produce under. For instance the promotion of certain improved seed varieties has consequences on local traditional seed varieties. Traditional seed varieties do well in their natural environment. And when seed lines are lost, farmers are put out of business and find it difficult to produce even to feed their families. Therefore, the use of local indigenous practices and organic practices that make less use of external input is the way to go for smallholder farmers in SSA.

To add to this, apart from the high cost of these technologies for farmers which end up excluding majority of peasants who do not afford it, most farmers lack the knowledge on how to implement these technologies well in order to maximise the best use of them. This further complicates the whole situation because when the crops fail to do well and there is reduction in yield, their livelihoods are affected and it becomes difficult for them to feed their families and provide for other needs.

Based on interaction with senior level officer from the Crops Unit of MoFA, he indicated that:

> *In determining climate change adaptation strategies for farmers in Ghana, seeds and fertilizers are amongst government promoted programmes. The ministry implemented the EXPANDED MAIZE PROGRAMME in 2009, and during that year the government made investment in importing hybrid maize seeds varieties which were later distributed to farmers. Areas that realised high rainfalls also recorded higher yields. But in most parts of northern Ghana, there were low yields because there were no higher rains and this had serious implications for food security that year* (MoFA Staff, Accra).

The politics of needs and whose interest plays out is interesting. Who actually profits and benefits from these strategies that are promoted moves far away from being the farmers. The government through MoFA provides subsidies on agricultural inputs such as fertilizers and seeds for farmers with several engagements with local agribusiness companies operating in the country. The northern regional seed officer of MoFA confirms that through such engagements with local agribusiness companies, prices are fixed from

the ministry's head office and then farmers can access the inputs from the district offices of MoFA throughout the country. The revenue generated from the sales is accrued to the local companies. It was revealed that the government only pays back the deficit of the subsidy component back to local companies or the agents of the TNCs in the country.

This is actually expensive for most farmers to participate in such programmes. In the first place, the conditions under which these programmes are operated do not allow farmers to have access because there is long chain of bureaucracy in the distribution systems of these inputs. Farmers are supposed to pay in kind in the form of produce after harvest to the government. And then the government will intend pay back to local agribusiness companies to enable them also meet the cost of their imports from trans-national agribusiness corporation from which they also bought. The power relations in these chain can be traced all up to these powerful corporate institutions which control the market through up to TNCs such as Monsanto, Yara, etc. in advanced countries. This confirms the main approaches of the new AGRA in the forms of development of resilient crop varieties that can withstand climate variability, pests and diseases as well as strengthening of regional and local markets for all farmers (AGRA, 2014).

The findings show that the benefits of these programmes can be attributed largely to the agribusiness companies. This is because the government through MoFA only focuses on making inputs available and accessible to farmers through negotiated prices. Thus, revenue and profits goes to the local companies who intend re-invest their profits back into their business which further increases private agribusiness expansion at the detriment of smallholder farmers whom are the target group of these programmes. Farmers however also benefit in a way marginally. Since these programmes do not cover all farmers, elite and influential big farmers hijack the inputs leaving women and marginalised groups. Also the promotion of these strategies serves as a medium for accessing quality seeds by farmers thus enhancing distribution of good quality seeds for farmers who can afford. For agribusiness companies, this serves as a good marketing avenue for profit making and wealth accumulation.

5.5 Differences in Participation in Climate Change Adaptation Programmes by farmers

Table 5.2: Age and Gender of Respondents – Farmers (%)

Tinguri Community					
Gender	Age				Total
	16 – 25	26 – 40	41 – 60	61+	
Men	10	40	8	2	60
Women	0	20	14	6	40
Total	10	60	22	8	100
Kparigu Community					
Gender	Age				Total
	16 – 25	26 – 40	41 – 60	61+	
Men	-	20	10	7	37
Women	-	35	25	3	63
Total	-	55	35	10	100

Source: (Field Data, 2015)

