

Weathering Change: Climate Change Vulnerability and Women in Cocoa Farming



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2. Acronyms

AR	Assessment Report
CAADP	Comprehensive Africa Agriculture Development Programme
CDM	Clean Development Mechanism
COCOBOD	Ghana Cocoa Board
ECOWAS	Economic Community of West African States
ENRAC	Environment and Natural Resources Advisory Council
FASDEP	Food and Agriculture Sector Development Policy
FCPF	Forest Carbon Partnership Facility
GDP	Gross Domestic Product
GPRS	Ghana Poverty Reduction Strategy
GSGDA	Ghana Shared Growth and Development Agenda
ICT	Information and Communications Technology
IPCC	Intergovernmental Panel on Climate Change
LBC	Licensed Buying Company
MESTI	Ministry of Environment, Science, Technology, and Innovation
MoFA	Ministry of Food and Agriculture
NADMO	National Disaster Management Organization
NAMA	Nationally Appropriate Mitigation Action
NCCAS	National Climate Change Adaptation Strategy
NCCP	National Climate Change Policy
NDPC	National Development Planning Commission
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
RCP	Representative Concentration Pathways
REDD	Reduced Emissions from Deforestation and Forest Degradation
UNFCCC	United Nations Framework Convention on Climate Change
WED	Women, Environment, and Development
WIAD	Women in Agricultural Development

3. Abstract

Climate change is increasingly recognized as a hurdle to achieving development goals in developing countries and emerging economies. While mitigation is still a focus of many climate change activities, adaptation strategies are recognized as essential to respond to the current and projected impacts of climate change. The concept of vulnerability is often used to identify what adaptation measures must specifically address, and is discussed in terms of three components: *exposure* to shocks or long-term stress; *sensitivity* of a system to the event; and *capacity to adapt*. Women are considered a vulnerable demographic, because of their reduced access to land, financial and productive resources, and information. This dissertation integrates a vulnerability framework with gender considerations as a means to explore many of the factors influencing climate change vulnerability among women in a case study of cocoa farming in the Central Region of Ghana.

The research is based on semi-structured interviews with female members of three communities, representing a cross-section of the different associations with land and farm decision-making, ranging from primary operators of cocoa farms to producers of food crops on a spouse's land for subsistence and local markets. The interviews highlighted the importance of income sources and diversification, access to information, and perceptions of empowerment and agency as contributors to vulnerability to projected climate change impacts. Women without direct access to cocoa generally had fewer assets at their disposal and shorter planning horizons that might lead to greater vulnerability. Despite these differences, most of the women demonstrated a positive outlook and future orientation that is often taken as a sign of adaptive capacity. This research demonstrated the need for more nuanced assessment of vulnerability among women, but also for rethinking the depiction of women as disempowered actors and the types of policies crafted to support climate change adaptation and development.

1. Chapter 1: Introduction and Context

Climate change is increasingly considered an important factor in meeting sustainable development objectives – growing an economy, reducing poverty, etc. Developing countries are anticipated to feel the greatest impacts from these shifts, in part due to their largely agrarian nature and the stresses agriculture will face from sub-optimal growing conditions (IPCC 2014). It is not an entirely bleak scenario, and considerable opportunity still exists to build up the resilience of communities at risk and improve the ability to adapt in the future. Understanding what underlies vulnerability to climate change is crucial to developing these successful adaptation strategies and preparing for uncertainty. Among the factors considered to increase vulnerability, gender inequities are often cited as hindering sustainable development processes, and women are singled out as a ‘vulnerable’ population (Beuchelt & Badstue 2013). Furthermore, consideration for women in agriculture is particularly important on the African continent, one already feeling the strains from climate changes, because of their roles on farms and in the households (Boserup 1970, p.18)

This dissertation aims to link the discussions of climate change vulnerability and women in agriculture. Key themes are illustrated through a case study in Ghanaian cocoa, from which implications for environment, agriculture, and development policies can be derived. The rest of this introductory chapter frames the ensuing analysis and discussion, first introducing the key debates around climate change vulnerability and gender. It then briefly introduces the case study country’s geographic and policy context. This is followed by a summary of the guiding research questions and dissertation overview.

1.1 *Climate Change and Gender*

1.1.1 *Vulnerability and Adaptation*

The concept of vulnerability provides a useful tool for identifying the ways in which a system might experience climate change. At its core, vulnerability is the “susceptibility to be harmed”, and the concept usually consists of three components: *exposure* to a shock or long-term shift; the *sensitivity* of the system to the event or change; and the *capacity to adapt* to novel conditions (Adger 2006, p.269). Besides distinguishing how various members of a population experience distinct climatic events and trends differently (Carr & Thompson 2014), an understanding of vulnerability and the underpinning factors at a local level in a

particular population is important to inform adaptation strategies (Adger 2001). While vulnerability has its roots in the natural sciences, a small portion of vulnerability assessments have begun focusing on social vulnerability, and discussing risk as both a societal and biophysical phenomenon (Preston, et al. 2011; Wise, et al. 2014). Moreover, vulnerability has been tied to the persistence of poverty, in that the chronically poor have fewer liquid assets to buffer against shocks (Hulme & Shepherd 2003).

1.1.2 Climate and Gender Discourse

Gender issues have a long history within ‘Development’ scholarship, but only recently has the climate change literature begun to address gender equity. Some of the major areas of interest in the gender literature include land access and tenure, division of labour and income, information resources, and empowerment, all of which have implications under a changing climate. The gender and development school has also had decades to work through simplistic portrayals of women as impoverished and helpless or noble caretakers of the planet. With the adoption of gender analyses in climate change research, it seems those stereotypes are resurfacing with added vigour, particularly the notion that women are universally more at risk and unable to cope with the challenges that climate change presents. Critiques are now emerging in this new literature, warning against either romanticizing the capacity of women farmers or victimizing them, risking inadequate solutions (Arora-Jonsson 2011; Terry 2009). It is argued that greater representation of the heterogeneity among women is needed in assessing vulnerability.

1.2 Case Study: Central Region Ghana

Ghana presents an ideal case study to examine the intersection of climate change vulnerability, adaptation, and gender. For one, the gender context is unlike other regions of the world. African women have had a fair amount of autonomy (Boserup 1970, p.207), and Ghana is noted for the shifting rights and roles of women as the country undergoes an agrarian transition. In relation to opportunity for influencing policy and development, Ghana is politically stable and moving toward middle-income status (Sova, et al. 2014). The country is located in West Africa, a region already variable in climate and expected to become drier and more extreme (Niang, et al. 2014). Cocoa, the country’s major agricultural export and an important driver of growth, is notably limited in its climatic tolerances (Läderach, et al. 2013), making the impacts of climate change a challenge to address in earnest.

1.2.1 Cocoa and Climate Teaser

Cocoa is a crop operating on multiple scales – one of global importance for consumers and businesses and locally for the millions of small-scale cocoa farming households worldwide. For farmers in southern Ghana, cocoa is their primary income source and their livelihoods. The potential threats to cocoa's viability and possible implications over the next 30-50 years are of great interest and concern, not only from a business perspective but also from a national standpoint to maintain the country's current development trajectory. It will be critical to consider the types of modifications to the current agricultural system that the nation and its farming population should be prepared for.

A high dependency on specific climate conditions, and so much vested interest in the industry, would necessarily place climate change as a prominent and real concern among governments and businesses. In the few studies that have employed climate projections as a means to forecast impacts on the sector, the prognosis is a substantial decrease in suitability of the current West African growing areas by mid-century (Läderach, et al. 2013). Studies also indicate that there is time to make modifications to the sector and to farmers' livelihoods so that the negative impacts may not be felt as acutely. Identifying key risk factors and points of vulnerability is critical to determining how to respond.

1.2.2 Ghanaian Policy Context

Ghana has a rich policy environment around climate change, agriculture, and socio-economic development. Involvement in international processes and the decisions taken at the national level trickle down to the level of community and farm, and influence and are influenced by the realities there. Agriculture and development are seen as inescapably intertwined, and thus much of the government effort has focused on production and crop breeding efforts, dissemination of new hybrids, and technological advances as means of boosting productivity and the country's economic growth. A suite of policies touch on topics related to agriculture and development goals, including the Food and Agriculture Sector Development Policy (FASDEP II) and the Ghana Shared Growth and Development Agenda (GSGDA) (Sova, et al. 2014). These reflect an interest in developing certain crops (like cocoa), improving

marketing and processing capacities, and moving toward technologically advanced agriculture.

Ghana has also taken an active role in international climate change processes (e.g. signing onto the United Nations Framework Convention on Climate Change [UNFCCC]) and in developing domestic strategies that address the national circumstances (Cameron 2011). According to the communication to the UNFCCC, adherence to the convention is considered a means to further the country's economic development in a low carbon manner (Oppong-Boadi, et al. 2011). However, because of the continued reliance on international financial and technical assistance, Ghana runs the risk of conforming its official climate change actions to demands of foreign aid and donor preferences and priorities. The country did launch its National Climate Change Policy (NCCP) in 2014, which prioritizes social development, and highlights issues of poverty, equity, and gender (Sova, et al. 2014; MESTI 2013). Climate-smart cocoa is also being raised as a nationally important strategy for climate change mitigation. More to the point, all of the climate-related policies are in their infant stages, a perfect point at which to consider how to integrate local understanding of vulnerability and plan coordination with the existing agriculture and development policies.

1.3 *Driving Questions and Thesis Overview*

The various levels of policy and practice make for a challenge in aligning the needs and priorities of each in the face of climate change. At the heart of much of this in the Ghanaian context are the country's cocoa systems, and women have been elevated to a place of prominence in terms of climate and development policy. The remainder of this dissertation hones in on issues of climate change vulnerability, adaptation, and gender. The objective in examining these issues at a local level is to provide insight into how higher-level policies, programmes, and projects are constructed and implemented. Broadly speaking, the question of 'how could climate change impact the lives of women involved in the cocoa farming system?' guides this research. Three sub-questions serve to break this down further, while also addressing topics not well represented in the literature on climate change and gender.

1. In what ways are women in a cocoa production system vulnerable, given the anticipated effects of climate change?
2. How does vulnerability vary among women of different backgrounds and means within the farming communities?
3. What implications do the identified points of vulnerability have for policy and potential adaptation strategies?

1.3.1 How are women vulnerable?

In employing a vulnerability framework and focusing on variables of importance in gender analysis, it has also become clear how interrelated are all the variables, and how the interactions (of both biophysical and socio-economic factors) are what ultimately impact vulnerability to climate change. While there is still considerable uncertainty as to the timing and severity of exposure to climate change, the social variables dictating sensitivity and adaptive capacity will be crucial to reducing vulnerability to any extreme weather event or long-term climate changes. In fact, topics such as access to land, the success of income-generating activities, and information and extension services received much more attention in terms of affecting the resilience of a woman's daily life and livelihood, than did the weather.

1.3.2 How does vulnerability vary among women?

The gender and development literature stressed the need to acknowledge heterogeneity within demographic groups. In this case study, the role of land and access to cocoa farms distinguished between groups of women. There were indications that this access played a critical role in mobilizing funds, fostering optimism and long-term planning, and improved accessibility of formal information sources. While impossible to say definitively who is 'vulnerable' and not, women who focused on food crops tended to have flexibility to make relatively rapid modifications and 'cope' with shocks; whereas women managing cocoa farms had to take longer-term perspectives, but could also operate on a similar timescale to climate change. Ultimately, it is important to acknowledge this within-demographic diversity, because different adaptation strategies and support programmes may best serve only subsets of the population.

1.3.3 *What are the policy implications?*

It is clear from the active role that Ghana has played in international negotiations, regional and continental coordinating bodies, and national-level policy development, that there is an understanding of how to operate in international development and policy circles. Yet there is a recognized distance between those who develop adaptation strategies, plans, and policies (and also dictate the use of associated national and international funds) and the needs for adaptation support on the ground (Ribot 2010). As nascent climate and development policies move forward from paper to practice, how well the policy translates in implementation has yet to be seen. There is still considerable opportunity for ensuring this success, and for integrating lessons from this, and other, local-level studies into implementation plans. This case study demonstrates how important a local understanding is for determining the array of potential, and even necessary, adaptation strategies.

1.3.4 *Dissertation Roadmap*

The chapters that follow will more thoroughly strive to answer the questions laid out above (Figure 1.1). Chapter Two reviews literature on vulnerability, adaptation, gender, and development to establish theoretical underpinnings and develop the conceptual framework for subsequent chapters. It also takes a more critical look at the current discourse on gender and climate change. Chapter Three provides additional background on the cocoa industry and climate change, and the specific circumstances (political and biophysical) in Ghana. Chapter Four sets up the conceptual framework based on the literature on vulnerability and gender, and details the research methods and case study site. Results from fieldwork in the case study region are discussed in the subsequent two chapters. Chapter Five focuses on the biophysical factors and the ‘exposure’ component of vulnerability, drawing on both projections of climate change and farmers’ perceptions and experiences of weather. Chapter Six, concentrates on social and economic factors that relate to the ‘sensitivity’ and ‘adaptive capacity’ elements of vulnerability. While the distinction between biophysical and social vulnerability is artificial, discussing the component pieces separately allows for clear treatment of each before bringing them back together. Finally, Chapter Seven revisits the research questions posed here, tying the results to the current policy environment in Ghana. The dissertation concludes by pointing to future areas of related research.

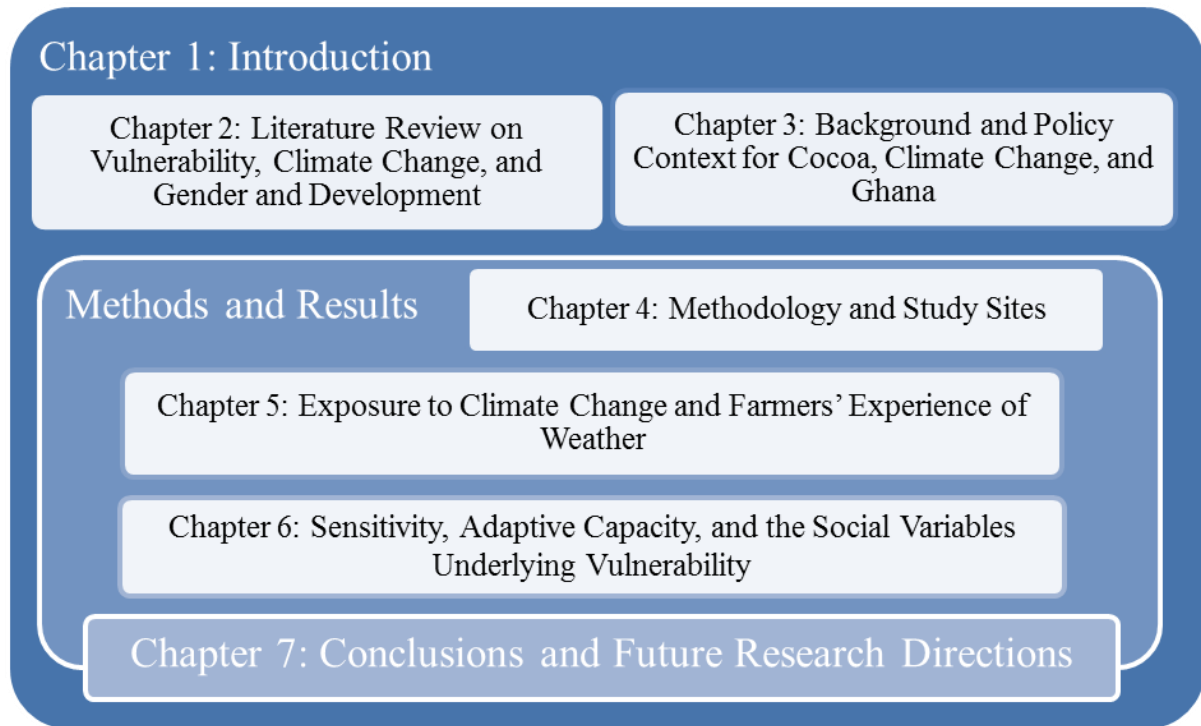


Figure 1.1 Overview of dissertation structure and the basic content of each chapter.

2. Chapter 2: Climate Change Vulnerability, Adaptation, and Women Farmers

The literature on vulnerability and adaptation has served as a means to examine the risks and human responses to climate change. Gender is one of the factors affecting vulnerability generally, and yet has for the most part remained absent in climate-related literature until recently. This chapter reviews the literature on origins and conceptualizations of climate change vulnerability and adaptation, and scholarship on gender and development. The literature to date has not been well integrated, and so the chapter will conclude by drawing linkages between the two literature bases, and then take a critical look at recent literature on gender and climate change. This review forms the base for a conceptual framework that guides the case study analysis.

While the specific magnitude and extent of climate change impacts is still shrouded in uncertainty, especially here in the context of West Africa, this framework allows for insight into points of vulnerability that will be important, regardless of how climate change manifests. In fact, Adger, et al. (2004) are less concerned with a detailed knowledge of future climate, and moreso with actions that will increase the general resilience of societies to the range of threats they might face. Considering the full implications of climate change cannot be wholly explained through biophysical factors, actions for resilience must include other social, cultural, and economic dimensions. Much of the published literature reviewed here has been undertaken in Africa, and studies in West Africa and Ghana were of particular interest and relevance for this work.

2.1 *Responding to Variability and Change*

Conceptualizations of vulnerability and adaptation have surfaced in disparate fields to describe ecological and anthropogenic risks and responses to environmental stress, shocks, and change. These terms have found use in describing and analysing situations in which climate change is or will be a factor in people's lives. Early examples of such an application are found in the Intergovernmental Panel on Climate Change (IPCC) Working Group II assessment reports on adaptation and vulnerability in the mid-1990's.

2.1.1 Conceptualizing Vulnerability

In the most recent IPCC assessment report (AR5), the authors define vulnerability as the “propensity or predisposition to be adversely affected” by climate change, and vulnerable socio-ecological systems as experiencing “hazardous climatic or non-climatic events and trends” (Oppenheimer, et al. 2014, p.1050). Prominent uses of vulnerability have historically been found in the scholarship on ‘entitlements’ or ‘natural hazards’ and disaster risk management. The latter, also considered a “geocentric” approach, adopts a linear cause and effect model rooted in the physical science. In this approach, a biophysical event or phenomenon results in certain risks and possible loss experienced by a target population (Füssel 2007). Eakin & Luers (2006) provide an example of vulnerability in Asian cropping systems, in which crop models projected a certain amount of impact due to climate-related events. While this process is straight-forward, research on natural hazards has also demonstrated how events like earthquakes and tsunamis (as well as social and political upheaval) have heterogeneous impacts on different societal groups (Adger 2006). Approaching the impacts of climate change through a natural hazards lens has been a logical step, although Füssel (2007) points out long-termism, a dynamic nature, and high uncertainty are characteristics that distinguish climate change from natural disasters.

Entitlements, considered the “anthropocentric” side of the equation, focus primarily on the social realm and frame vulnerability in terms of access to resources, dictated by class, gender, and other social factors (Adger 2006). This school of thought is often framed as an issue of equity and justice, where the rights and opportunities afforded to individuals and groups (e.g. education, technology, decision-making) shape their respective vulnerabilities (Eakin & Luers 2006; O’Brien 2007; Pérez, et al. 2014). Füssel (2007) constructs vulnerability in terms of ‘entitlements’ as an interplay of external structural factors (e.g. rights and opportunities) and internal agency (stemming from access to assets, etc.). With respect to its application to climate change vulnerability, entitlements along with roles and responsibilities associated with an individual’s social standing serve as one of the (if not primary) influences affecting vulnerability (Carr, et al. 2014).

Though harbouring minor variations, the suite of definitions conceptualize vulnerability in a similar fashion, as composed of three elements: the *exposure* of a system to one or multiple stresses, a measure of how *sensitive* it is to the impacts, and its *capacity* to respond and adapt

(Adger 2006; Bohle, et al. 1994; Eakin & Luers 2006; Füssel 2007; Gallopín 2006; Janssen 2007). For climate change, Führer and Gregory (2014) posit vulnerability is a function of the character, magnitude, and rate of climate change and variation (all related to exposure), as well as sensitivity and adaptive capacity of the system in question (p.3). Moreover, Bohle, et al. (1994) suggest that when applying vulnerability to climate change, it is necessary to take a temporal approach: understand current vulnerability; assess trends and potential risks of climatic variations; and have a sense of feasible responses and pathways to build resilience and respond to impacts.