Table 5.2 above illustrates the age and sex distribution of respondents interviewed in the two communities in which climate change adaptation programmes are currently implemented. Kparigu has high number of female participation than in Tinguri. As shown in table 5.3 below, most of the respondents are married with a few widows who maintain female-headed households. The major crops they cultivate include maize, rice, sorghum, soya beans, yam, etc. Most of the women in both communities also engage in petty trading at the Walewale market which comes off every three days. Some of the women indicate that they engage in the sale of oil, soap and other products to be able to cater for other household needs. Some of the men rear animals in their backyard. Some of the animals they confirm were given to them as alternative livelihoods support under the implementation of the SLWMP. The project gives small ruminants to households to rear and after two years, you handover to another farmer and keep the offspring for

another two. However, majority of the women lamented that they never get these benefits because some of the men end up selling the animals to marry additional wives. One of the women in an FGD involving only women in Tinguri had this to say:

> *Instead of passing on the animals to those of us who don't have and keep the offspring, they will sell them and lie that the animals died. They are only interested in marrying more women* (52 year old woman)

The situation was the same in Kparigu as well. However, the opinion leaders in both communities confirmed this situation and rather have remained quiet about it. From their looks they are also victims of the act. In discussing the ways to ensure that the women also benefit from the animal support, the assemblyman for the Kparigu electoral area promised to involve the project staff. As will be shown later, marital status influences access to participate in these programmes among female respondents in both villages.

Table 5.3: Marital Status of Respondents (%)

Tinguri			
Marital status	Single	Married	Widowed
Men	0	35	0
Women	0	60	5
Total	0	95	5
Kparigu			
Marital Status	Single	Married	Widowed
Men	10	50	0
Women	0	30	10
Total	10	80	10

Source: (Field Data, 2015)

The climate change adaptation programmes promoted by the agriculture ministry to farmers are supposed to be available for all farmers particularly smallholder farmers who suffer most from climate hazards. However, from

the field findings majority of respondents confirm that only some specific farmers are rolled on the programme. Interestingly, the middle-class and colleague farmers with political influence who have power and control over resources end up hijacking these programmes leaving the marginalised groups to their fate. All respondents who currently get to participate in these programmes are connected in one way or the other with the chief, the assemblyman, the opinion leader, etc.

In respect of gender inclusion, some proportion of participants come from households that are female-headed households (10% - 30%). Women participation in some of these programmes always comes from adaptation strategies funded and promoted by NGOs and other development agencies such as USAID, DFID, GiZ, etc. that prioritise gender inclusion in their programme designs. Government promoted programmes through MoFA, EPA and FC are very insensitive to gender considerations at the implementation stage since these programmes at the local level are left to be handled by local leaders. The minimum requirements to participate in these programmes starts from sixteen years and the ethnic make-up of the participants is mixed.

From the findings there is no ethnic discrimination regarding who qualifies to participate since there is only one dominant ethnic tribe in the study area, Mamprusis, with a few Frafras and Dagombas. There is inter-marriages amongst these ethnic groups and thus see each other as one. All farmers within the catchment areas of government promoted programmes qualify to be engaged in climate change adaptation programmes since climate change programmes affect everyone. Though its effects are felt unequally among smallholder farmers, programmes assume that the same strategies would work for all.

This is somewhat problematic in the sense that smallholder farmers by their nature do not have the same capacities to handle shocks from climate variability and its related stresses. A few farmers do have the necessary resources to cope with the undue hash conditions whiles others will have their livelihoods largely affected or taken away due to climate variability and change. From the field study, the average landholding size in the two communities is

1.5 hectares. The tenure arrangements in respect of access to land and other natural resources further compounds the situations of peasants. Some of the farmers who have land rent it out to other peasants who do not have land. These group of peasants have to pay for a piece of land to be able to farm or sharecropping. Other peasants who have to sell their labour power in order to survive and feed their families. Thus the effects of climate on these peasants will be unequal because of their access and ownership of resources.