Exposure refers generally to the “degree, duration, and/or extent” to which a system might experience an acute shock or prolonged stress (Gallopín 2006, p.296). Some definitions are limited to environmental perturbations, while others include socio-political strains (Adger 2006). Individuals may experience the same shocks with differential impacts, or due to contextual factors, may be exposed to different shocks entirely (Oppenheimer, et al. 2014). The impact of climate change will depend on the agro-ecological zone and current climate, as well as non-climatic factors, including socio-economics, trade, institutions, and geography (Dinar, et al. 2008, p.127). Sensitivity provides an evaluation of the level at which a system experiences or is affected/modified by a perturbation or climatic stimulus (Gallopín 2006). As is evident from this description, sensitivity is inherently tied to exposure (Smit & Wandel 2006), and is almost inseparable at the household level on which it is often assessed (Eakin & Bojórquez-Tapia 2008). It is determined by internal properties of a system, dependent on context and characteristics of the system in question (Brooks, et al. 2005).

Adaptive capacity is the final factor included in discussions of vulnerability, and is generally considered the ability to adjust to a disturbance, moderate potential damage, and utilize opportunities to cope with consequences (Brooks, et al. 2005; Gallopín 2006). Accessibility of assets (natural, socio-political, human, physical, and financial capitals) affects the ability to respond or adapt to environmental change, stress, or shocks (Cooper, et al. 2008; Pérez, et al. 2014). These authors also argue it is well documented that a diversified asset base correlates with more resilient livelihoods. As such, indicators of adaptive capacity often include access to information, technology, wealth and finance, and institutional resources (e.g. subsidies or external support) (Eakin & Bojórquez-Tapia 2008).

2.1.2 *Vulnerability and Climate Change*

Vulnerability is useful in the context of climate change, as it can be employed as a metric to distinguish and target vulnerable individuals or groups. Carr and Thompson (2014) articulate this utility, introducing the concepts of ‘differentiated vulnerabilities’ - where different members of a population experience impacts of the same event or trend differently - and ‘distinct vulnerabilities’ - where members of a population experience discrete events or trends. It is therefore important to recognize that in addition to biophysical, political, economic, social, cultural, and institutional conditions combined are what explain variation in vulnerability of socio-ecological systems to climate change (Eakin & Luers 2006). For example, Adger (2006) implicates adequate income and wealth in ability to handle system shocks and recover from or adapt to them, linking decreased livelihood resilience to vulnerability. This is echoed by Hulme and Shepherd (2003), who note that the chronically poor are constrained by multiple factors and don’t have the liquid assets to buffer against shocks. In conceptualising climate change in the African context, Bob and Babugura (2014) argue that an individual’s access to land and natural resources is a key factor in determining vulnerability to climate change.

Increasingly, there is recognition of the interdisciplinary nature of vulnerability, which extends beyond biophysical impacts and the technical capacity of a system to respond (Engle 2011). As Tschakert & Mochada (2012) remark, taking a purely scientific and technological perspective of climate change is "inherently flawed" (p.277). Employing a social definition of vulnerability builds on the more traditional study of Natural Hazards, looking at interactions between ecological and economic factors, and allows for the inclusions of other variables (e.g. productive resources or social protections) that contribute to human vulnerability (Rodenberg, 2009, p.15). Ultimately, how we assess vulnerability influences where and in what forms adaptation strategies may occur. While the ensuing chapters focus mainly on women within a cocoa farming system, the theory is broadly applicable and serves to inform a large set of adaptive measures.

2.1.3 *Vulnerability Informing Adaptation*

Adaptation and vulnerability are closely related and interacting concepts, as employed in climate change research and practice. Like vulnerability, adaptation has roots in the natural sciences, with more recent applications of the term to socio-ecological and anthropogenic

systems. Adaptation originates from evolutionary biology, in which certain genetic or behavioural traits are seen to allow an organism to “adapt” to environmental changes (Smit & Wandel 2006). Anthropology adopted the notion of “cultural adaptation” to explain adjustments in subsistence activities of human populations, and the term has since appeared throughout social sciences scholarship, including research into political ecology, entitlements, and food security (Smit & Wandel 2006). In relation to climate change, framing continues to shift to include socio-economic considerations and underlying causes of vulnerability (Noble, et al. 2014). For instance, Twomlow, et al.’s (2008) definition of adaptation includes changes in management activities, institutional settings, and infrastructure in order to effectively respond to climatic changes.

The adaptation literature distinguishes between ‘coping’, generally considered short-term strategies for managing shocks, and ‘adaptation’, which covers a longer time period and more enduring changes (Terry 2009). Cooper, et al. (2008) describe coping as “risk spreading” that mitigates the negative impacts of a bad season. Inquiries into past responses to change likely reveal coping strategies, which are then used to inform potential adaptations (p.27). Burke and Lobell (2010) argue that year-to-year changes in climate variables can provide insight into longer run climate change adaptation, especially considering responses to past weather events provide some of the only evidence available to illustrate a farmer’s possible responses to climate change (p.134).¹

Examples of adaptation mechanisms include insurance (e.g. crop, weather index-based); crop, livestock, and income source diversification; changing intensity and sequence of production practices; improving nutrient and pest control management; developing new and modernized technologies; and temporary migration (Dinar, et al. 2008, pp.136-139). Diversification of production systems and livelihood options is also a widely accepted strategy to cope with variability (Twomlow, et al. 2008). Many of these strategies, however, also require certain requisite resources to begin with.

¹ Weather refers to atmospheric conditions occurring at a point in time, and usually on short time scales. Climate is on a longer time scale, describing averages and trends in conditions (Climate Impacts Group, <http://cses.washington.edu/cig/pnwc/weathervsclimate.shtml>, Accessed 2 August 2015).

As noted earlier, vulnerability and the variables underlying it dictate what adaptation strategies are necessary and possible in a given circumstance. Adaptation requires information on vulnerability in order to elucidate the options to reduce risks, respond to vulnerability, and build capacity (Noble, et al. 2014; Smit & Wandel 2006). For example, Crane, et al. (2011) describe a case in Mali in which farmers planned for seeds, labour, and soil in a way that maintained flexibility in the face of future uncertainty. However, the social history and constructs of ethnic identity influenced what technical solutions were acceptable (e.g. diversification is not accepted in Fulani farming). One difficulty of farmers' "socially embedded and incremental approach to adaptation" is that only minor shifts occurred, which may not be adequate for rapid or long-term climate change (Crane, et al., p.185).

Tschakert & Mochada (2012) critique the "dominant discourse" of adaptation as functioning as a bandage rather than addressing underlying vulnerabilities and inequalities that shape that ability to adapt. These inequalities become visible through an understanding of vulnerability and in studies of factors affecting adaptation decisions. For instance, crop diversification, changes in farming practices and timing, and shifting land use were employed by both men and women in a Benin study; however, men were better placed to change land use and farming practices since they often have control over major assets such as land and equipment (Yegbemey, et al. 2013).

2.2 *Dominant Discourses in the Gender, Development, and Agriculture Literature*

Within the climate change literature, identifying the vulnerabilities of and within populations is depicted as essential to developing adaptation strategies. While gender is seen as one factor within the vulnerability discourse, climate change is a relative newcomer to the gender and development table, which has a longer history of scholarship. This section will delve further into the background of the gender and development field, and expand upon issues of prominence for vulnerability, including access to land, labour division and income, education and extension, and decision-making and empowerment. This review also touches on the dichotomous portrayal of women as impoverished and helpless versus noble caretakers of the Earth.

2.2.1 *Foundations*

Gender dimensions, and particularly the role of women, have been part of conversations in the field of development since the middle of the 20th century. Gender analysis within development studies responded to a recognition that benefits from the economic projects were not accruing (or “trickling” down) to the poor and women (Lambrou 2001). Since that time, research and practice has continued incorporating and evolving values and understanding attached to the condition of men and women (Momsen 2010, pp.12-15). Ester Boserup’s (1970) ground-breaking work on women’s role in economic development is still recognized as providing the foundations for the entire field of gender and development, crafting many of the theoretical underpinnings for studying gendered differences related to labour, education, financial resources, etc. (Cornwall 2005, p.7; Momsen 2010, p.11). The decades of gender research has thus deepened understanding of how development processes affect men and women differently.

Historically, there have been two rather disparate framings of women in development - one as victim and one as caretaker - that until recently have not benefited from more nuanced and context-specific appraisal. Arora-Jonsson (2011) criticizes the ‘feminisation of poverty’ hypothesis, which assumes that most poor people are women rather than elucidating finer resolution variations in the experience of poverty. She adopts a skeptical view of blindly accepting assumptions that all women are poor, which implies that alleviating poverty will lead to gender equality, and that poor people are always more vulnerable. Tuana (2013) elaborates on these points, warning against fall characterizing all women as vulnerable with little voice, when there is incomplete evidence that 70% of poor are in fact women (p.29).

Since the 1980’s, the Women, Environment, and Development (WED) discourse has also gained traction, raising women up as caretakers of the environment: closer to nature, more knowledgeable about natural resources, and most at risk from environmental degradation (Bob & Babugura 2014). WED scholarship rose up at that time in alignment with “ecofeminist” mentality that women’s subjugation is linked to environmental degradation (Resurrección 2013). These views built on two different schools of thought: one following the stereotypic characteristics of women as nurturing and maternal, peaceful and spiritual, and the other grounded in a gendered division of labour and a woman’s reduced capacity to

protect herself (Rodenberg 2009, p.11). While some WED scholars argue that this movement has helped to “strengthen the process of women’s self-organization” and empowerment (Rodenberg 2009, p.10), it has also perpetuated an idealized image of rural women.

Despite these two polarized discourses, gender scholars have also worked over the decades to counter simplistic binaries of men versus women. The discourse has thus evolved to consider ‘gender’ as the interactions between and within groups of men and women, and as a socially-constructed rather than purely biological identity (Carr & Thompson 2014). Cornwall (2005) raises an important critique of the assumption that the sexes are homogenous and united entities, arguing that relationships between women could be equally if not more important – in terms of hierarchy and exploitation – and could ultimately undermine the “myth of female solidarity” (p.4). Arora-Jonsson (2011) also refutes representation of women as a homogenous, marginalized, and suffering group, arguing that “women can be rich or poor, urban or rural, from different ethnicities, nationalities, households and families all of which produce specific results” (p.749).

Feminist post-structural approaches to gender and development promote a gender typology that moves away from this traditional generalizable woman and considers individuals in context of place and time (Carr 2008; Rodenberg 2009, p.15). This progression in the construction of gender is critical because of how much of the discourse around gender and development hinges on a set of risks and vulnerabilities. If one considers vulnerabilities may be ‘differentiated’, where the same event affects members of a community differently, and ‘distinct’ in that members of the community are exposed to and experience different events, there is bound to be variation within and between groups of men and women. Carr & Thompson (2014) illustrate the implications of this, noting that “the vulnerability of a wealthy woman’s livelihoods to climate variability may have more in common with that of a wealthy man than it does with the vulnerability of a poor woman’s livelihoods” (p.183).

Certain themes have arisen in the gender and development literature that have implications for climate change adaptation, and could serve as indicators within a vulnerability framework. These include unequal participation in land holding and cash crops (see section 2.2.2); the “invisible” nature of women’s agricultural work (related to gendered division of

labour, section 2.2.3); access to education and extension services (section 2.2.5); and the influence of economic autonomy in marriage (with consequences in decision-making, section 2.2.4) (Cornwall 2005, p.7). The remainder of this section will elaborate on these themes, which will be further examined with more specificity to the case study in the results chapters.

2.2.2 *Land Access and Tenure*

Access to land and the security of tenure is a topic that arises often in gender and development literature, and is included as a component of gender analysis. It has implications for labour responsibilities, income sources, and autonomy. According to FAO (2011), women in developing countries are less likely to own, operate, or rent land, though this varies considerably by region. Meinzen-Dick, et al. (2014) suggest that many women have access to ‘use rights’ on the land of a husband, father, or other relative, but this precludes long-term investments. Furthermore, what land women do hold is consistently smaller in size and of poorer quality (FAO 2011).

Various barriers to land ownership exist. In some cases there are hurdles in national or customary law in terms of the right to inherit or purchased land. In sub-Saharan Africa, the right to use land is often controlled by families and their heads and thus a woman’s access to land usually depends on the inclinations of the head of her own or her husband’s family; in many cases a husband might be expected to allocate a portion of land to his wife (Bryson 2007). Because traditional tenure systems often do result in women managing land, some criticisms of recent reforms have cited the erosion of customary land rights in favour of formal legal land titles given to household heads as actually worsening women’s access to land (Bryson 2007; FAO 2011)

Even under circumstances where legal systems support a woman’s ability to hold land, other factors make this difficult or even impossible. An analysis in Ethiopia found that lack of ownership of plough animals and cultural taboos against certain necessary farm tasks explained the lack of success implementing new legal rights for women (Holmes & Jones 2009). Finally, differential access to land and security of tenure arises repeatedly in the gender and development literature as contributing to the uptake of certain roles, and as a rationale for why it’s difficult for women to produce higher yields or earn higher incomes

(CTA 1999; Farnworth 2013). Land is a critical, even necessary, asset to obtain a loan or productive resources, but also to participating in decision-making processes both at household and community governance levels (Namubiru-Mwaura 2014). Studies have also shown that land ownership is correlated to increased food expenditure and childhood educational opportunities, contributors to development goals and poverty reduction.

In Ghana, cocoa is particularly salient to this discussion, because it is a perennial and long-lived tree crop and disproportionately grown by male farmers; therefore land access and tenure would both be long-sighted and gendered (Akyeampong & Fofack 2014; Clark 2000, p.253; Doss 2002). The country's land tenure and inheritance system is complex, varies by ethnicity, and has evolved over time (Ackah & Lay 2009). Traditionally, the *Akan* matrilineal language group that dominates the cocoa-producing south encouraged a husband to allocate a portion of land to his wife to protect against loss of livelihood upon his death (Asare 1995, p.106). In addition to this form as a gift, a woman could gain access to her own cocoa farm by grant from the chief or inheritance. The land tended to be significantly smaller than for men, dictated by the acreage her kin allowed her to have, her ability to compel people to work for her, and other draws on her time (Grier 1992). Outside of this, it was difficult for a woman to gather enough capital to purchase land of her own, let alone hire labour and feed a family (Clark 2000, p.259). According to Vigneri and Holmes (2009), women comprise only 20% of Ghanaian cocoa farmers, and in all areas and over time women's holdings are smaller than men's (Oppong, Okali, & Houghton 1975). Yet it is also understood that, despite apparent gendered nature of crops, women do control cocoa farms.

2.2.3 Division of Labour and Income Sources

Division of labour between males and females, and its implications for wellbeing and poverty alleviation, is a central theme of the gender and development literature. In theory, clear delineations of responsibility among men and women exist, in part or whole due to biological characteristics and constraints as a result of the differential reproductive demands placed on men and women. The nature of childbearing and rearing has more naturally placed women in “repetitive, interruptible, non-dangerous tasks” that don't require venturing far from the home (Guyer 1980, p.356). Due to these constraints, many of the activities in which women participate won't necessarily generate income and thus will not register in census or other

data collection. Women's time is engaged by occupations that carry low prestige and are "invisible" to economic statistics, contributing to an underestimation of time and effort spent on constructive tasks (Duncan 2004, p.xv). Through work carried out in Ghana, Duncan (2004) depicts these "invisible" pre- and post-farm activities as things like cooking and childcare, as well as processing palm oil and *gari* (from cassava root) for household use - activities that incur an opportunity cost of time that could be spent on other income-generating pursuits (p.26).

While the actual breakdown of daily tasks is geographically and culturally determined, common themes do arise across studies. Clearing of land and heavy weeding (that which requires the use of a machet ) falls into men's domain, while women may sow, harvest, store, and transport agricultural products, as well as carry out household activities (Duncan 2004, p.67). Within the African context, it is widely accepted that women play a central role in smallholder farming systems, serving as the dominant figure in food crop production and some minor market sales (Boserup 1970, p.10; Doss 2002). A woman's domain tends to be devoted to sowing tomatoes, pepper, okra, eggplant, and other vegetables on a small plot of family or her husband's land (Greenstreet 1981, p.10). Boserup (1970) raises the issue that though a woman may retain the right to grow food on land belonging to her husband, she is not an independent cultivator growing on land in her possession, and thus could be merely in a transitory position (p.48). Not surprisingly, the respective division of labour is put forward as both a product and a driver of the marginalization of women and of gender inequality within society (Momsen 2004, p.16; Rodenberg 2009, p.11).

Considered a product of its geography, European influences (specifically the establishment of industry drawing men away from farms), and history, West African agriculture has been female-dominated, with men in many parts only involved in the clearing of land (Baumann 1928). Trade is one domain in which women represent the majority of actors. Statistics dating back to the 1960's from Ghana show women comprising 80% of the trade labour force, in both village and urban settings (Boserup 1970, p.75). This revolves mostly around food products (e.g. grains, vegetables, fish), in areas characterized by female farming traditions (p.79). Similarly, according to a study in Kenya during the 1960's and 1970's, informal market sales of surplus food crops are one of the main sources of income for rural women (Okeyo 1979). While some women sell their own produce, others buy from multiple

individual rural farmers and sell in more urban areas. Some women specialize in fish, purchasing stock in areas of high supply and selling in areas of high demand, often smoking them first. The income generated from market activities tends to be less than what is possible from exportable cash crops, yet will contribute to household and personal expenses (not usually school fees) (Okeyo 1979).

In the context of southern Ghana, the dominance of cocoa production elevates the importance of commodity and cash crop agriculture. Cash crops are those intended for sale in formal markets, and require engagement in output markets to sell either domestically or for export (Hill & Vignieri 2009). A distinction should be made between those crops grown exclusively for sale (e.g. plantation crops) and those sold when there is a marketable surplus. Researchers have argued that the introduction and prioritization of cash crops for export, often tied to European colonialism, shifted traditional distributions of labour and rewards within agriculture, presented additional constraints and opportunities for income generation, and influenced the balance of power within and between households (Boserup 1970, p.42; Due 1982; Duncan 2004, p.32; Tosh 1980). As a consequence, the bulk of instruction on new methods, varieties, and technologies that emerged targeted these crops, and thus had little relevance to women who did not control the cash crops.

The “hidden” nature of women’s labour also surfaces in the context of the cocoa economy, often as unpaid labour on husbands’ farms (Barrientos 2013). Similarly, there is a division of labour - women’s activities are particularly concentrated in planting, young plant care, pod breaking, carrying, fermenting and drying of cocoa, while men do the initial land preparation, pruning, chemical applications, and selling. For those involved, cocoa farming is an important and often lucrative economic pursuit, representing over three quarters of income for its producers (Vigneri & Holmes 2009). Consequently, because men most often control the monetary gains from cash crops, women may not see any direct benefit to their lives and livelihoods from an increase in income from cocoa.

Farmers may choose to diversify because of the impression that farming is not adequate or one activity is not enough on which to live, or that it reduces risks especially for women who don’t necessarily control all the income they generate (CTA 1999). Some research shows that

men have a higher chance of diversifying both crop varieties and income source types (Oyekale & Oladele 2012). Due to their generally greater control over land and assets, men are often better positioned to make changes to crops, management practices, and investments, as Yegbemey, et al. (2013) point out in a case study of Northern Benin. However, the multiple demands placed on a woman, the associated threats from losing a valuable income source, and a desire to keep financial independence from their husbands, often necessitate women engaging in more than one venture (Barrett, et al. 2001; Eriksen, et al. 2005).

While decades of research on 'women and development' has provided considerable insight into the different roles men and women play, the static nature of these labour divisions continues to be a point of contention. Boserup (1970) posited that growing population densities and shifts to more intensive cultivation and thus different labour requirements (p.22), and a modernization of economies (p.212) would necessitate evolution of gendered labour divisions. Songsore (2012) illustrates how rigid rules dictating labour division have continued to shift in Ghana, as time and new circumstances demand (p.141). Barrientos (2013) notes that such division of labour in cocoa farming are blurred, especially as other pressures on men's time emerge. Tschakert & Mochada (2012) argue that this notion of fixed gender roles, especially ones considered points of vulnerability, is an essentially flawed assumption. One would imagine that within the dynamics of daily life, and as shifting climatic conditions present new challenges and opportunities, that current roles would evolve to meet emerging needs. This possible mobility is especially important in the context of climate change, where novel conditions and consequent needs are likely to arise.

2.2.4 Decision-Making and Empowerment

Power dynamics within decision-making responsibilities are an addendum to the division of labour, but one that holds particular significance for empowerment. Unequal distribution of power manifests in the access to, and control and allocation of resources, household tasks, and economic activities (Songsore 2012, p.135). Carr & Thompson (2014) stress the sound evidence of the pervasive and enduring lack of decision-making power for women, at various scales. This is not just about on-farm management decisions, but also those related to selling, mobility, and the like. In addition to undertaking the more physically demanding work, men

consulted in a study of the Greater Accra Metropolitan Area claimed responsibility for making decisions on production, reproduction, and maintenance (Songsore 2012, p.141).