5.6 Climate Change Adaptation Strategies and Local Indigenous Knowledge Systems and Practice

This section presents and discusses how the promotion of hybrid seeds by MoFA through its adaptation programmes conflict with smallholder farmers' indigenous practices and seeds systems. Amongst other organisations, the ministry of food and agriculture promoted the PANN 53 hybrid maize to farmers in the 2011/2012 cropping season under the ministry's *Block Farming Programme.* Also, through the implementation of the World Bank funded Sustainable Land and Water Management Project (SLWMP), JICA funded Sustainable Rain-Fed Lowland Rice Production Project, Rice Sector Support Project, some hybrid varieties were given to farmers as part of programmes support towards adapting their farming practices to climate change. These and other initiatives of the ministry support farmers in local communities with improved agricultural practices and technologies, to develop their lands, engage in tree planting, watershed and micro-watershed management, alternative livelihoods support systems, etc. Under these systems, they also give farmers improved seeds (early maturing and drought-resistant) varieties and fertilizers. These are given on credit basis to enhance their production.

From the findings, it was realised that the PANN 53 Hybrid varieties imported by the ministry required approximately 6 bags of Sulphate of Ammonia per acre. Also, fertilizer was expected to be applied at certain growth stages of the plant and these posed challenges to peasants with little technical know-how to follow the required application procedures in order to

realise the desired yield. Farmers lamented how costly the use of the PANN 53 Variety was to them. On the other hand also, fertilizers that were subsidised by the government for smallholder farmers end up in the hand of unscrupulous businessmen who connive with staff of the agriculture ministry to sell on the black market for higher prices. A farmer in Kparigu indicates that:

> *The problem with the PANN 53 seeds was that, it required between 6 and 8 bags of Sulphate and this was difficult for some of us to buy. We are even struggling to make ends meet, how do afford 8 bags of fertilizer for an acre of maize* (49 year old Male farmer, Kparigu)

From an interaction with smallholder farmers in an FGD, it was revealed that farmers tend to adopt these strategies under false illusion because they need the support to be able to increase their agricultural productivity. Some farmers are unable to access the programme due to the accompanying commitment to paying back the credit. These end up not making such programmes sustainable because farmers are expected to pay in-kind back government in the form of produce to enable government cover the cost and then also pay local agribusiness companies under the subsidy. But one key question that arises is that, why will the government not just bring in these inputs direct to farmers and leave out these local companies that are just interested in increasing their profit and to engage in accumulation?

This is because the main interest of these agribusiness companies is to maximize their profit and turn-over. And farmers in the long run get ensnared in a web that keeps them continuously reliant on hybrid seeds at the extinction of farmers own seeds. One interesting scenario about this arrangement is that farmers would have to use a certain quantity of fertilizers to be able to realize the desired yield from their farms. This is difficult because it rarely happens and farmers only end up getting indebted to government. It was recounted that those farmers who are unable to pay back the credit after harvest do not get to participate the following cropping season. Also, since the seeds used are hybrids, farmers will have to purchase new seeds.

The findings also show that farmers kept their own seeds or purchased seeds from colleague farmers or families and friends in the past in order to plant

for the next season. In the past they did not use high quantities of fertilizers and other agro-chemicals unlike the requirements today. They relied on local materials and other organic products as their sources of manure. However, today, the influx of these programmes from government through the agriculture ministry and other organisations has made them highly dependent on seeds from elsewhere which comes with unfavourable burden on farmers. A female farmer in Kparigu in a discussion says that:

> *It is very difficult to get seeds from colleague farmers that are not hybrid and with these seeds you cannot use them to plant the following season. Unlike first we used to get seeds from friends, families and colleague farmers to plant the following season. It is no longer so now. Very difficult to get seeds. And the seeds that extension agents bring us are expensive to manage* (45 year old female farmer, Kparigu).