Increased control (e.g. over resources and land, decision-making) is also linked with greater agency (Seebens 2010), which in turn could counter marginalization and reduce levels of vulnerability. The cocoa system in southern Ghana can serve as an example, differing from subsistence agriculture in that it is dominated by male involvement in the decision-making, production, and sale (Hill & Vigneri 2009). Researchers have attributed some responsibility of women farmers' marginalization, their loss of power and status, to shifts from subsistence agriculture to cash crop economies (Cornwall 2005, p.7; Duncan 2004, p.xv). Hill & Vigneri (2009) review constraints women face in engaging in cash crop economies. These include access mainly to small plots of land (making it difficult to reach necessary scale); insecure tenure (disincentivizing long-term investment and making it more difficult to provide collateral for credit); fewer external labour resources at-hand; lower utilization of sprays, fertilizers, and improved seed varieties (due to barriers of credit, extension, and social networks). While generally important, these factors are even more critical in a cash crop system where yield, quality, and consistency are paramount.

One of the tensions Kabeer (2005) described is between perceived alternatives and ones that could actually be possible. Research has shown that support structures like community groups can aid in aligning the perceived and possible. For example, a community-based trust to manage natural resources formed by women in Botswana, the *KgetsiyaT-sie* (KyT), aided members at local scales in accessing resources and new skills and training (Ketlhoilwe 2013). The study demonstrated how members of the group were proactively building strategies to protect themselves and reduce the impacts of climate change. Finally, empowerment is usually framed as enhancing productivity or means to obtain tangible assets, yet there is growing acceptance for the importance of perceptions and attitudes (Momsen 2010, p.14-15). A rise in self-confidence and self-esteem is anticipated to encourage more active participation in decisions and exertions of control.

2.2.5 *Education and Extension*

Formal education opportunities for girls and the accessibility of information services, such as agricultural extension, are issues raised repeatedly in gender and development literature (Boserup 1970, p.200; CTA 1999; Duncan 2004, p.80; Meinzen-Dick, et al. 2014). While the former is often held as pivotal to managing challenges of poverty, population growth, and well-being, the latter is of immediate concern for women managing or working on farms and their potential for improvement. Extension and development projects are often geared towards the needs of men (Carr & Thompson 2014). A study in Senegal demonstrated that women farmers still desire access to such crucial information as the onset, length, and cessation of rainy seasons, the distribution of rainfall, and warnings about extreme events (Tall, et al. 2014). Moreover, women perceive information resources as a main constraining factor to sustainable agricultural production (Siulemba & Moodley 2014).

Due (1982) notes that “Women have been largely excluded in the past from other areas of informal education, especially in any training related to their work in agriculture, even though they play such a major role in total food output, animal husbandry, and marketing” (p.6). She provides statistics from western Kenya demonstrating the comparably few extension service visits and participation in training sessions for female farm managers versus male (Staudt 1976 cited by Due 1982). Similarly, while Duncan (2004) notes that access to extension in Ghana is overall generally low, the situation is even worse for women (p.81). This can be attributed to a shortage of qualified extension agents and a bias towards commercial farmers, with an estimated only 4.3% women receiving any formal extension (p.80). Women’s continued use of “traditional” instead of “modern” methods for crop cultivation is often attributed to difficulty accessing training in farming (Greenstreet 1981, p.19). However, it is important to consider how this could be minimizing the importance of local and observational knowledge, as well as elevating technologically driven agriculture and development. Research is only beginning to address how traditional and technological knowledge can be put to use in tandem (Newsham & Thomas 2011).

2.3 *Bridging Climate Change and Gender Literatures*

Because of how climate change adaptation is conceptualized in terms of risk and vulnerability, and how research on gender and development draws out themes of inequality,

rights, and access, the study of the two together is complementary. The research explicitly linking climate, gender, and development (including poverty and agriculture) has only really emerged in the past five years (Bob & Babugura 2014; Chaudhury, et al. 2012; Demetriades & Esplen 2008). Climate change is one factor for which Boserup (1970) could not have fully accounted in the early conceptualisations of gender and development research, but many of the themes she and others have raised are important considerations for climate vulnerability and potential adaptation measures. One of the reasons it is critically important to consider the interconnections between these two literature bases and their associated accumulation of experiences is that, just as it exacerbates the challenges in already degraded or compromised ecosystems and landscapes, climate change will likely enhance already existing social inequalities and impeding capacity to adapt (Demetriades & Esplen 2008; Rodenberg 2009, p.25). As such, without considering where the current discrepancies are, it will be difficult to identify what impacts may be attributed to climate change (Carr & Thompson 2014). Climate is just one of many factors contributing to the vulnerability of smallholder farmers, and should be considered along with the broader context of livelihood constraints (Okali & Naess 2013; Pérez, et al. 2014). This section will present the literature addressing both climate change and gender, and comment on some of the current shortfalls in its representation.

2.3.1 The New Climate Change and Gender Literature

Of the IPCC reports, only the most recent (AR5) in 2014 has included gender as more than a passing reference, devoting a 'box' to the topic (Vincent, et al. 2014). Gender is considered to be a significant factor in vulnerability during and after climate events (Alston 2014). This is largely attributed to issues of access and control to certain factors, limited for women, that are also considered to increase vulnerability: natural resources, information, decision-making, educational and employment opportunities, and land. Of the analyses that have taken place and research projects underway on climate change and gender, many have emerged from outside of academic peer-review and remain largely situated in the form of working papers, project reports, and policy papers (e.g. Chaudhury, et al. 2012; FAO 2011; González, et al. 2011; Jost, et al. 2014; Lambrou & Piana 2006; McOmber, et al. 2013; Naab & Koranteng 2012; Okali & Naess 2013; Perez, et al. 2014). MacGregor (2010) corroborates this, noting that at the time of writing the limited research on gender and climate change was carried out only by a few Women, Environment, and Development (WED) scholars, within United Nations agencies (and now largely the Consultative Group on International Agricultural

Research), as part of non-profit campaigns, and not reaching into broader research circles in climate and development. For this reason, literature outside of peer-reviewed academic journals features more prominently in this section, and provides a flavour of who has actively been working in this space.

Looking back on the early 2000's, Denton (2002a &b) discusses the growing importance of linking gender and climate change in development research and practice (though acknowledges a lack of evidence of differential impacts). Early climate change literature focused on aggregate and biophysical impacts from climate model predictions, and largely on mitigation measures and market mechanisms. Thus developing countries' roles were relegated to the Clean Development Mechanism, side-lining adaptation measures along with gender and other social justice issues. Rodenberg (2009) argues that while gender may not have been part of climate conversations until recently, it has framed certain development debates for many years (p.9). Moreover, there are conspicuous parallels between the two literature bases in their treatment of risks and vulnerable populations. Women are generally speaking considered a vulnerable subset of the population, based on the factors discussed in previous sections (Bee, et al. 2013, p.97; Bob & Babugura 2014; Terry 2009). Chaudhury, et al. (2012) corroborate this stating "rural women often face higher levels of poverty and have less education...likely to be less resilient to a changing climate" (p.3).

Several studies in Africa have chosen to examine gendered consequences of climate change through the lens of vulnerability. From research undertaken in Burkina Faso, González, et al. (2011) articulates several reasons for women's higher vulnerability: dependency on natural resource; lack of control over land; limited access to a good education, agricultural training, the appropriate tools or other inputs, and credit; excessive demands on time from both farming and household responsibilities; and exclusion from decision-making. Similarly, a multi-country study in Africa showed that women controlled less and poorer quality land, utilized fewer improved agricultural technologies and practices, and had less access to education and extension services, all factors negatively impacting their vulnerability to climate change and potential to adapt (Pérez, et al. 2014). Tschakert & Mochada (2012) also articulate that while droughts, floods, and heatwaves impact both men and women,

historically rooted practices and power structures dictate how each experiences these events in actuality.

These studies also illustrate the one-dimensionality of the study of climate change and gender, and how the literature has been able to perpetuate a generalizable female climate 'victim'. Denton (2002b) notes how diversity - both among 'women' of different classes, ethnicities, or regional affiliations and between geographies and communities - might influence the extent and severity of climate impacts. While warnings against type-casting women in developing countries as lacking agency and capacity is not new in more recent gender and development literature, such stereotypes persist (Tschakert & Mochada 2012). The critique does not seem to have been integrated into the novel discourse on climate change and gender, which has co-opted and continued to play upon the 'victim' image. Some critiques even suggest that the exploitation of gender by new climate change literature reverts to outdated depictions of weak, vulnerable, poor, and isolated women (Okali & Naess 2013).

2.3.2 *Victim or Virtuous?*

Looking back at the gender and development literature, Boserup's (1970) treatise tries to position women not as passive victims, but as vocal participants in asserting their rights and capabilities (p.vi). Bee, et al. (2013, p.97) notes a gradual shift in the climate change literature towards depictions of more autonomous decision-makers, though the current rhetoric still largely ignores the agency of women, placing them as passive victims. According to Lambrou (2001), women are depicted as "disadvantaged on all counts" by a large portion of literature on gender and development. In a reflection on the current state of the gender and climate change literature, MacGregor (2010) observes that "women" and "vulnerable" are most often co-located, and raises concerns over the bias in depiction of women in developing countries as "helpless, voiceless and largely unable to cope" (p.227). Moreover, she argues that the research on climate change and gender appears to centre largely on documenting empirically women's greater level of vulnerability and hardship.

There is some evidence to support these characterizations, demonstrated by gender differences in the experience of climate change, as well as lower rates of survival of women in natural disasters/hazards (MacGregor 2010). Reality is of course more complex, and there

are cases that would counter these findings. Arora-Jonsson (2011) criticizes the *assumed* “universal vulnerability” of women to events, such as hurricanes and severe drought, without adequate attention to culture and social context. Continuing with a one-sided track ignores what progress has been made in “feminist critiques” within the WED discourse (Okali and Naess 2013). Dankleman (2002) argued that denying women agency also neglects their capacity to adapt to climate change. Furthermore, it can detract from more fine-grained examination gender variation and dynamics. Generalizations across an entire sex obscure other underlying considerations, such as power imbalances between different groups of men and women. Climate change itself adds another dimension of victimization to existing gender discussion, though there are of course both agents and victims among men and women.

Cornwall (2005) describes how the “conflicting narratives of the oppressed, powerless, victims” and “assertive, self-reliant heroines” plague the climate change field (p.4). Alston (2014) argues that more of the underlying sentiments of the WED discourse is needed in the climate change literature, in order to bring forward women’s “critical local knowledge that can enhance climate adaptations and assist the development of new technologies to address climate variability” (p.289). A growing pool of literature on female innovation and adaptation strategies for climate stresses like droughts, floods, and uncertainty in farming is beginning to address this gap (Carr & Thompson 2014). Perhaps a fruitful focus is actually found in research in West Africa in contrast to Eastern and Central Africa, which centres on the story of power and autonomy more in line with the images of virtuous, caretakers of the Earth painted by the WED discourse (Cornwall 2005, p.1; Okali and Naess 2013).

It is critical not to swing too far toward either extreme presented in gender discourses, because then the needs of those who are still marginalized risk being overlooked. The danger with both of these characterizations is that they are polarizing and “stylized” (Rodenberg 2009, p.15). It is a fine line to walk - praising the successes on one hand and feminizing poverty by generalizing women’s relationship to nature and the environment on the other (Carr & Thompson 2014). Arora-Jonsson (2011) advocates for striking this balance between acknowledging both women’s and men’s capacity to deal with climate change without losing sight of underlying power dynamics and social inequities. As noted earlier, gender scholarship had begun to adopt more nuances through discussions of interactions between

men and women, and within group heterogeneity. These lessons are ones that researchers and practitioners alike should heed in trying to address climate change impacts, particularly in the context of rural livelihoods and meeting development goals. As Carr and Thompson (2014) advocate, without a nuanced gender approach is essential to the discussion of climate change adaptation, we risk “overlooking significant differences with regard to knowledge, resources, and power within gender groups that shape development and adaptation outcomes” (p.186).

3. Chapter 3: Cocoa and Climate in West Africa

Building on the foundations of climate change vulnerability and gender developed in the previous chapter, a case study in the central region of Ghana applies the principles to women in cocoa farming. This chapter situates the research results in the broader context of industry, geography, and policy. As such, it first provides some background on the cocoa industry, at a global level and then for Ghana specifically. It then presents the current understanding of climate change impacts on cocoa. Finally, it explores the policy environment in Ghana and its relevance for climate change adaptation in the country.

3.1 *A Crop of Global and Local Importance*

3.1.1 *Scale of Industry*

Cocoa and its associated production of chocolate is a more than US\$100 billion global industry, covering over 10 million hectares of arable land (USDA 2013; FAOStat²). Unlike many commodity crops (e.g. oil palm and sugarcane), which are often cultivated in large plantations, cocoa production is still composed primarily (over 70%) of small-scale farmers, and five or six million smallholders still earn the majority of their income from the one crop (Franzen & Mulder 2007). These circumstances make cocoa not only of interest to global agro-industry players serving commodity markets, but also significant for the development community, with objectives to alleviate poverty and ensure food security that affect many rural populations across the world.

The actual physical production of cocoa is relegated only to certain tropical regions of the world, because it requires a specific warm, humid climate and consistent levels of solar radiation. Although the crop finds its origins in the Amazonian region, at present over three quarters of the production takes place in tropical West and Central Africa (World Bank 2011). Of the countries situated in this region's Guinean Forest belt, Côte d'Ivoire and Ghana comprise the greatest proportion of production and serve as the top international exporters.

3.1.2 *Cocoa's significance in Ghana*

Cocoa pervades the country of Ghana, comprising nearly two-thirds of agricultural foreign exchange, and provides the majority of annual household income for more than 800,000

² <http://faostat.fao.org/>

smallholder families (MESTI 2013). The commodity is one of Ghana's main exports, making up close to 12% of the country's agricultural land (calculated from MoFA 2011). It comprises 11% of agricultural GDP and 21% of merchandise exports (GSS 2014; World Bank 2011), standing as the second most important export good after gold and dominant agricultural export. For those who derive their livelihoods from cocoa, at least two-thirds of their income comes from sales of the crop (Kolavalli & Vigneri 2011). The country's economy and a large proportion of the population are consequently tied intimately to the success or failure of the cocoa industry, even if not directly involved in the cultivation. The World Bank (2011) attributes some of the country's recent economic growth and poverty reduction to cocoa production, and the national government continues to heavily emphasise continued expansion of the industry. Considering the high prices, room for yield increases, and government commitment, cocoa is expected to continue playing a central role in the country's economic growth and development (Breisinger, et al. 2008).

3.1.3 The Cocoa Production System in Ghana

Cocoa has been cultivated in Ghana since the mid-19th century, originally introduced to the Eastern Region from Sao Tomé in 1872 (Asare 2013). The crop subsequently spread west across the southern portion of the country, making Ghana the largest producer of cocoa in the world for a time in the early 20th century. Farmers in the region already familiar with using forest products such as oil palm and rubber as cash crops, easily adopted and adapted the understory tree crop in their traditional forest farming systems (Leiter & Harding 2004). At first, cultivation followed a shifting model of thinning understory and planting cocoa seedlings, moving on to new land as the soil nutrients depleted and trees stopped producing well (Ruf 2011). With the introduction of hybrid seeds beginning in the 1950's - ones tolerant to direct sun, more resistant to prevalent pests and diseases, and able to produce a crop twice per year - farming practices shifted accordingly to low/no-shade monocultures, using added fertilizers and pesticides.

In Ghana, cocoa farming is still dominated by smallholders (Leiter & Harding 2004), who continue to integrate food crops - such as tomatoes, plantain, and cocoyam - when first preparing the land as a means to feed the household and earn some income before cocoa is viable to sell (Hill 1963, p.188). After harvesting this initial season of food crops, cocoa is

interplanted with maize, plantain, cassava, and additional food crops (Duguma, et al. 2001). These food crops (largely maintained by women) continue to sustain the household, add a small supplementary source of income, and shade the young cocoa seedlings. Certain timber, medicinal, and fruit trees are also retained for their economic value or to shade young cocoa.

3.1.4 *Cocoa in a Changing Climate*

As noted earlier, cocoa has narrow tolerances for temperature, precipitation, humidity, and sunlight, making the favourable conditions in southern West Africa optimal to cultivate cocoa (Nicholson, et al. 2000; Washington & Hawcroft 2013). The region is distinguished by a tropical climate, including generally consistent and substantial bimodal rainfall distribution from April to July and September to November. Weather variables have substantial influence at various stages in cocoa production – raising seedlings, producing seedpods, and processing beans, and also impact the occurrence of certain pests and diseases.

Comparing anticipated climate change and the conditions under which cocoa remains economically attractive highlights some of the problematic future conditions. Yet only a few studies have jointly analysed cocoa viability and projected climate conditions. These model-based studies show that a decrease in precipitation and increase in temperature (and related evapotranspiration) lead to a bleak future for cocoa in West Africa, with less suitable growing conditions in the region. Consequently, West Africa's comparative advantage in cocoa production is likely to change due to new temperature and precipitation regimes, the major weather variables that affect cocoa production and the occurrence of pests and disease (Anim-Frapong & Kwimpong 2005; Ofori-Boateng and Insah 2011).

The National Climate Change Policy makes clear that reduced cocoa harvests could lead to a loss of national income (MESTI 2013), with further implications for government spending on social services and support programmes. The policy context of Ghana makes it an interesting case in which to ask question about climate vulnerability, with tangible implications for how policy is constructed and, more importantly, implemented.

3.2 *Policy Context in Ghana*

Ghana is acclaimed as a model in the African political sphere, due to its stable democracy and strengthening economic circumstances (Sova, et al. 2014). Substantial engagement at the international level in climate change and development processes, multi-decadal experience in national level agriculture, development, and environment policy, and efforts to work cross-sectorally and with non-governmental entities, distinguish the country as a potential leader in climate change policy. Because local communities don't operate in a vacuum, but are inextricably tied to decisions taken by the national government in Ghana – which also rely heavily on the direction of international policy processes and priorities – it is important to consider the alignment of objectives across multiple scales.

3.2.1 *Ghana on the International Stage*

In terms of engagement in the climate and environment policy arena, Ghana has taken an proactive approach. The National Environment Action Plan of 1991 is an example of this foresight, predating the country's signing of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 (Sarpong & Anyidoho 2012). At the same time, involvement in regional collaborations, such as the Economic Community of West African States (ECOWAS) and the New Partnership for Africa's Development's (NEPAD) Comprehensive Africa Agriculture Development Programme (CAADP), demonstrate an interest in collaboration with nearby nations. Ghana's relation to various international conventions and funding streams has implications for the types of policies, programmes, and projects that occur in the country. Right now bilateral donors and multilateral funds comprise the bulk of climate change finance in the country, and consequently donors have largely driven progress in environment-related policy and programmes (Cameron 2011). Furthermore, critics argue that a focus on the UNFCCC distracts from in-country activities, and what has been carried out is done at the 'project' level in an ad-hoc and piecemeal fashion with little overall coherence. Considering climate change adaptation costs for the agricultural sector alone are estimated at upwards of US\$ 300 million in 2020 (Asante, et al. 2010), there is incentive to align the country's priorities with those of potential funders.

3.2.2 *National Climate Policies*

The country has made clear that action on climate change is considered a means to further the country's economic development in a low carbon manner and to reach middle-income status (Oppong-Boadi, et al. 2011). Consequently, the National Climate Change Policy (NCCP) has gone beyond the typical two-pronged mitigation and adaptation dimensions of climate change, and embraced social development considerations and objectives as priorities. Similarly, placing the country's most lucrative agricultural commodity – cocoa – at the centre of climate mitigation policy, demonstrates that the country takes the relationship between prosperity and climate action seriously. Two work streams have particular relevance in light of the discussion on climate change vulnerability and gender: the NCCP and related Climate Change Adaptation Strategy (NCCAS); and climate-smart cocoa and the direction of the country's involved in REDD+. Furthermore, both are in early stages of development and implementation, making this a timely topic on which to focus.

Historically, international funding structures have pushed mitigation activities, such as through the Clean Development Mechanism (CDM) and with sights set on funding for Reducing Emissions from Deforestation and forest Degradation (REDD+) (Sarpong & Anyidoho 2012). Among the country's ministries, the Ministry of Environment, Science, Technology and Innovation (MESTI) is responsible for carbon credit generating activities (e.g. REDD+), the national climate change policy, developing and implementing Nationally Appropriate Mitigation Actions (NAMAs), and mainstreaming climate-oriented activities (Stanturf, et al. 2011). MESTI is also leading UNFCCC activities and hosted the multi-stakeholder committee that developed the NCCP.

Taken at face value, the NCCP addresses many of the common critiques of the climate change vulnerability and gender literatures, broadly approaching vulnerability in both natural and social systems, and coordinating across sectors. For instance, the policy recognizes climate change as a magnifier of existing social pressures, and that these put the process of reaching a “more coherent, equitable, and integrated society” and middle income status at risk (MESTI 2013, p.2-5). Complementary to the more comprehensive NCCP, the National Climate Change Adaptation Strategy (NCCAS) has the basic goal to increase resilience to climate change impacts with a similar strategy, and also employs a vulnerability framework.

Developed jointly with UNEP and UNDP, funded by the Danish Ministry of Foreign Affairs, and carried out by MESTI, perhaps the most important aspect of NCCAS is how it lays out the key challenges (or points of vulnerability) in Ghana, both in terms of physical impacts from climate change and the broader social, economic, and institutional shortcomings (UNEP/UNDP 2011).

This emphasis on underlying social drivers of vulnerability is clearly conveyed by nearly half (47%) of the budget being allocated to the social development policy area (Asante, et al. 2015). Gender considerations are given a place of prominence in the policy, and comprise the single largest focal area of budgetary allocation (Asante, et al. 2015), targeting sustainable livelihoods and poverty reduction, training and capacity-building programmes, access and use of science and technology, and full participation in climate change initiatives (MESTI 2013). While it is vital that gender sensitivity and equity considerations are embedded in the policy, it does fall into the trap (mentioned in section 2.3.2) of treating women as a unified, homogenous, and universally more vulnerable group. Ezekiel (2015), in an assessment of the policy, recommends carrying out a gender risk or vulnerability assessment, and suggests greater inclusion of the Ministry of Women and Children (MOWAC) in decision-making procedures.

Climate-smart cocoa emerged as an NGO-driven attempt to take a multi-stakeholder approach to climate change mitigation and adaptation in the cocoa sector (Asare 2013). Dating back to work started in 2009 by Forest Trends and the Nature Conservation Research Centre (NCRC), it has now broadened to include a mixture of government actors, private sector agri-food and chocolate companies, Licensed Buying Companies, sustainability standards setters, international research centres, NGOs, and bi- and multi-lateral donors. However, the emphasis remains on technical aspects, maintaining productivity, and land use planning for mitigation, and adaptation is still focused largely on the practices, making the programme really only applicable to those who can make decisions about cocoa management (Asare 2013). The aim was over time to shift viewing cocoa as a land-based investment, to part of a diversified and extensive livelihood production system that holds fewer risks than other costlier investments.

The concept has also gained enough traction that the REDD+ readiness plan has adopted climate-smart cocoa as a means of addressing cocoa as a driver of deforestation. In 2011, Ghana initiated a REDD Readiness process through the World Bank's Forest Carbon Partnership Facility (FCPF) (Acheampong, et al. 2014). The union between Ghana's Cocoa Board and the Forestry Commission in the Cocoa Forest REDD+ Program is unprecedented (Forest Commission 2014), but points to future cooperation between sectors in the country. The programme documents state their role in facilitating a transition to climate-smart cocoa production systems, and identify more robust extension services, credit provision, and risk management supports are some of the current major gaps. With an expected commencement in 2016 and 20-year tenure, the Cocoa Forest REDD+ Program recognizes the challenges in coordination across ministries and sectors, as well as the necessity of operating at a national level to deal with some of the systemic barriers (e.g. related to tree tenure regulations).

3.2.3 Alignment and Coordination

A central theme in Ghana's Second National Communication (SNC) to the UNFCCC was harmonized and coordinated actions (Asante, et al. 2015), and the government has made an effort to coordinate across sectors (Cameron 2011). However, while meeting the stated objective of developing 'human resource capacity for climate-resilient agriculture' requires augmenting extension capacity and diversification (MESTI 2013, p.4-2), only about 10% of total NCCP budget is allocated towards these ends (Asante, et al. 2015). This is perhaps already considered a component of agricultural policies, and highlights the importance of ensuring that climate, agriculture, and development policies are complementary. A distinct challenge will be aligning existing agriculture and development policies with evolving climate change priorities outlined in the recent policy documents. Considering that subsistence agriculture still comprises 60% of employment in Ghana (Oppong Boadi, et al. 2011), the shape of climate-related action has implications for meeting agricultural needs.

In 2006, 85% of all agricultural expenditures went to supporting Ghana's Cocoa Board (Breisinger, et al. 2008), an indication of the importance placed on the commodity crop. Ghana is unique in that it is the only major cocoa producer without a fully liberalized market, placing the Cocoa Board (COCOBOD) in supervisory capacity at each step in the supply chain. This means that while prices may at times be lower than the global market, there is not

the considerable fluctuation often experienced due to supply and demand changes. In addition to reinvesting in the cocoa economy through infrastructure projects, supply subsidies, and education, COCOBOD also develops policies implemented by various divisions on disease and pest control, breeding, bean quality, and marketing (e.g. Cocoa Research Institute of Ghana) (Asare 2013).

While COCOBOD still sets the price floor for cocoa, the Cocoa Rehabilitation Program initiated in the mid-1980's induced the recent devolution of purchasing power from the state-owned Produce Buying Company to private licensed buying companies (LBCs) (Asante-Poku & Angelucci 2013). These Licensed Buying Companies are still regulated by COCOBOD, but purchase directly from farmers at a set price and sell at a distribution centre at another set price (World Bank 2011). Kolavalli and Vigneri (2011) argue that this shift increased the reliability of payments to farmers, and incentives such as bonuses, input subsidies, and credit.

At present, agricultural policy has a strong focus on modernization of agriculture as a force for economic growth (Sarpong & Anyidoho 2012), and runs the risk of policy not considering the broader set of societal issues that affect people's livelihoods and the country's prosperity directly and indirectly. Ghana released its second Food and Agriculture Sector Development Policy (FASDEP II) in 2007, and its framework for implementing the objectives, the Medium Term Agricultural Investment Plan (METASIP) in 2010. Considering climate change was a topic relegated to the policy spheres environment, energy, and forestry until five or so years ago, it is no surprise that climate change impacts were not explicitly integrated into the six policy objectives of FASDEP II (Sarpong & Anyidoho 2012).

Development policy and programmes are central to managing the risks and impacts of climate change, and the second Ghana Shared Growth and Development Agenda (GSGDA II) has fully adopted this perspective. The importance of climate change objectives is acknowledged within the GSGDA II (2014-2017), and is now a cross-cutting issue in all national development plans and sectoral programmes (Asante, et al. 2015). The GSGDA II has also ensured that activities focused on agriculture internalize a climate-resilient approach, with interventions on capacity and awareness building for farmers and extension officers,

targeting vulnerable groups, promoting agricultural biodiversity and adapted crop varieties and animal breeds, and document indigenous knowledge while introducing improved post-harvest technologies (Sova, et al. 2014). Like the NCCP, the GSGDA II reflects on how the impacts of climate change and consequently vulnerability will be differentiated among various social groups. However, it also fails to make distinctions with fine enough scale for accurate targeting and effective solutions, earmarking the “the poor, women, children, and rural residents and residents of the northern part of the country” as the most vulnerable (Sarpong & Anyidoho 2012, p.6).

Finally, even with full and sustained coordination of national level climate change, agriculture, and development activities, there is still the challenge of translating policy objectives to locally-relevant projects and programmes. In Ghana, the District Assembly Common Fund is the means by which funding can be accessed for local level development projects, yet UN agencies and bilateral actors continue to dominate implementation of adaptation projects. International non-governmental organizations with country offices, such as IUCN and Friends of the Earth, and other organizations like Nature Conservation and Research Centre; Abantu for Development; Environmental Applications and Technology Centre (ENAPT Centre) engage in climate change activities and provide alternative approaches outside of UNFCCC and bilateral donor driven activities at a local level (Asante, et al. 2015; Cameron 2011). While some suggest that weak technical capacity, inadequate funding, and poor coordination will hinder these organizations from effectively tackling climate resilient development (Sarpong & Anyidoho 2012), it could also lead to inconsistent quality and fragmentation of such work.

4. Chapter 4: Methodology

The previous chapters laid the theoretical and contextual groundwork, from which the dissertation will now move to a case study in southern Ghana. This chapter lays out the conceptual framework of vulnerability and gender, used to interrogate data from the case study. It will subsequently outline the methods for data collection and analysis and description of the study sites.

4.1 *Conceptual Framework*

As described in chapter two, there are growing bodies of literature on ‘climate change vulnerability and adaptation’ and ‘gender and development’. However, until recently there has been little cross-pollination of the two. The conceptual framework (Figure 4.1) adopted here was used to guide the interviews conducted during fieldwork and as a lens through which to interrogate the data collected (including which variables and relationships to examine in the analysis). Miles, Huberman, & Saldana (2013) suggest that qualitative research usually falls in between ‘loose’ and prescriptive, so the conceptual framework was derived while in the field and the research adopted some structure but also allowed themes and patterns to emerge along the way (p.19). The conceptual framework for fieldwork and subsequent analysis in this study includes elements discussed in both gender analysis and climate vulnerability frameworks, with the aim of integrating climate change vulnerability/adaptation and gender considerations in this research.

Lambrou (2001) describes ‘Gender Analysis’ as “an extensive methodology that examines the interactive roles of men and women in terms of labour relations, access and control to land and to natural and financial resources, decision making, and specific knowledge about NRM processes” (p.6). MacGregor (2010) argues that analysis of gender and climate change should focus on power relations, and how the “discursive and social constructions” of masculinities and femininities shape how any phenomenon, including climate change, is approached (p.228). She refers to this as the feminist constructivist approach. Though this dissertation research did not carry out a full gender analysis, the areas of interest outlined in gender analysis and associated literature were incorporated into the conceptual framework. For the purposes of this research, the particular circumstances of women are examined in

order to further understand how vulnerability (and potential adaptation strategies) varies among women within a community and capture some of the intra-group heterogeneity.

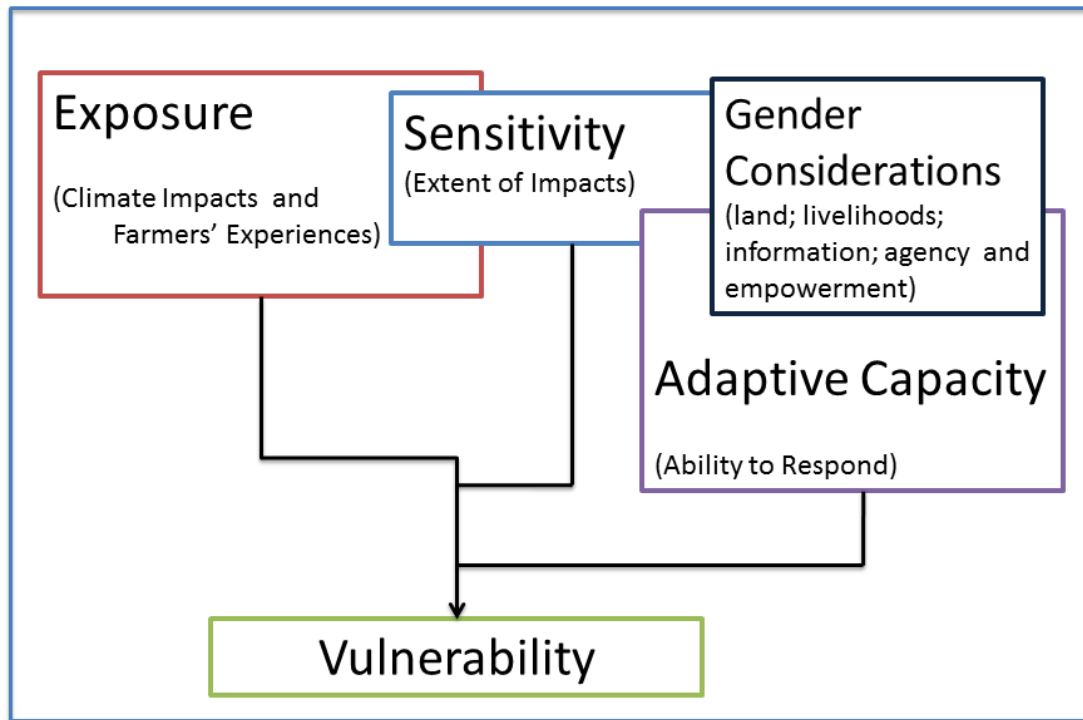


Figure 4.1 Conceptual Framework Diagram, including the three components of vulnerability (exposure, sensitivity, and adaptive capacity) and gender considerations discussed in the literature review.

According to the literature base, vulnerability is composed of three elements: exposure, sensitivity, and adaptive capacity. In this case, exposure is restricted to coarse scale impacts from projected climate change; sensitivity deals with how experiences of those climatic events and change vary in extent and severity; and adaptive capacity hones in on factors most salient to the ability to respond. Key topics raised in the gender literature are used as a means to assess the latter two components. As an example, Chindarkar (2012) describes a framework for analysing gender and climate change-induced migration, which marries the conceptualisations of vulnerability to relevant themes in gender literature. The author suggests a set of indicators, including climate variability and frequency of disasters (exposure); land, economic, and perceived sensitivity; livelihood diversification, education, and social safeguards (adaptive capacity). For the purposes of the forthcoming analysis, projected climate impacts and perceived important weather variables serve as the basis for exposure; land access and income sources and diversification are used to indicate sensitivity; and access to information, empowerment, and agency feed into adaptive capacity.

4.1.1 *Methods*

In order to assess the research questions outlined in Chapter 1, a mixture of methods was used. A review of literature on current and future climate in West and Sub-Saharan Africa, as well as tolerances and projected impacts on cocoa production system, were used to assess the ‘exposure’ component of vulnerability. Because studies on the exposure to climate risks are still limited, especially at a regional level, the CLIVAR VACS African Climate Atlas tool³ was used to complement existing literature and to provide images scaled to the country level. Past precipitation and temperature data, obtained for three locations in the moist semi-deciduous forest zone, was used to illustrate trends over time. There is still considerable uncertainty around future conditions and impacts; however precipitation data and interview responses related to the experience of extreme and/or variable climate are considered useful proxies for considering future exposure (e.g. West, et al. 2008).

Sensitivity and adaptive capacity were explored qualitatively through semi-structured interviews with female cocoa farmers in Ghana. According to Cope (2012), such qualitative methods are useful to fill gaps around “people who have typically been left off the historical record or are located outside the gaze of the mainstream of research (e.g. women, ethnic minorities, poor people, children)” (p.440). Using qualitative methods was ideal due to the flexibility of learning, adjusting, and trying to best understand what was really going on in an unfamiliar context (as suggested in Miles, Huberman, & Saldana, 2013, p.11). Also, such methods are valuable for discovering the meaning people place on events, processes, and structures in their lives and the connection to the world around, as well as capture some of the complexity and fluidity of social processes.

4.2 *Study Design and Sampling*

4.2.1 *Study sites*

This project is situated within a larger three-year (2013-2016) Ecosystem Services for Poverty Alleviation (ESPA) study (ECOLIMITS)⁴, located in a cocoa landscape in Ghana and among coffee growers in Ethiopia. The larger study examines how varying intensity of

³ <http://www.ouce.ox.ac.uk/~cliva/cmip5/index.html>

⁴ <http://www.ecolimits.org>

land use affects the provision of ecosystem services (e.g. carbon stocks, soil health, pest and disease control) in these production landscapes. For cocoa, ecological data was taken on a gradient from inside the intact forest of Kakum National Park to no-shade cocoa monoculture. To address the poverty alleviation side of the equation, the study asks how social processes influence these ecosystems and whether there is a relation between poverty and reaching or exceeding a limit to ecosystem services. It also aims to consider “pathways out of poverty” and how those might harm or benefit the ecosystems.

Gender dimensions were an area of interest for ECOLIMITS, but one that had not yet developed a programme of action. Furthermore, the majority of the farmers with ecological data collection taking place on their farms were male. This dissertation research served to fill in that initial gap within the Ghanaian cocoa context, as well as consider the added dimension of climate change. This lens combines the natural and social sciences and allows a focus on the circumstances of a segment of the population traditionally considered marginalized or at greater risk of experiencing poverty.

The study took place within three communities located in the Central Region of Ghana, in the Assin North District around the upper perimeter of Kakum National Park (Figure 3.2). Comprising 42% of the region’s economically active population (GSS 2012), farmers (including foresters and fishers) derive their income primarily from cocoa (>75%), alongside oil palm, maize, and other food crops (Vigneri & Holmes 2009). The communities all date back approximately 75 years or three generations, though they each represent slightly different ethnic compositions, land tenure and inheritance systems, and social dynamics.

Aboabo (Figure 3.2a) is an Assin community on the western side of the national park, under the paramount chief at Nyankumasi, and currently dominated by Northern migrants (Hirons 2015, pers. comm.). Consequently, sharecropping in the form of *Abunu*⁵ is commonly practiced, and food crops are generally shared as *Abusa*. On the eastern side of the park and closest to a city, Ahomaho (Figure 3.2b) falls under the paramount chieftaincy of the Fante Nyankumasi Stool. The community was initially a hunting camp founded in the 1940’s, and

⁵ *Abusa*, literally one-third in *twi*, refers to a sharecropping arrangement in which the caretakers of the land are ‘paid’ one-third of the cocoa harvest, and two-thirds to the landowner. *Abunu* is a 50:50 division of land, but sometimes cocoa output, and usually requires the caretaker to cover all farm management (Vigneri 2008).

the population is not as dominated by migrants. A landowner originally would have acquired land from a chief, and can give out land as he or she sees fit. Finally, Kwameamoabeng (Figure 3.2c) was also established around 1940 and now is composed of a mix of Krobo and Assin residents, and land is held under different arrangements accordingly. Women practice *Abusa* more than men, and land for oil palm and food crops always revert back to the land owner for replanting. There are several distinct communities (including central Kwameamoabeng, Krobokesem, Nkawkaw, and Koforidua), and was the most decentralized of the communities.

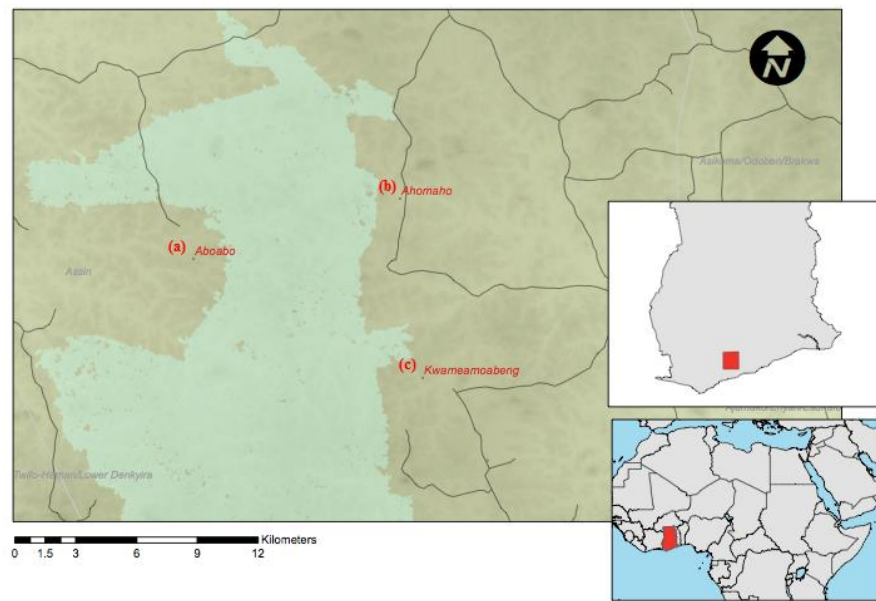


Figure 4.2 Study communities (a) Aboabo, (b) Ahomaho, and (c) Kwameamoabeng (modified from: Alexandra Morel 2015, ECOLIMITS project).

4.2.2 Preliminary interviews

Fieldwork in the study sites took place from June through August 2014, and was planned to coincide with the ECOLIMITS team's period of ecological fieldwork and the social science scoping trip. This was practical and strategic for several reasons. For one, in the first week I was able to gain some understanding of the natural science component of the project by visiting the farms at which ecological data was being collected, meet the Ghanaian partners from the Nature Conservation Research Centre and the Department of Wildlife, and better understand the system of cocoa production. During this time, the committees (set up in each of the communities by the project to handle any grievances or questions) were convened and provided an opportunity to introduce me formally to the communities. As is custom, I also

officially met each of the community's chiefs, though the form and level of formality of this introduction varied between the three.