Some of the farmers also confirmed that they still plant seeds they ultimately manage to get from families and thus plant them to compliment seeds gotten from government and other organisations. It was revealed that they fail to realise good yields because they are rather unable to meet requirements of hybrid seeds. This comes from low rainfalls or long dry spells that impede the viability of the seeds. Furthermore, this could be as a result of the proper timing of application of fertilizers to their fields. It was realised that farmers with little or no education fail to apply these technologies well too, thus resulting in low yields.

Nonetheless, farmers admitted to some extent their participation in government promoted adaptation programmes is beneficial. Some of them confirmed they are able to increase their yield and improve their incomes and livelihoods from their harvest when they realize good rains for the season. Some farmers who are able to apply the required quantity of fertilizers to their fields at the appropriate period recorded higher yields than previously. Seasonal variations as a result of climate change could result low rainfall that could lead to crop failure. This leads to inadequate water available for plant uptake, thus resulting in low yields.

In addition, the SLWMP being implemented in the area has an alternative livelihood support component. From the field data, farmers highlighted the

importance of the alternative livelihood supports given to them under the programme. Smallholder farmers are given small ruminants such as goats and sheep, rabbits, pigs, etc. for rearing in their households. This is very beneficial and is expected to ensure some responsibilities; whiles cushioning them against the shocks of climatic variations, it is expected to provide for the protein needs of their families during meals thus enhancing their food and nutritional needs. They can also sell some of the animals to provide for the educational needs of their children as well as health needs. A 62 year old woman who lives with her granddaughter indicates that:

> *I have been able to pay the school fees of my granddaughter and also buy her a new school uniform from the sale of one my goats. The only problems we face with the animals is lack veterinary staff who can frequently check on them* (62 year old farmer, Kparigu).

An additional advantage from the alternative livelihood support is that, some of the farmers who are able to maintain their animals under intensive systems are able to use the animal droppings as organic manure in their fields. They also enjoy protein at some point when they kill one of the animals.

Chapter 6

Conclusion

Climate change affects agricultural production globally. Particularly, smallholder farmers in SSA are the most affected by the impact of climate variability. The emission of GHGs by advanced industrial countries continue to deplete the ozone causing global warming which heats up the earth surface. This affects agricultural production which requires practical adaptation and mitigation measures as well as resilient food systems.

Industrial agriculture especially in advanced countries is involved in the framing climate change adaptation and mitigation policies, especially in the global south. The practices under industrial agriculture continuously degrade biodiversity and a threat to the maintenance of ecological balance. Industrial agriculture generally poses barriers to smallholder farmers in the study area.

There are barriers to adoption of climate change adaptation strategies in two different categories. On one hand, farmers face challenges to participate in climate change programmes both from government agencies and NGOs. This comes from the fact that climate change programmes are uncoordinated and is difficult for farmers to make the optimum benefit from them. These are available to farmers in fragments and different forms. The multiple stakeholder governance in the sector needs a comprehensive consultative discussion so as to be able to synergise efforts and activities of stakeholders involved. This way, AEAs will be able to understand which technologies to disseminate to farmers and which specific farmers require what types. Farmers reveal that

On the other hand, climate smart agricultural programmes are impediments to smallholder farmers realising other very effective and sustainable adaptation strategies. The smart agricultural programmes being promoted to farmers are expected to increase farm yield per unit area under climate challenges. However, the inability of such practices to offer farmers the capacity to protect their soils and enhance resilience is problematic. This include the

promotion of the use of hybrid seeds, synthetic fertilizers and pesticides to farmers because they are either drought-tolerant or resistant to pests and diseases. Big TNCs such as Monsanto, Syngenta and Yara control the seed and fertilizer market globally and they continuously make investments in the form of aid and Corporate Social Responsibility (CSR) to SSA countries in the name of modernizing Africa's agricultural systems to ensure food security. The use of these hybrid seeds has implications for farmers' local indigenous knowledge and seed varieties. The study reveals that farmers in the study area find it difficult to save their own seeds and plant it the next cropping season. In the past farmers from both communities used to save their own seeds or buy from colleague farmers or families and friends. These days everyone is relying on the market to buy hybrid seeds for production.