These formalities at the start of fieldwork were critically important for establishing a presence in the communities and for building relationships with members. Furthermore, while English is one of the official languages in Ghana, residents of most rural areas speak a local language. As such, an interpreter fluent in English and trained in the study of languages was employed to interpret between English and the local language *Twi* (and a few times *Krobo*). In the first three weeks of fieldwork several group interviews were conducted to get a sense of the range of issues and challenges forefront in people's minds, and to familiarize ourselves with the character of each community. Follow-up individual interviews with ECOLIMITs plot owners and other farmers were then used to get specifics of management practices and climatic influences. As dictated by research ethics, all participants were assured that information supplied would remain confidential and anonymous, and that they had the right to withdraw at any time (e.g. Longhurst, 2012, p.111).

The initial interviews conducted in Aboabo, Ahomaho, and Kwameamoabeng provided a good foundation on major challenges, agricultural management practices, and weather (extreme events and variability) in cocoa production systems in order to inform subsequent interviews. Once common concerns and practices had emerged repeatedly, the project scope was refined to deal specifically with the impacts of climate change on women in the communities. This decision complemented data collection for the ECOLIMITS project (focused primarily on male plot owners), and placed the research within an emerging literature and active field of inquiry on gender and climate change. It also served a practical purpose, with women being more available for interviews during the day and both my interpreter and myself being females.

4.2.3 *Characterization and purposive sampling*

It is of course impossible to completely capture the vast diversity among people within and between communities and at the same time provide generalizable observations and policy-relevant lessons. As such, principles from "grounded theory" were applied – comparative in nature, specific to the social system under study, and allowing the research to be a process of

discovery through which questions are refined and themes emerge (see Glaser & Strauss 1967). A level of typification that arose from early interviews was used in order to articulate theoretical understanding and generalizations (as suggested in Gherardi & Turner 2002, p.92). The characterization that emerged allowed the proceeding of more strategic sampling, aligning with Miles, Huberman, and Saldaña's (2013) assertion that qualitative samples tend to be purposive rather than random and set boundaries within limits of time and means as well as the conceptual frame (p.31-32). Moreover, in much of the gender and development literature, there is an emphasis on the within group heterogeneity, thus stressing the need to break the confines of 'women' as one category (Arora-Jonsson 2011; Carr 2008; Cornwall 2005). Interviews were carried out to a point of theoretical saturation, at which further interviews did not yield additional information or substantially different data.

Based on initial interviews conducted with women, women were grouped by the modes in which they engaged with the cocoa farming system. The female representatives on the ECOLIMITS community committees were then asked to comment on how women were engaged in farming, noting any misrepresentations or gaps. This initial characterization split women into seven categories: women who only worked on their husband's cocoa farmers (and those were either inherited/mixed or sharecropped); women who managed their own cocoa farms (inherited, sharecropped, or mixed acquisition); widows who managed a cocoa farm; and single women who had no access to cocoa. Using a variant of quota selection within major subgroups (e.g. Miles, Huberman, & Saldaña, 2013, p.32), subsequent interviews concentrated on women covering the range within this characterization, using referrals from interviewees and the representatives whenever possible.

This portrayal is itself very simplified, and within the broad categories there is still considerable variation. Different ethnicities and traditions have their own rules dictating inheritance and access to land, and this is also fluid and ever evolving so that the amount of variation identified is not unreasonable (Hill & Vignieri 2009; Quisumbing, et al. 2001). Yet, in order to retain the ability of gleaning policy-relevant messages, categories were combined to focus on 'indirect cocoa farmers' who only had access to their husbands' cocoa farms or worked only as labourers on others' farms; 'direct cocoa farmers' who operated their own land; and non-cocoa farmers (Figure 6.1). Because the goal of this project was to examine the

variety of potential climate change impacts and adaptation strategies, this level of disaggregation seemed appropriate for distinguishing within-group variation in vulnerability.

4.2.4 *Semi-structured interviews*

As Twyman, et al. (2014) notes when dealing with people, climate change is experienced through local manifestations. Therefore the types of questions asked on climate and weather related to precipitation events, disease and pest outbreaks, and variability or temperatures outside of the ordinary. This line of inquiry was carried out with a variety of community members, until a point of saturation was reached. Overall, a total of 102 interviews were conducted (a few of which remain incomplete), though most of the 53 (Table 4.1) with women in the communities followed this initial period of exploration around climate.

Table 4.1 Breakdown of interviews with women, by category and community.

Community	Aboabo	Ahomaho	Kwameamoabeng
Direct Cocoa	6	15	8
Indirect Cocoa	10	4	8
No Cocoa Access	0	1	1

An interview guide was developed to ensure that certain topics were covered in each interview, while still providing flexibility to pursue interesting concepts or stories (see Appendix 1: Interview Guide). Longhurst (2012) suggests working out a list of themes or questions to ask, which elicit "factual", descriptive, thoughtful, or emotional material (p.107). This approach was adopted, with a mixture of questions that allowed the discussion to unfold in a more conversational manner so that participants could explore the issues they felt were important. Whenever possible, interviews were transcribed the evening after conducting interviews (following Longhurst 2012, p.110). Though some researchers recommend audio recording interviews, I chose not to do this because of the potential discomfort of participants and impacts on their responses. I used the translation time to ensure notes taken during interviews were as precise as possible.

4.2.5 Interview transcripts and coding in NVivo

To analyse interview data, I used the NVivo software package to facilitate organization and coding of transcripts. I primarily used selective coding as a means to interrogate the interview data, following core themes outlined in my conceptual framework and identified in the theoretical literature and preliminary interviews. This involved repeated readings of the data, during which particular topics became apparent and were assigned a code. After an initial coding of transcripts, the passages were reviewed to identify broader themes or interesting points and illustrative quotes (see Holliday 2007). The software was also used as a tool to sort the interviews by the categories of women determined earlier and to draw out similarities or differences that appeared within the data (e.g. Cope, 2012, p.448). It was possible to tabulate the number of interviews with certain descriptive codes, which were then used to provide a degree of quantification and make some of the figures (e.g. bar graphs).

4.3 *Potential Biases and Areas for Further Exploration*

Finally, there are several factors that would have introduced bias in interview responses that are important to bring to light in this study. Because the data collection was carried out during the main rainy season, it is possible that participants focused more on excess precipitation than would otherwise be the case. Future research would include data collection during both rainy and dry seasons, so as to capture the variability of weather as well different harvest seasons (see Jost, et al. 2014). Access to more complete local weather station data would be needed to compare perceived extreme events with documented ones in order to augment the rigour of the analysis.

As articulated in the previous chapter, ‘gender analysis’ is considered to encompass both males and females, and the interactions between. However, for the purposes of this research, women were the primary focus. This is for several reasons: time and personnel constraints; ease of accessing interview subjects; and an interest in exploring within-group variation. Although the broader literature supports the notion that rural women tend to be in more vulnerable positions, recommendations for future research would include comparable data collection and analysis with male farmers in the same communities.

This analysis is also based primarily on qualitative data collection. A mixture of qualitative and quantitative methods is often recommended (Miles, Saldaña, & Huberman 2013, p.43), so the addition of survey data (particularly disaggregated within household) daily activity schedules would be useful to provide more detail related to involvement in specific income-generating activities and usage of information resources. While also qualitative, focus groups would benefit the understanding of past weather phenomena and for collective brainstorming on adaptive capacity and potential adaptation strategies. Finally, there are new participatory methods surfacing (e.g. building on scenario planning) that could add insight to women's empowerment and perceptions of agency.

5. Chapter 5: Biophysical Exposure to Climate Change

As mentioned in Chapter 3, there is consensus among the scientific community that climate change is emerging as a key challenge in many parts of the world, and Tropical West Africa is expected to experience novel climate in terms of the levels and timing of precipitation and temperature by 2050 (Niang, et al. 2014). Considerable inter-annual variation in weather already exists, and longer term projections of the region's climate are couched in caveats. The complexity of the influences on weather patterns and a limited understanding of the drivers of climate over time in the region make discussion of future (and even present) weather and climate fraught with uncertainty. While change is highly likely, the extent of impact is still a point up for debate. Acknowledging those limitations, there is considerable value in understanding the range of potential impacts of climate change as a way to safeguard or even improve the livelihoods of those at risk.

The first component of climate change vulnerability is exposure. While this could refer to stresses and shocks from political, social, and economic sources, here the focus is on the environmental stresses associated with climate change. The concept of exposure itself can be further separated into shocks - or perturbations at a distinct point in time - and trends over the longer term, gradual shifts and stresses (Gallopín 2006; Oyekale, et al. 2009). The latter characteristics set vulnerability to climate change apart from the discussion of natural hazards. Both temporal scales are of course important considerations for agricultural systems. Among climate change projections, there is consensus that the African continent will feel the impacts of climate change acutely (Niang, et al. 2014).

This chapter tackles exposure of the cocoa farming system to climate change by reviewing studies on projected climate change in West Africa and impacts on cocoa production, as a means to understand the potential challenges to which farmers will have to respond. To compare this to what farmers actually are aware of and therefore react to, a complementary analysis of bioclimatic variables farmers raised in interviews follows. The results demonstrate both considerable uncertainty for the future and variation in present experiences. It also reinforces the idea that exposure may differ due to geographic heterogeneity, and therefore makes a case for robust analyses of the other two components of vulnerability in order to build resilience in the face of this uncertainty.

5.1 Exposure: Climate, Weather, and Experiencing Change

5.1.1 Projected Climate Changes

The Intergovernmental Panel on Climate Change's (IPCC) projects climate conditions not experienced before to occur earliest (late 2030s to early 2040s) in the Sahelian and tropical West African regions (Niang, et al. 2014). A review of African adaptation literature has shown the impacts of climate change on Africa will affect the level and variability of temperatures, and water availability (Dinar, et al. 2008, p.127).

All cocoa processes, from planting and establishment to harvest and processing rely directly or indirectly on the weather and climate (Oyekale, et al. 2009). The combination of an optimal temperature range, rainfall, and relative humidity was shown in two of the major West African producers to exert the greatest influence on a successful cocoa year (Ghana: Anim-Kwapong & Frimpong 2005; Nigeria: Lawal & Emaku 2007). Fluctuations in climate affect cocoa production through factors related to seed germination, premature ripening, and incidence of pest and disease (Cameroon: Kimengsi & Tosam 2013).

Temperature

There is evidence that Africa is warming faster than the global average, and has already experienced considerable warming over the past century (Collier, et al. 2008; Hulme, et al. 2001). This is evident for the region, as well, with a rise in temperature during both dry and wet seasons in the humid deciduous forest zone over the past 45 years (Figure 5.1).

According to the most recent IPCC report (AR5), there is high confidence that the end of the century will experience increased persistence of hot days (Niang, et al. 2014). The Assessment Report for Africa suggests that in tropical West Africa, the near surface temperature will exceed its narrow band of variability as early as 2027 under high emissions scenarios. For West Africa generally, estimates of temperature increase range between 3°C and 6°C above the late 20th century baseline (Niang, et al. 2014), as much as 5.4°C by 2080 in Ghana (Anim-Kwapong & Frimpong 2005) (Figure 5.2). Lobell, et al. (2011) consider temperature shifts in Africa to be the distinguishing factor between the 2050's climate and today's, arguing that models predict it as the biggest driver in agricultural shifts (p.261).

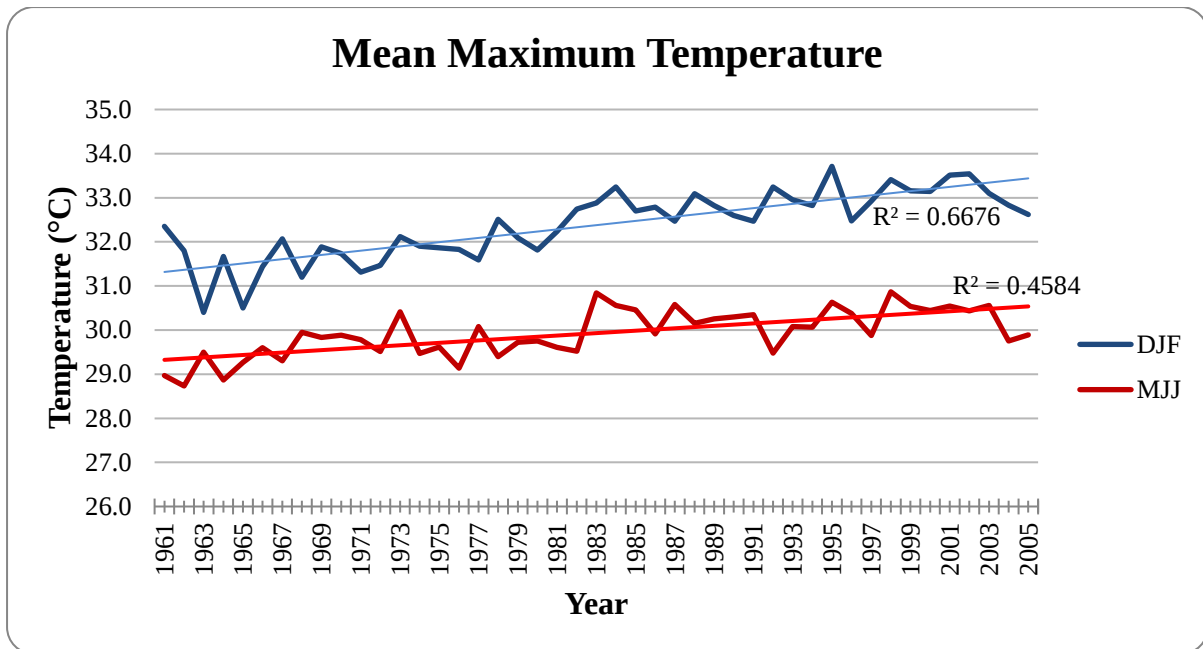


Figure 5.1 The mean maximum temperature (for Kumasi, Akim Oda, and Wenchi) over time. There is an approximate 2°C rise in the dry season (DJF) and 1°C during the rainy season (MJJ).

Temperature primarily defines the geographic range in which cocoa is present, limited to areas with an annual average maximum of 30-32°C and minimum of 18-21°C (Mossu 1992, p.23). Moreover, temperatures in the Guinea Forest Zone, the southern humid portion of the region, vary more than in other cocoa producing regions of the world, especially between wet and dry seasons, suggesting the crop may already be on the edge of thermal tolerances. While there is a positive correlation for temperature and cocoa crop yield (Lawal & Emaku 2007), productivity declines significantly after drought (Moser, et al. 2010). Because cacao trees are very sensitive to soil-water deficiency, changes in yield from year to year are often attributed to differences in rainfall (Mossu 1992, p.23). However, it is the interaction between temperature and moisture that is particularly important, with the link between high temperatures and increased transpiration resulting in water stress and suppressed growth (McAleer, et al. 2011).

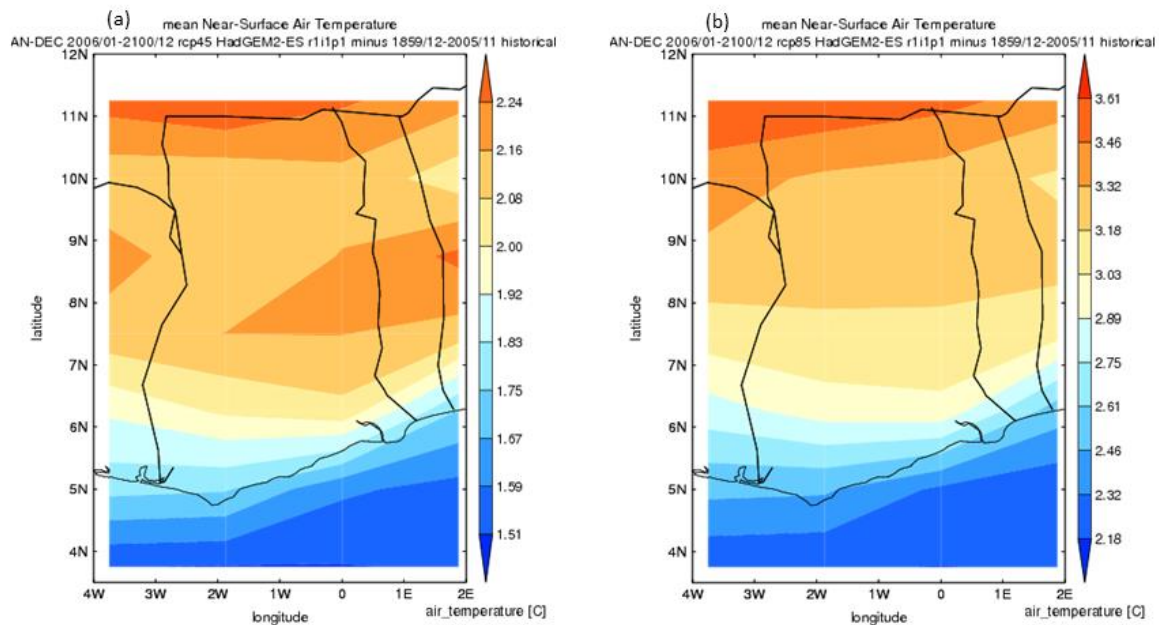


Figure 5.2 Maps of Ghana with temperature deviations from the 20th century baseline for the (a) RCP 4.5 and (b) RCP 8.5 emissions levels, estimating 1.75-2.75°C higher mean annual temperature by 2100 (Source: CRL OUCE, University of Oxford, 2015).

Precipitation and Humidity

The bimodal precipitation peaks in coastal regions of Ghana is heavily influenced by the monsoon (Washington, et al. 2012). Precipitation plays a vital role in dictating vegetation composition in Ghana, and so rainfall shifts will also have serious implications from an agricultural perspective. Though recognized to be of critical importance, precipitation is shrouded in uncertainty due to the challenges associated with incorporating these complex circulatory interactions (Niang, et al. 2014). However, the general consensus is for a slight near-term increase in precipitation (Hulme, et al. 2001; Niang, et al. 2014), with an overall decline in mean annual rainfall in the Guinean coast of West Africa (Anim-Kwapong & Frimpong 2005; Nutsukpo, et al. 2013; Oppong-Boadi, et al. 2011; Wittig, et al. 2007). Examples of temperature and precipitation shifts in the recent past and present already exist. For instance, relatively dry conditions during the two wettest months and relatively wetter conditions during the short dry season have prevailed along the Guinea Coast since the 1970's (Nicholson, et al. 2000). Minutely drier conditions are also visible in data from the humid deciduous forest zone, but the more noticeable trend is the considerable inter-annual variation

that is difficult to plan for (Figure 5.3). It is therefore understandable there is still concern over the seasonal cycle dictated by precipitation regimes (Washington, et al. 2012).

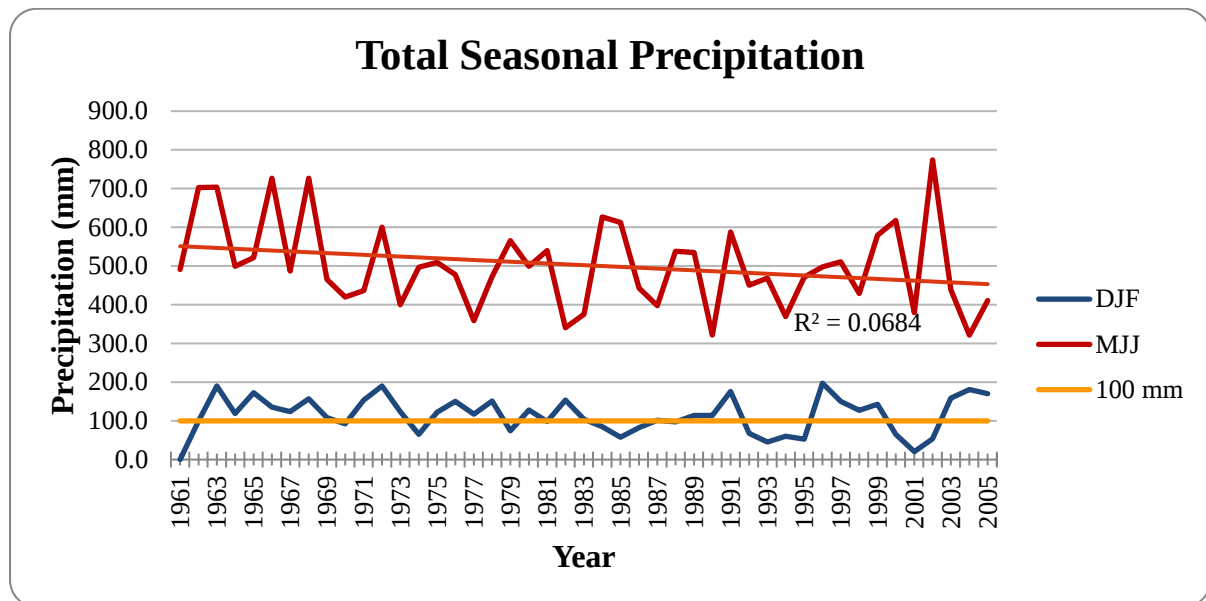


Figure 5.3 Total precipitation averaged across sites by season. While there is only a small downward trend during the rainy season (MJJ), the inter-annual variation is noteworthy. The 100mm mark indicates seasonal conditions unsuitable for cocoa production, seen with some frequency during the dry season (DJF).

Because of their reliance on precipitation, rain-fed crop production systems will feel impacts from shifts in precipitation, temperature, and seasonality more acutely (Niang, et al. 2014). Ghanaian agriculture is still almost entirely rain-fed, with only 4% of potential irrigation developed, even for the country's most lucrative of crops (Nutsukpo, et al. 2013). Experiments in the Ashanti region of Ghana showed that precipitation accounted for two-thirds of the variation in cocoa floral phenology (Adjaloo, et al. 2012). There are indications that rainfall in excess of 2500 mm may lead to higher occurrence of fungal diseases, and contribute to leaching of soils (Urquhart 1961; p.48). Increases in relative humidity coincides with increased cocoa yield but also the incidence of black pod disease, which is a spore dispersed by raindrops and insects, germinating under high humidity and lower temperature conditions (Urquhart 1961, p.166). As mentioned in the previous section and in section 1.2.1, level of humidity resultant from the interaction between temperature and precipitation may actually be more indicative of the stresses placed on the cocoa production system. According to projections (see Figure 5.4), humidity will decrease during the dry season when crops face water stress, and will increase during the rainy season when prevalence of disease increases.

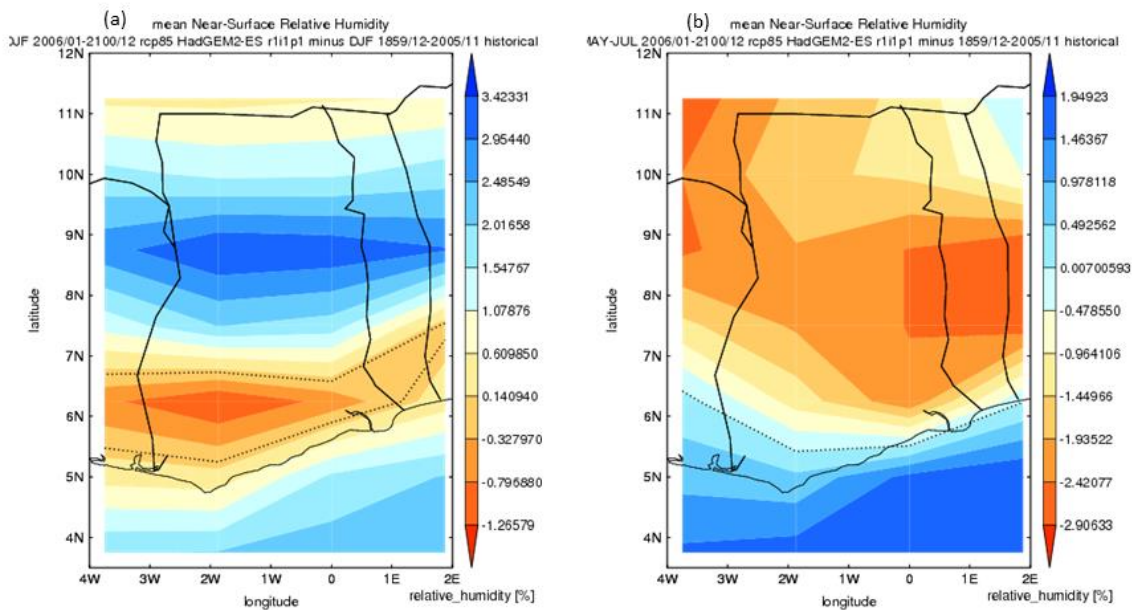


Figure 5.4 Maps of Ghana with mean humidity deviations from 20th century baseline during the (a) Dry Season (DJF) and (b) major Rainy Season (MJJ) for RCP 8.5. Humidity is projected to decrease during the dry season and increase during the rainy season (Source: CRL OUCE, University of Oxford, 2015).

Extremes and Variability

Seasonality is key for cocoa production, because the onset of rains dictate flowering (at present, April-July) and coincides with pollinator incidence (Adjaloo, et al. 2012). Moreover, Urquhart (1961) argued that while important, total rainfall is misleading in Ghana due to the seasonal nature of rainfall and growth stages for cocoa (p.19). Regression analyses find that simulated cocoa yield correlates with total rainfall, but more importantly with rainfall during the driest months of the year (Zuidema, et al. 2005). Anim-Kwapong and Frimpong (2005) found that for adult plantings in Ghana, water deficits resulted in lower yields and an increase in the level of mirid (capsid) damage (especially during high water deficit period of September-March). These sensitivities do not bode well when juxtaposed with an expected drier, warmer climate, with periods of heavy precipitation during the cooler rainy season described earlier

Beyond aggregate projections of temperature and precipitation, the incidence of extreme weather events is of particular interest for tropical West Africa. In its Fourth Assessment Report, the IPCC indicated a 22% annual increase in the occurrence of extreme wet seasons

in West Africa by 2100 (Codjoe, et al. 2013). Regional models of West Africa also indicate that the number and intensity of heavy precipitation days during the rainy season (May-July) are expected to increase (Niang, et al. 2014). For crop growth, this number of hydrological cycle events is of greater importance than overall amount of precipitation. As an illustration, in Burkina Faso there is confidence that low-rainfall events will decrease and strong-rainfall events will increase (Ibrahim, et al. 2014). Moreover, greater inter-annual variability of the monsoon precipitation may increase the likelihood of desertification in water-stressed areas and would make crop production less predictable (Washington, et al. 2012).

Aggregate Impacts

Based on a cocoa production impact assessment from constructed climate change scenarios, a study by Anim-Kwapong & Frimpong (2005) shows a decrease in cocoa yield in Ghana between 2020 and 2080. This coincides with a shift in geographical distribution of pests and disease, as well as exacerbated soil moisture conditions during the dry season (November to March). Using a mapping methodology, another study considered cropping in Central Region, Ghana as facing moderate risk from drought due to climate change (Antwi-Agyei, et al. 2012). Finally, Läderach, et al. (2013) modelled a suitability map for Ghana and Côte d'Ivoire using bioclimatic variables, finding an overall 89.5% decrease in the climatic suitability of the current growing regions, due largely to increased water stress and risk of drought. They also note that changes won't be uniform or consistent, but gradual, and thus are optimistic about adequate time for adaptation, though not for complacency.

Of course, projected climate figures are aggregate and average measures from general climate models, and therefore have limitations. The coarse scale of predictions (and often consequent down-scaling of models) adds to the uncertainty of future climate change at the more localized scales important in discussing individual and community vulnerability (Mearns, p.172). However, these projections provide insight into the trends of certain variables, such as precipitation and temperature, indicate impacts on cocoa and food crop production based on certain thresholds and optimal tolerances, and suggest novel circumstances for which people must be prepared.

5.2 *Perceiving Weather and Climate*

The previous section reflected on projected and modelled climate impacts, taken at a coarse resolution. This is useful to give a general idea of where climate conditions might be headed and what farmers might face. However, it is important to remember that decisions are made based on information in the shorter term and at smaller scales (Arense & Crane 2010; Coe & Stern 2011). Moreover, perceptions provide a necessary bridge between the scientific understanding of ‘climate change’, and the impacts felt at the local and farm level (Simelton, et al. 2013; Westerhof & Smit 2008). They essentially translate quantified projections of rainfall or temperature into the ‘experienced’ climate by individual or sets of farmers, and the heterogeneity of how those manifest with a community. As such, farmer perspectives and experiences are a critical component of understanding their exposure to a changing climate. Simelton, et al. (2013) argue, “appreciating how changes are perceived at the local level is crucial to anticipating the impacts of climate variability and/or change, as only farmers who perceive a problem will implement strategies to adapt or respond to it” (p.124).

An emerging and growing body of literature uses farmer consultations about their perceptions of weather trends and climatic change, and their coping or adaptation strategies (Akponipké, et al. 2010; Comoé, et al. 2012; Cooper, et al. 2008; Fosu-Mensah, et al. 2012; Legesse 2013; Rao, et al. 2011). Results of such studies have demonstrated that farmers are well aware of climate conditions and seasonal variability, most reliably up to a decade prior. Dinar, et al. (2008), in their analysis of climate change in Africa, noted that Ghanaian farmers perceived that temperatures have become hotter, rainfall has declined, and timing of the rainy season has shifted (p.75). A study in rural Ethiopia found that farmers perceived relatively accurately decreases in precipitation and increases in temperature over time (Legesse 2013). West, et al. (2008) also found farmers’ perceptions of decreased rainfall in Burkina Faso to be accurate. Precipitation, temperature, seasonality, and extreme events are common variables on which farmers often base decisions (Arense and Crane 2010; Rao, et al. 2007; West, et al. 2007). A study carried out in Ghanaian cocoa producing areas found that farmers viewed precipitation and relative humidity as the most important variables in cocoa farming, and that weather greatly influences the growing and management of crops (Codjoe, et al. 2013).

Here, the perceptions of specific climatic variables reflect what most affects a woman's daily life and serve as useful indicators of exposure to projected climate changes. Interview respondents characterised 'good years' and 'bad years' for agriculture and the 'optimal' conditions for farming practices. Through this process, subtle differences emerged with regards to who placed the emphasis on which weather phenomenon, and the nature of their responses. The prominent climate-related features in conversations seemed to reflect the different needs and optimal growing conditions of various crops and farming arrangements. This in turn relates to a woman's relation to cocoa farming, the land she manages, and the primary activities in which she engages. Consequently, these perceptions suggest that exposure to climate events or conditions may differ among women in a community.

5.2.1 *Farmers' Climate Experiences*

General Conditions and Heterogeneity

In interviews, respondents were asked about the important conditions for production - of cocoa, but also what affected the other crops grown - and the consequences if such conditions deviated from expected. This provides some sense of exposure to projected climate changes in these specific communities. Initial interviews focused on drawing out major weather themes and the conditions that appeared most important to farmers. Rainfall most often arose during interviews, and about half of participants noted sunshine as important for their farms (see Figure 5.5). Moderate conditions were identified as the most favourable for a good cocoa year - not too much sun, not too much rain. What this meant in practice was subjective and also depended on the characteristics of the farm itself. For example, one man noted that dry periods are generally not a problem for him, because of his proximity to the forest. Conversely, another man noted that he would much prefer rain than excess sunshine, because the sandy soil on his farm dries out quickly.

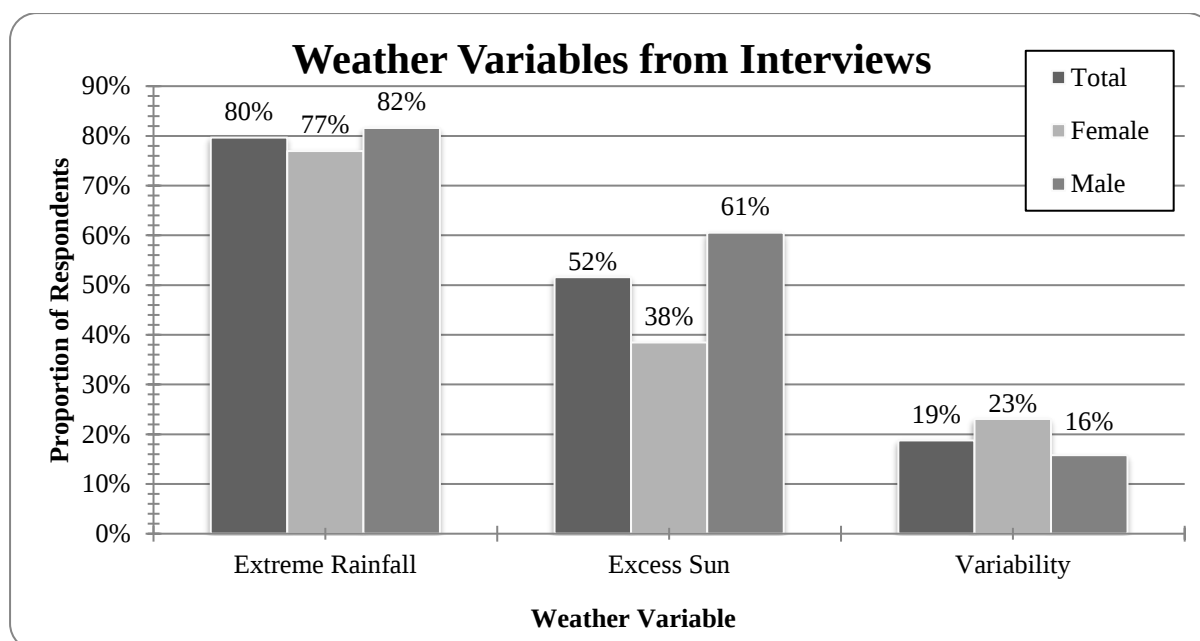


Figure 5.5 Weather variables of greatest occurrence during interviews among both male and female farmers.

Temperature

Temperature did not come up as a variable of most concern, but this could be attributed to its less conspicuous nature. For example, one study in Uganda and another in Kenya attributed discrepancies between farmers' perceptions of rainfall and actual precipitation data in part to either conflating the effects of increased temperature and evapotranspiration, or the effects of

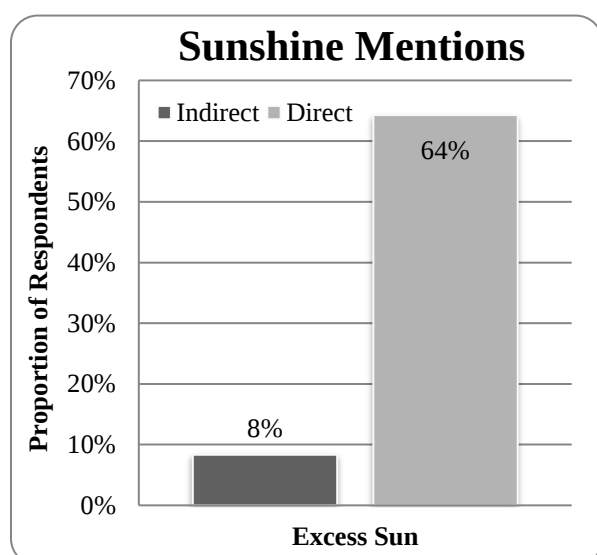


Figure 5.6 Proportion of women, categorized as indirect and direct cocoa farmers, who discussed excess sunshine during interviews.

environmental degradation (e.g. soil erosion and fertility loss), with less rain (Osbaahr, et al. 2011; Rao, et al. 2011). Mentions of periods of 'too much sun' might stand in as a proxy for temperature, seeing as increased evaporation has the effect of drying.

Only direct cocoa farmers brought up the role of sunshine (Figure 5.6), all of who were in agreement that too much (and implicitly the associated elevated temperatures) was detrimental. According to one of these farmers

who compared cocoa's response to sun to a human's, "cocoa leaves dry out, and trees become weak; they are unable to seek shade as a person would" [KA16D2Jul]⁶. In a study by Thomas, et al. (2007), male South African smallholder farmers saw drought as a risk more often than women, a result the authors attribute to differential livelihood strategies. It is interesting to note the parallel with the Ghanaian women farming cocoa directly, a cash crop and more traditionally the responsibility of men.

Precipitation and Humidity

Rainfall, even if sometimes confused with other related factors, was the primary topic of conversation. In a study by Pérez, et al. (2014) all perceived changes in weather were related to precipitation. Farmers experience and respond to weather variables that have observable tangible consequences. As one woman put it, comparing the previous year to the current, "rains have been good for both cocoa and food crops this year. Last year, there was too little rain. A bad year occurs when there is not moderation - either too much or too little rain" [AB106IN19Aug]. Despite any differences in perceptions around rainfall, it is understandable that so much emphasis is placed on this weather variable when it plays such a central role in crop production.

Of the women consulted in this study, the indirect cocoa farmers (almost) exclusively mentioned rainfall as the weather variable of principal importance. The amount or timing of rain and the rainy season were expressed in relation to food crop activities. For example, one woman who grew crops on a spouse's land noted the unusually early rainfall that shifted her planned harvest schedule: "this year it did not rain on time. I should have harvested maize already, but rains didn't come" [HOM96IN10Jul]. The amount of rainfall was also noteworthy. Having been a heavier rainy season once it did begin, cassava rot was forefront in many women's minds. For example, one woman noted that "massive rain this year has caused cassava to rot...it will be another year until it is ready to harvest" [HOM11D28Jul].

⁶ Interview naming convention:

Interview ID number Date
 [XY#Z#]
 Community Abbreviation Direct or Indirect Cocoa

Variability and Extremes

Among those women interviewed, there was a consensus of the season onset of rains varied. This is different from unpredictability, which implies an inability to plan for unsuitable conditions and may yield negative consequences for farming. One woman in this study accepted this uncertainty, saying “sometimes the month when you’d expect rain it does not come; it just depends on the year” [HOM54D15Jul]. Timing and planning horizons of farmers feed into exposure to climate change and the associated vulnerability of the system. Inter-annual variation was a frequently discussed topic, but came up most often among indirect cocoa farmers. Not surprisingly, this variability often arose in relation to planting and harvesting of food crops. Many admitted they didn’t know now what the season would be like next year, and that “year to year, things differ” [AB27IN29Aug].

Besides the general year to year variation and uncertainty, periods of extreme rainfall or aridity were also topics explored during interviews. Over three-quarters of those who discussed weather in interviews raised rainfall as an important variable, and most expressed concerns about extremes (Figure 5.5). There was a common understanding that extreme ‘dry’ conditions come cyclically every two or three years. One woman said that “last year was very dry”, but qualified the statement by noting that this is not a very frequent occurrence [KA16D2Jul]. Farmers recognized concentrated rainfall events as a challenge, but also that the number of events have become fewer (and perhaps more pointed) over the years. Several men also suggested that heavy rainfall events come every ten years or so. Farmers perceived that rainfall has gotten heavier over time, with one noting “I have not seen the river flood like it has this year any time since moving here” [HOM9D5Jul]. According to past weather records, Boreal summer precipitation has indeed increased since the 1960’s and Austral summer rainfall has decreased (Codjoe, et al. 2013).

Interestingly, the indirect cocoa farmers did not raise longer-term weather trends as an issue. In contrast, direct cocoa farmers adopted a longer-term perspective and considered how conditions had changed since their parents’ time or earlier. One woman remembered when previously working with her parents on their farm, “there was moderate rainfall and sun, which was good for production; now it rains more heavily” [KA16D2Jul]. An elderly woman shared this longer-term perspective, saying “rainfall was much more reliable when I first

started; now it's harder to predict" [KA33D11Jul]. Such observations are also indicative of the relatively greater permanence of cocoa farming and the concern with a time-scale on which meaningful management decisions for the crop can actually be made and implemented.

Final Thoughts

Weather events that have livelihood impacts are more evident in farmer responses than those that are separated from impact (Osbaahr, et al. 2011). For vulnerability, this is ultimately what matters. Impacts and consequences from weather phenomenon reflect the differing priorities of direct and indirect cocoa farmers. A study done on climate change in Ghana discussed the impacts farmers experienced, including crops "withering" due to low rainfall and high temperature, and greater incidence of pests and disease due to temperature and humidity changes (Yaro, et al. 2010). Similarly, indirect cocoa farmers tended to cite the loss of cassava, maize, or vegetable crops due to rot or poor production. One woman charged the weather as dictating what she planted and where, saying that "in the case of tomatoes, they can grow on a piece of land, but when it's rainy they don't produce well there" [KA102D18Aug]. Understandably direct cocoa farmers provided more detailed and varied responses about the impacts on cocoa specifically, from black pod disease and flowers "washing away" to leaf desiccation and premature ripening.

Anim-Frapong & Kwimpong (2005) raise the interesting point that cocoa production requires "non-routine decision making" by farmers to adjust behaviour that suits a crop that is disease-prone, sensitive to temperature and moisture. In fact, interviews in a study by Nyantakyi-Frimpong and Bezner-Kerr (2015) highlighted how environmental variability and extreme weather events are already part of daily existence, and farmers continue to find means of responding. While there is mixed evidence on farmers' ability to detect longer-run changes in climate (Burke & Lobell 2014, p. 138), Adger, et al. (2009) argue that a failure to link experiences and long-term trends could also negatively impact the capacity for future adaptation. Thus the uncertainties around future climate conditions in Africa, and the diversity of responses across interviews, support the notion that developing resilience "in the face of uncertainty" will be critical for successful adaptation (Niang, et al. 2014, p.1226).