Apart from the loss of seed lines which could put farmers out of business, the use of these hybrid seeds come with requirements to use a certain quantities of fertilizers. Yara controls the fertilizer market in Ghana and so the government and other NGOs go into contract with them to supply farmers with subsidized fertilizers and pesticides. The high cost fertilizers is a challenge also to farmers because even at the subsidized prices, it is still difficult for some farmers to afford them. In as much as the use of these inputs could increase yield per unit area, agro-chemicals also depletes the soils over time. Global political and economic forces and capitalism drives all these. The quest of private TNCs in the agricultural sector to increase their accumulation of capital will continue to shape how government institutions and NGOs determine agricultural and environmental policies.

There is the need for the promotion of organic and agro-ecological principles to food systems production as effective ways of adapting to global environmental challenges. Organic farming principles are easy to implement by smallholder farmers because they are less costly and easily adapt to local conditions. Unlike industrial agriculture where farmers have to rely on external inputs, organic production makes use of traditional agricultural practices which will strengthen the resilience of smallholder farmers.

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Appendix

Questionnaire/Interview Guide

1. *Who defines climate change adaptation strategies in the agricultural sector in Ghana? (RQ 1: Agriculture Ministry staff, and policy documents)*

   a. How does your ministry tackle climate change and variability?

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   b. What specific adaptation strategies are being promoted by your ministry (government-promoted strategies) to farmers? Name them …… …

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c. What informs how these strategies are determined? Why?

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d. Why do you promote these strategies to farmers? Do you achieve the desired results?

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e. What is the level of adoption of the strategies you promote to farmers? ……

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f. Do you take into consideration farmers' existing local knowledge systems when designing adaptation strategies for them? How is this done? ……..

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g. What do you see as the greatest challenges in implementing climate change adaptation strategies?

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2. *Who profits from climate adaptation strategies? (RQ 2: Ministry staff and local agribusiness companies)*

a. How does your ministry/company determine prices of seeds and fertilizers for farmers?

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b. What happens with revenue from seed and fertilizer sales?

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c. Is this a profitable activity?

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d. How is the profit from sales used?

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e. Which ministry (for government interviews) handles sales, revenue, investments? … ……..

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f. Does most revenue remain with government? Or with local or transnational seed and fertilizer companies? (**You may or may not need to ask this as a follow-up to the question above, depending on the responses you get.)** .....

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g. In your opinion, what are the benefits of this program for farmers, for the government, and for agribusiness companies?

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3. Are government-sponsored climate change adaptation programs exclusionary /differentiated?(RQ 3:both ministry staff and farmers)

a. How do farmers participate/enroll in climate change adaptation programs? Are programs available to everyone, or are there requirements for participation? ……..

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I. What proportion of participants are female-headed households? ……

II. What is the ethnic make-up of program participants? …….

III. What is the age spread of program participants? ……

4. *In what ways do government-sponsored climate change adaptation strategies conflict with local indigenous knowledge and practice? (RQ 4: for farmers)*

a. What types of adaptation strategies does the ministry of agriculture recommend to you? Do other organisations apart from the ministry also recommend some adaptation strategies to you? What are they?

b. Have you adopted any of these strategies? Why or why not?

c. Are the climate change adaptation strategies promoted by the government similar to how you farm? Or are they different?

d. (How) have government programs changed your way of farming?

e. What kinds of seeds do you plant?

f. Since you started using the seed-fertilizer program, do you continue to plant other seeds?

g. How do you get seeds to sow the next farming season? Do you save own seeds or you have to buy again from government?

h. Has your participation in government programmes changed your income/livelihood? and if so, how?

Demographic characteristics of respondents

Respondent(s): …… AGE……..

SEX……

Location: ……

Household size ……

Level of Education ……

Farm size…… Land/ Farm ownership ……