It is apparent that climatic variables, and particularly those that are central to the well-being of cocoa trees, are forefront in farmers' minds. There is also evidence that the weather-related

challenges farmers already face are likely to become exacerbated over the coming decades as depicted in climate models. In essence, exposure to climate change, while not yet high in all but the transitional areas of cocoa production, is expected to be a serious concern. It is important to note that there is a difference between an area continuing to be suitable for cocoa production, and for it to be a lucrative endeavour. Considering the tight margins on which the region's inhabitants operate, even if it is still possible to grow cocoa, it may no longer be attractive and other activities may become more enticing.

Finally, people don't neatly categorize weather phenomena neatly, and experiences differ for a variety of reasons. Twyman, et al. (2014) note that, even if men and women perceive the same changes and events, they may experience impacts in different ways because of their respective roles, responsibilities, and assets. The next chapter will more thoroughly examine these other socially-oriented variables.

6. Chapter 6: Examining Social and Economic Drivers of Vulnerability

Exposure of the cocoa system to climate changes outlined in the previous chapter is just one piece of the vulnerability puzzle. Women, migrants, and the socially-disconnected landless are by default viewed as the most vulnerable groups in Ghana (Stanturf, et al. 2011). The factors delineated in gender and development and the entitlements literature are critical to completing a picture of who is most vulnerable and in what ways. These factors include income, education and local knowledge systems, social networks, and accessibility to credit, along with broader government policy, influence vulnerability for women (Keilthoilwe 2013; Williams, et al. 2015). Women interviewed placed emphasis or attention on particular indicators. This chapter explores these social variables influencing sensitivity to climate change and adaptive capacity. Each section presents results related to climate change vulnerability, preceded by a brief recap of and concluding with linkages to the literature.

6.1 *Land and Sensitivity*

Land and tenure were introduced in section 2.2.2, as factors affecting access to resources, labour divisions, and power dynamics. Women face greater difficulty acquiring their own land; though in some customary tenure systems as practiced in Ghana, land can be given as inheritance or by a woman's husband. Otherwise, women are primarily described as helping on their husbands' farms and cultivating food crops (for subsistence and cash). Sensitivity might come in two forms for those who have obtained land: for one, it tends to be smaller in size and of poorer quality than that of their male counterparts (Ackah & Lay 2009). Secondly, cocoa itself has been shown to experience high exposure to climate change, making it sensitive as a system. However, a woman with access to land for cocoa also benefits from the control over what is planted and harvested and the income generated (Carr 2008). Overall, a lack of access (and tenure security) is thought to discourage long-term planning and adaptation, and hinder the ability obtain credit (Stanturf, et al. 2011), increasing sensitivity to climate change. Thus, it makes sense that relation to land would serve as a foundational element, off of which the other indicators of vulnerability can build and interact.

Based on initial interviews, women were characterized by the ways in which they engage in the cocoa farming system, using a simplified version with 'direct' and 'indirect' cocoa farmers as the main designations for analysing the data (Figure 6.1). This came about because

a distinguishing factor among the women interviewed was their relationships to a cocoa farm. For example, a woman may work solely on a spouse's land, receiving some income from the major cocoa harvest, but only overseeing (if that) the management of food crop plots (**Indirect Cocoa Farmer**). For the most part, these women assisted on their husband's cocoa farms (e.g. during harvest), and grew food crops either interspersed with young cocoa or on small separate portions of land. This arrangement may have resulted after marrying into the community, but potentially from southward migration of the couple. The land on which cocoa grew ranged from the man's inherited land to an assortment of sharecropping relationships (see section 4.2.1).

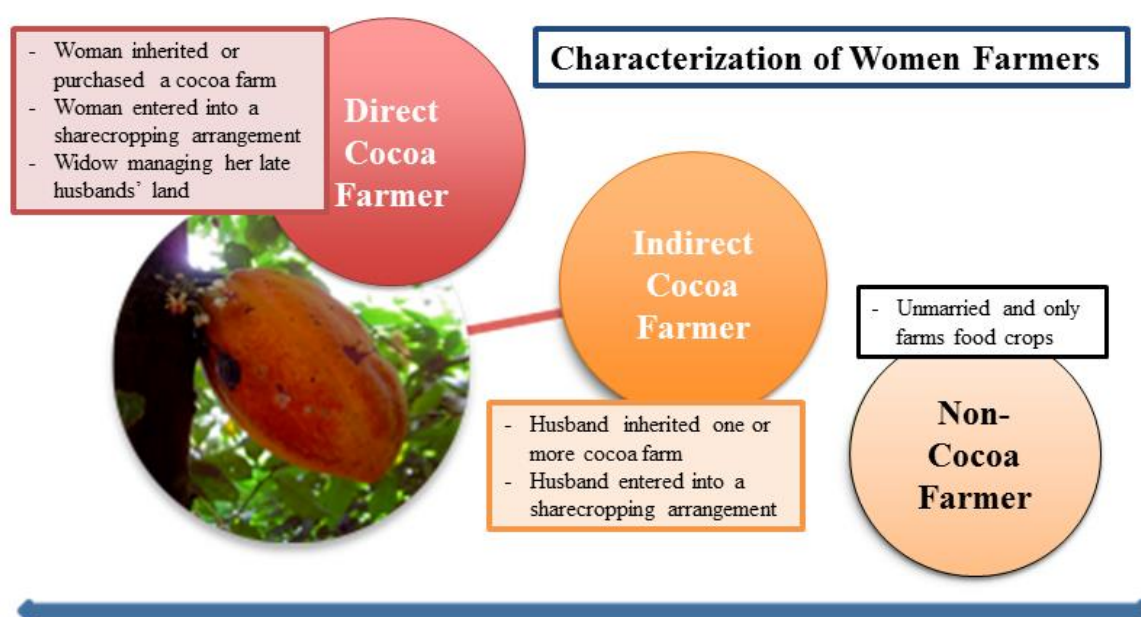


Figure 6.1 Schematic of women's relation to cocoa farms, as a way of further disaggregating this demographic.

Another woman might participate in cocoa farming activities (e.g. harvesting or weeding) on a spouse's farm, but also operates her own cocoa land that was inherited, purchased, sharecropped, or a combination of the three (**Direct Cocoa Farmer**). In essence, the Direct Cocoa Farmer was responsible for making decisions about management, hiring labour, and selling beans. A few women managed cocoa farms, for which responsibility devolved to them after their husbands' deaths. Finally, a couple of women interviewed did not partake in cocoa farming due to marital status and lack of access to land to a farm; this seemed to be a rare occurrence in the communities.

It is clear that the past – the history and evolution of a community – has some bearing on the characterizations and current sensitivity. Indirect cocoa farmers consist entirely of women who were external to the community, having come either to marry a man already in the community, or with her husband to acquire land (Figure 6.2). In contrast, direct cocoa farmers were more varied in their origins, but the majority (62%) were either born in the community or arrived as a child, and either could take over for a parent who had acquired land or have the connections to obtain her own.

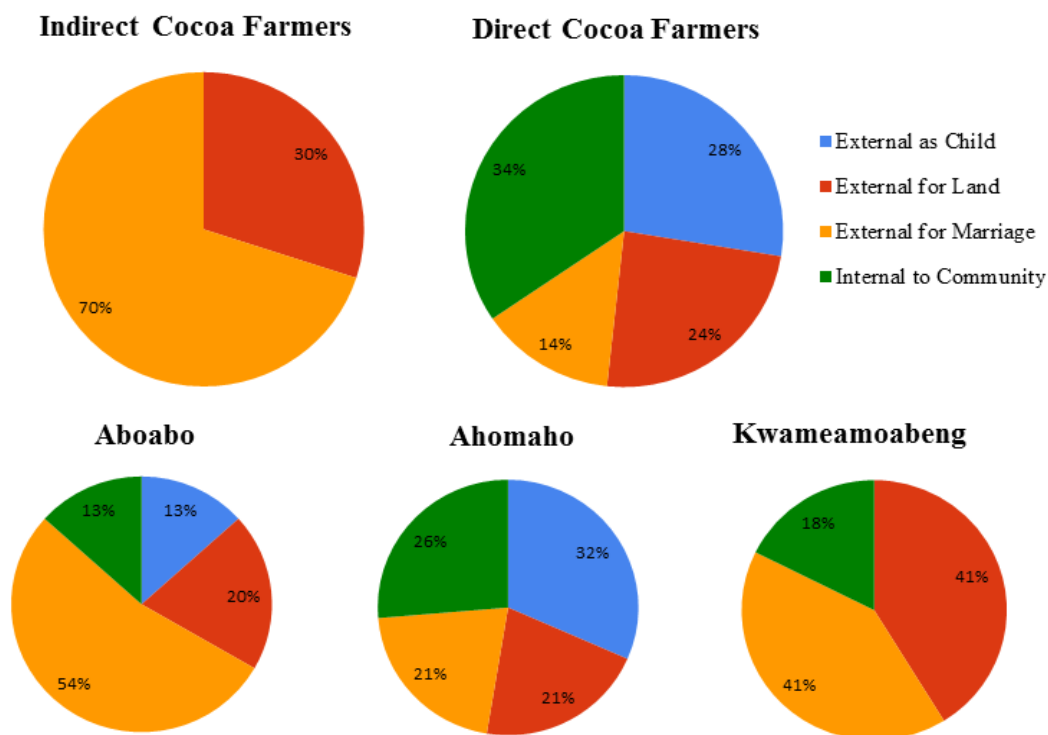


Figure 6.2 Breakdown of the origins of the Direct and Indirect cocoa farmers interviewed. As a comparison, the origins of women interviewed in each community are also depicted.

The distribution of these origins by community in turn reflects the different foundations of each and its relation to the respective stool. A deeper knowledge of the history would be necessary to understand the variation, but is outside the scope of this dissertation. It is also difficult for donors and policy makers to account for all the nuances, and thus many issues around land are left to the traditional authorities (Ubink & Quan 2008). A simpler disaggregation for the purposes of this research serves to focus attention on the factors that policy makers and development practitioners might actually influence to reduce vulnerability.

Ackah and Lay (2009) found in a study that there are other limiting factors for women's livelihoods besides the size of land parcels in Ghanaian cocoa farming. In order to glean some useful lessons from exploring these other components of vulnerability, henceforth differences between the women in the three communities is discussed in terms of those who do (**direct**) or do not (**indirect**) operate their own cocoa farms. However, this typology is by no means a complete or only way of disaggregating, and it is still a simplified representation of reality. There is considerable variation within those groups, particularly with regards to the array of tenure arrangements. Yet for the remainder of the analysis, this simplification aids in illustrating the concept of within-group variations in vulnerability and the value of more nuanced approaches that are largely absent in the climate change literature.

6.2 *Money Matters*

As noted in section 2.2.3, division of labour and income sources is a central theme in the gender literature, and analysis of vulnerability often includes livelihood-related indicators, particularly the types and number of income sources. Certain responsibilities and crops are embedded in gender norms, such as subsistence farming and taking care of household chores in the domain of women. Yet women also dominate trading and market activities, and the traditional divisions of labour continue to shift as circumstance change (e.g. men migrating to cities). The types and number of income sources, not including the 'invisible' activities in which women engage, hold considerable weight in how sensitive women's livelihoods are to climate change, because of how individual sources or the whole portfolio might be affected.

Income diversification is often framed as a means to reduce sensitivity in production systems by spreading risk across multiple crops or ventures (Antwi-Agyei, et al. 2014; McOmber, et al. 2013; Twomlow, et al. 2008; Waha, et al. 2013; Yegbemey et al. 2013). According to Heltberg, et al. (2009), the sensitivity of a household is influenced by the suite of assets and livelihood strategies, such as the varieties and combinations of crop and livestock, and diversification of farm and off-farm/non-farm activities. Clark (2000) argues that such diversification allows rapid responses to disruptions, writing "this diversity helps preserve alternative channels, minor crops, and small enterprises through even the most difficult conditions" (p.254). Studies in Ghana and other West African countries have shown livelihood diversification is a common strategy amongst farmers as a means of dealing with uncertainty (Antwi-Agyei, et al. 2014; Oyekale & Oladele 2012; Ruf, et al. 2015).

There are also strong connections between livelihood diversification and climate change vulnerability and adaptation, exemplified in the lessons from past responses to extreme weather events. An example in Zambia showed how during extreme events, such as droughts and floods, farmers (both men and women) practiced vegetable gardening, 'piecework', brickmaking, charcoal burning, and livestock selling (Siulemba & Moodley 2014). Of relevance for cocoa in particular, Ruf, et al. (2015) suggest that "crop diversification has become common among tree crop farmers around the world as a way of reducing their vulnerability to environmental and market shocks and is now frequently recommended as a component of strategies to adapt to climate change." A case study in the Ghanaian forest-savanna transition zone, where cocoa dominated prior to the 1982/83 drought and bushfires, illustrates this by depicting how cropping composition can change in response to a climate-related shock (Adjei-Nsiah & Kermah 2012). Previously in the Brong Ahafo region, yam was grown primarily for home consumption and maize was an important but more minor crop; whereas after the drought maize, yam, and cassava have come to dominate as more suitable to the increasingly dry conditions, and cocoa has all but disappeared.

Off-farm income sources come through strongly in the literature as a key factor affecting the sensitivity of an agricultural system to climate-related shocks. Cooper, et al. (2008) assert that varied asset bases produce more resilient livelihoods that are less sensitive to shocks, arguing that those who rely largely or completely on rain-fed agriculture are often the most affected. As an illustration, they describe how the failure of rainfall and replenishment of wells forced the diversification of income sources into off-farm activities in Andhra Pradesh, India. Similar phenomena occurred in northern Burkina Faso, where unreliable rainfall has motivated diversification off-farm (Nielsen & Reenberg 2010), and in Ghana since the drought of 1983 (Antwi, et al. 2014). The following result further support that women often engage in multiple economic ventures, including both on and off farm activities.

6.2.1 Income Sources and Sensitivity

Both groups of women interviewed demonstrated engagement in livelihood diversification in some way; however, the types of activities and the extent of diversification varied substantially. A lower percentage of indirect cocoa farmers discussed participation in any

particular venture (Figure 6.3a). Moreover, the types of income-generating activities mentioned were best represented by food and cash crops. In contrast, off-farm income sources like prepared foods (e.g. *watkye* or *rice balls*) and ‘odd jobs’ (e.g. midwifery or washing dishes in town) arose more often in conversations with direct cocoa farmers. A greater proportion of these women were also active in any given venture. Cocoa is deliberately left out, because both direct and indirect farmers access income from the harvest and sale, though the scale will differ between the two groups.

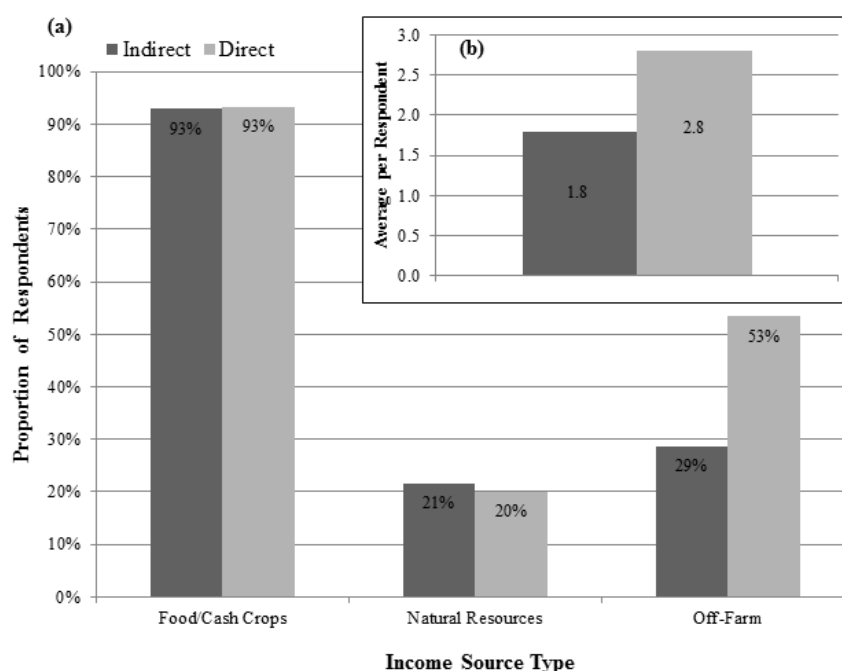


Figure 6.3 Income diversification: (a) different types of income generating activities in which direct and indirect cocoa farmers engage; (b) the average number of ventures per female farmer. Food/cash crops include staple crops, rice, oil palm, and vegetables. Natural resources include non-timber forest products and ‘crafts’ made from them, and fish. Off-farm sources include trading, prepared foods, and ‘odd jobs’.

For indirect cocoa farmers, diversification is often equated to crop diversification, although petty trading did come up fairly often. For example, in response to a question about different ways of making a living, a woman described her activities, saying “if you are producing tomatoes and pepper, which are not doing well, it is possible to switch to garden eggs and okra and it will be wonderful” [AB106IN19Aug]. ‘Diversification’ was recognized as a means to spread risk and manage shocks. According to one woman, “If the crops generally do poorly, we fall on hard times. However, if the cocoa does poorly, and the food crops do well, they can serve to supplement for inadequate cocoa harvest. One doing well, does not

dictate the other's success" [AB6IN27Aug]. However, the income streams in the control of the women are generally perceived as a stopgap, their importance downplayed compared to that of cocoa. Selling food crops is a useful source of income for their "upkeep", making household ends meet, and smoothing out the periods between cocoa harvests.

Upon examining the pursuits of successful female cocoa farm operators, there are clearly more elaborate and fluid portfolios of income sources, characterised by a diversification of the types of income-generating activities, including off-farm. While conducting an interview in one woman's small 'chop shop', she explained how variability is the reason why selling prepared food is better than, say, only growing tomatoes. "At a particular point you might grow maize, followed by tomatoes, and you can't really change that plan. But a friend might have the same plan, which is why things become common at a particular point"

[HOM64D30Aug]. She hit upon the challenge with a reliance on food crops, where there is only so much flexibility and room for mitigating unforeseen circumstances. The prepared food, on the other hand, presented a consistent and dependable source of revenue, less at the mercy of adverse weather conditions. This anecdote corroborates Cangarajah, et al.'s (2001) findings in Ghana that link engagement in cocoa and non-farm income sources.

The form the diversification strategy takes for direct cocoa farmers not only is evident in non-farm income streams, but includes on average a greater number of occupations (Figure 6.3b). For example, one woman who inherited a cocoa farm noted that she also processes and sells palm kernel and fruit to make oil and help pay school fees and license fees for one son who is a driver. If the necessity arises, she will also go out to farms to collect firewood to sell, make *gari*⁷, and even do odd-jobs like washing in a nearby town [HOM37D30Jul]. Another woman cobbled together her own parcels of land, but also owns a pharmacy, sells shoes and other products as a trader, and was a teacher. She also articulated a major reason women have an inherent tendency toward diversification, "I can't rely on husband to pay school fees, even though he does contribute...it is necessary to do many things to make sure ends meet" [HOM62D18Jul].

⁷ *Gari* is a form of grated and toasted cassava used as a light snack or meal.

One point raised among many of the women related to dependency on cocoa for livelihoods. Dependency on cocoa itself, especially in light of the potential impacts from climate change, could be considered a point of vulnerability. Money from cocoa is very much already committed – to school fees, health services, and reinvestment into the farm. In terms of climate change, this feeds back into planning horizons mentioned earlier. Funds from cocoa might not be immediately available for quick responses to extreme events or shocks, but might lend themselves better to long-term planning for eventual climate shifts. Women without their own cocoa were adamant that food crops were only for their maintenance, household upkeep, and emergency periods, but it does fill gaps in essentials if a cocoa crop does poorly – essentially ‘coping’. These short-term measures may not suffice as climate shifts and stresses are more regularly placed on the cocoa system. Those with off-farm income sources may find themselves in a more secure position, able to endure hardships. Such diverse pursuits do spread risks, but also requires a certain amount of initial stability and resources on hand (e.g. Davis, et al. 2014).

6.2.2 *Capacity to Diversify as Capacity to Adapt*

Diversification also relates to adaptive capacity and the power of financial resources for making alterations as the need arises. Underlying diversification, which itself affects sensitivity to climate change, are enabling conditions like adequate financial means and accessible information to actualize goals. Clark (2000) found that the factor limiting income diversification during the 1982/83 drought in Ghana was liquid capital, and those with such resources at hand could sustain themselves longer. Antwi-Agyei, et al. (2014) found a similar wealth gap in diversification; their study found richer households more often had less climate-sensitive off-farm livelihoods.

The direct cocoa farmer interviewed at her *watkye* shop shared that the income from selling the popular rice and bean dish has allowed her to invest in additional things, including acquiring new land, putting children in good schools, and setting aside money for savings [HOM64D30Aug]. Her response illustrates how critical financial resources are to undertaking income generating activities that spread risk, and emphasises the positive feedback loop catalysed by initial cocoa finance. In speaking with the former teacher mentioned earlier, it was clear she saw financial resources as a substantial barrier to income

diversification, particularly among those without cocoa. She praised women for having passion and drive, but said they “don’t sell, because they don’t have money to start a business” [HOM62D18Jul]. These desires to start a business or go into trading were echoed by indirect cocoa farmers, most often noting the what-if scenario had they the money in hand. Other studies corroborate these observations, with Barrett, et al. (2001) arguing that diversification prior to shocks is a form of ‘self-insurance’ in which the poor are unable to engage, especially with relation to non-farm income sources. McOmber, et al. (2013) note that women often find difficulty in accumulating and controlling financial wealth, and ultimately limiting their capacity to respond to climate change.

6.3 *Empowered to Adapt*

A current critique within vulnerability discourse focuses on the limitations of assessments of vulnerability to climate change due to their failure to integrate institutional elements, entitlements, and ‘agency’ (Preston, et al. 2011). Brown and Westaway (2011) go a bit further to suggest that the adaptive capacity component in fact depends on both tangible elements like income and resources, as well as the less concrete factors like perceptions of self and opportunities to enact changes in one’s life. They admit that little empirical or systematic assessment has taken place as of yet, but there are researchers beginning to articulate the connections between human development concerns of self-efficacy, optimism, decision-making, and perceptions, and how and the extent to which people will be able to manage climate shocks, stresses, and change. Newer evidence is showing that perceived adaptive capacity may hinder adaptation in practice (Adger, et al. 2009). The concept of empowerment ties together many of these softer contributors to adaptive capacity. Who controls resources, income, and decision-making, as well as perceived influence over the future are themes that surface in literature discussing empowerment (Bob & Babugura 2014; Resurrección 2013; Vigneri & Holmes 2009).

It has been argued that women’s empowerment and their fulfilment of leadership roles are important for a more climate resilient future (Bob & Babugura 2014; Isaac 2012).

Consideration for empowerment in the context of adaptive capacity takes on additional significance in an agricultural economy heavily dependent on an export commodity crop like cocoa. Researchers have detailed how the introduction and prioritization of such cash crops,

often tied to European colonialism, shifted traditional distributions of labour and rewards within agriculture and thereby influenced the balance of power within and between households (Boserup 1970, p.42; Due 1982; Duncan 2004, p.33; Tosh 1980). Empowerment, as influenced by perceptions of agency, control, and support, is subsequently examined for the women farmers in the communities in Ghana. Rather than supporting the image of climate victim painted in the literature, the interviews reveal many strong women who, with adequate support, have great potential to adapt as needed.

6.3.1 Agency for Adaptive Capacity

Agency is broadly defined as the ability to define goals and act on them (Brown & Westaway 2011). Further, discussing agency in relation to climate change acknowledges that humans are never just passive in the face of imminent threats. While competing conceptualizations of agency exist, two are particularly useful applied to climate change and women in the cocoa system. Emirbayer and Mische (1998) frame agency as a “temporally embedded process”, and stress an ability to envision alternative futures, in addition to reflect on past and present circumstances and manoeuvrability. A second places an individual’s motivation and purpose underlying specific actions as related to a sense of agency (Moser 2007).

Purpose and the Future

Purposefulness and future orientation arose as themes, particularly among direct cocoa farmers. These themes manifested as aspirations for children, and to some extent other plans like business expansion or building improvements. A woman operating her own cocoa farm was seen as the means to “further” her children’s education or as a form of secured inheritance for the future. One direct cocoa farmer noted that the greatest benefit of having her own land, versus sharing with her husband, is that it can be left as property for her children to inherit and not risk being subsumed by her husband’s family [KA20D19Jul].

Many implied or said outright that they continue to put great effort into farming so as to earn enough for their children to become well educated and “achieve a better station in life” [e.g. HOM54D15Jul]. Some indirect cocoa farmers also provided insights into their imagined futures. While these also dealt with children, the few comments made were primarily in the negative, centred on escaping farming. As an example, one woman responded, “I do not

expect to find any of my children in farming. There are many schools and businesses, which is why there is an emphasis on covering school fees and educating children. I will continue to farm so the children can be put through school” [AB106IN19Aug]. This conveys a sense of self-sacrifice and inevitability for herself that she does not wish on her children.

Attitude and Perceptions of Self

Perceptions of one’s circumstances, competency, and self-efficacy are also marks of agency and empowerment (Brown & Westaway 2011). For instance, Oppenheimer, et al. (2014) assert that perceptions and cognitive constructs of risks and adaptation options have bearing on the subsequent ability to adapt. As such, it was interesting to come across the recurring image of a “hardworking woman” depicted by many of the direct cocoa farmers. This depiction stemmed from women who seemed to adopt the mentality that taking control of the present could effect the future outcomes they desired. One woman expressed “that those who succeed are the ones who put in great effort and much time and energy, while those who are lazy or don’t make an effort will complain of low yields and no support” [HOM62D18Jul]. Similarly, another woman lamented how “the young males in town are lazy and not hardworking. The female youth, however, are enterprising and starting their own businesses” [HOM42D24Jul]. This is not to say that the indirect cocoa farmers disregard their own and others’ capacity to achieve goals through determination and hard work, but it was just not as overt or freely expressed.

Results were more mixed among indirect cocoa farmers, for whom a common admission was one of resignation, seeing no alternatives to farming. For instance, one woman did “not have much faith in the future of cocoa; it varies by year. In five years it could be good or dead. But there is not another option besides farming” [KA66IN25Jul]. This type of attitude - one without vision of future opportunities - flies counter to what researchers insist is fertile ground for cultivating adaptive capacity. However, one woman with a young child did adopt a very rosy attitude, seeing cocoa as a boon to the country as a whole. She positioned farming as a generator of development, creating a platform for the next generation to get into business. Her plan was to “do the farming work well so that youth will want to join” [AB6IN27Aug]. As recognized in the literature, imagining an improved future, and the

optimism associated with it, conveyed a sense of power and agency among respondents (Carr 2008). This indicates that given the requisite support, these women would be able to take necessary steps to adapt to climate change. The results also suggest a relationship between lack of agency and lack of control over cocoa farming, particularly among those women who came to their current communities for marriage.

6.3.2 *Supportive Environments*

Decisions, Control, and Support

Control over resources, incomes, and decision-making surfaced in the literature as key components of empowerment (as noted in section 2.2.4), and this topic made some appearances during interviews, as well. Many women stressed that having control over food crops is very important for a woman. Not only do the crops physically provide the sustenance that is her responsibility to the family, but placing the power in her hands can lend confidence and ownership necessary to manage well. Many of the direct cocoa farmers enjoyed complete autonomy over their farm plots, making separate management decisions. Some noted that husbands and wives work on each other's farms and make decisions jointly. Risk mitigation often serves as the rationale given for joint management, relying on the variation in land character to yield a good harvest on at least one plot in any given year. This is a relevant point with regards to climate change adaptation.

Indirect cocoa farmers ranged from jointly managing land to having little or no say in decisions. It seemed as though the women whose husbands inherited land enjoyed less say in the management and felt less control over the outcomes. According to one woman, a big problem was that "I have not even one tree of my own, and therefore nothing that I have control over to provide for my needs" [AB59IN22Aug]. This could be remedied if her husband would "lead her to land" and she then had enough money, but she said her "husband won't lead, and prefers to hire labour on his land rather than enlisting" her help. This situation left her feeling powerless and without options or recourse. This may differ from sharecroppers on cocoa farms, because in many instances the land is often sought out jointly, even if the woman does not end up with the final decision-making powers. For instance, one such woman noted that she and her husband share in the tasks and decisions; "when we weed,

we all do it together. We also decide what actions to take together” [AB97IN19Aug]. In contrast to the previous scenario, the woman at least has feelings of inclusion and some semblance of control, which provides better incentive to actively participate in the farming. This, however, is a rarity amongst the indirect cocoa farmers in this study.

Social support structures or groups that could empower women were decidedly absent in the communities in Ghana. Women without cocoa farms went to particular lengths to describe the utility of such groups in serving times of need and making possible positive futures. The reasons given for a group’s perceived usefulness ranged from facilitating access to information about good farm management practices to providing credit for small businesses or during difficult periods. One woman remembered in her hometown, “the youth put together support groups that met every two weeks – girls to girls; boys to boys. People would give advice and contribute to the coffers for when someone was in need” [HOM103IN5Aug]. Since moving to the community for marriage, she hadn’t come across anything like this.

6.3.3 *Feeling the Impacts*

Historic and current adaptation is informed by perceptions and local knowledge based on previous experience (Adger, et al. 2009), highlighting the importance of examining how differential impacts of 'bad' years might affect empowerment and adaptive capacity. During interviews, women addressed the consequences of having a bad weather year, which provide insight into the variation in empowerment and adaptive capacity within the communities. Indirect cocoa farmers reflected on the inevitability of “going without” during a bad year. For example, one stated that in a poor production year they “will be hungry; children may need pens or something for school”, and she won’t be able to provide for them [AB97IN19Aug]. When asked specifically how the impacts of a bad year for cocoa versus a bad year for food crops differ, another woman said that “if crops don’t do well, you will be hungry, unless you have some money available to buy food. Cocoa is our main source of income. So if that does not do well, it is very difficult and you will surely go hungry” [KA50IN4Aug].

In contrast, the direct cocoa farmers stressed the additional costs of inputs or labour for applying pesticides, setting up irrigation, or transporting a harvest during ‘bad’ years. Considering that climate changes might require more time and effort (e.g. turning beans when

heavy rains; extra weeding; replanting when seedlings die), this is an added expense that women working only their food crop plots will not experience. One woman articulated how during heavy rains “cars can’t make it through on the road. Beans will be heaped and ready to get picked up but no truck will come. Then I will have to hire labour to carry bags” [KA48D26Aug]. So while a food crop cultivator may be resigned to reducing the quality of life or not being able to provide adequately for her family, one with a cocoa farm is more concerned with results less directly harmful to basic livelihoods, such as additional costs from labour and inputs to production.

Finally, this brings the discussion back to the victim characterization dominating the climate change and gender literature at the moment. Whether strong-willed and independent or merely making due and getting by, very few of the women interviewed in the communities seemed to fill the victim role. The victimization pervasive in climate and gender literature denies women agency despite demonstration to the contrary. Though the degree of perceived agency, and the sense of control and optimism over the future, varied by group, it may not only be misleading but even counterproductive to characterize even a subset of women as ‘climate victims’. Also considering many of the women who appeared to have the most points of vulnerability still had drive to succeed, there is considerable scope for adaptation with the right support structures. The whole discourse on vulnerability and gender may be better served by constructive discussion of solutions that account for the differential sensitivities and capacities among women within a community, rather than simplified ruminations on helplessness that could result in misdirection of resources or condescending attitudes that underestimate a woman’s ability to achieve.

6.4 *Knowledge is Power to Adapt*

Knowledge is power, and access to information resources and knowledge is often considered a means of empowering women and an important contributor to adaptive capacity (McOmber, et al. 2013; Williams, et al. 2015). Besides enabling people to make sense of the world around and environmental phenomena, knowledge has predictive power and allows for preparation and responses to climatic shocks and changes over time. According to the IPCC Fifth Assessment Report, “knowledge empowers people to participate more effectively in local, national, and international conversations about climate change adaptation”, and a lack

thereof hinders adaptation opportunities (Williams, et al. 2015). The treatment of access to information in the gender literature was introduced in section 2.2.5, and broadly depicts women as facing difficulty accessing agricultural education and technical assistance (McOmber, et al. 2013; Meinzen-Dick, et al. 2014). As such, this section explores the sources of information women in the communities cited as important, as well as perceptions around access to information.

6.4.1 Sources of Information

First of all, when comparing the interviews conducted with men versus those with women, it was clear that different modes of information acquisition were either available (or perhaps most suitable) (Figure 6.4). Female farmers tended to rely more on media (radio), their husbands, or their mothers for information. Formal sources (e.g. extension) and fathers or elders surfaced more often among male farmers. Informal exchanges with peers and observational learning were relatively evenly distributed, indicating that informal exchange is a characteristic of farmers more generally and considered a valuable means of acquiring new knowledge and working through current challenges.

Among women, this distribution of sources of information also varied (Figure 6.5), depending on differences in constraint and needs of individuals. Media, and radio more specifically, was cited as an important source of information for agronomic practices and weather forecasts. Women not responsible for cocoa farms (indirect) most often referred to wireless radio, including weather forecasts, news, and farm programmes developed by the Ministry of Food and Agriculture. While still providing an infusion of external information, this does not address individual or unusual problems a farmer might face.

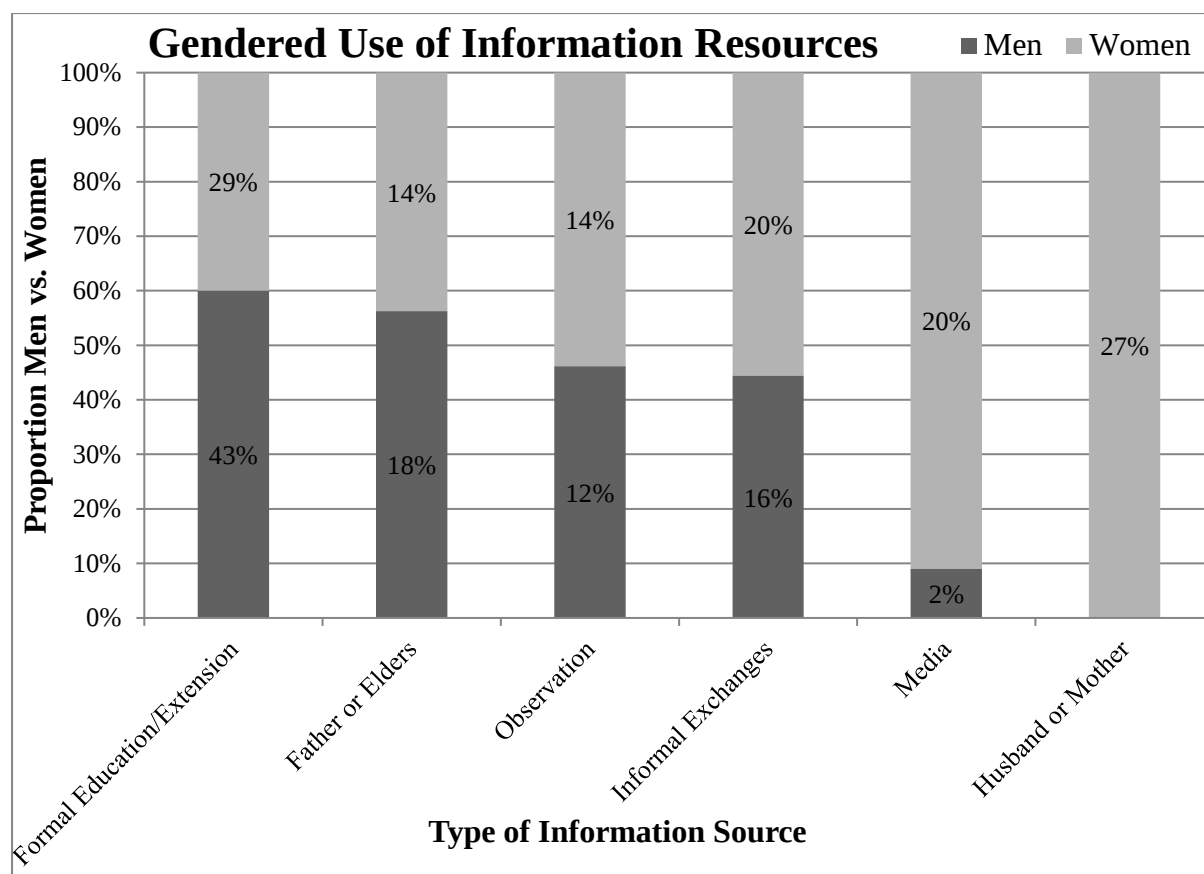


Figure 6.4 Ratios of the types of information resources used by men and women.

Most indirect cocoa farmers were adamant about not receiving any help from extension agents. One woman bemoaned the fact that “Agric” - as farmers referred to extension agents - does not come to her farm, yet sometimes there are things going wrong that she would like to know more about, such as what land is appropriate for planting which crops [KA12IN29Jul]. Politics also gets entangled in formal government information provision, with one widowed cocoa farmer observing that ‘Agric’ has a particular group of people they always educate, and reasoned that you probably have to pay money to be able to access the training they provide [HOM17D28Jul]. While in theory agricultural extension provided by the government is freely accessible to all farmers, this statement hints at economic or political barriers to accessing certain information sources.

Direct cocoa farmers did express better access to extension services, but they still readily admitted that the agents don’t come very often. One critique from the users of extension services is the emphasis on inputs. One woman mentioned their presence the week prior, but

was frustrated that they were “still talking only about chemicals” [HOM37D30Jul]. This paradigm of formal information provision seems to result from a primary focus of extension on an export commodity crop in the region, thus explaining the bias towards men and female direct cocoa farmers and the emphasis on technological solutions. However, it leaves something to be desired in terms of augmenting capacity to adapt to climate change.

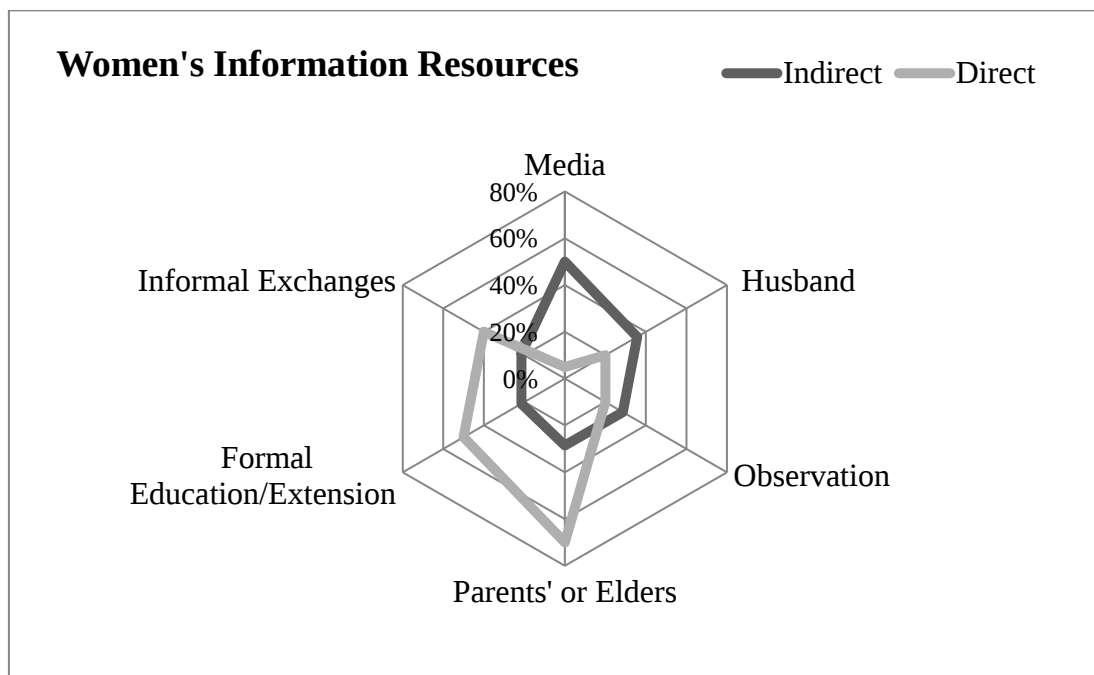


Figure 6.5 Information sources cited during interviews with Direct and Indirect female cocoa farmers. Percentages reflect the proportion of respondents who discussed the specific resource.

Informal sources of information arose repeatedly, and their importance has been emphasized in other studies mentioned earlier. Parents (particularly mothers) came up in conversation most often with direct cocoa farmers. A common story was shared by one of these women, who said “I was born and bred by my mother, and would go to the farm with her” [HOM8D21Aug]. For those with a family legacy of farming cocoa, this makes sense. A response often given for questions on how women acquire knowledge of farming captured the osmosis-like way in which the direct cocoa viewed their tutelage: “so far as you are a farmer, you will know what to do” [AB108D4Jul]. Considering women more often use household labour than hired (Hill & Vigneri 2009), it is understandable that particularly those women raised by mothers with land would glean much of their basic knowledge from experience going out to the farm and helping.

Though less exposed to parental wisdom, indirect cocoa farmers did discuss the importance of information from husbands and peers. These women seem to readily share information informally, particularly when finding something difficult. One woman felt her access to information was good, saying “I have gotten to know things from the other farmers, here and even in Gynabodee, like what grows well in any particular year” [KA57IN26Aug].

However, the sources of information she noted were limited to these informal interactions. Some women in this group married into cocoa farming and/or came from a more urban area, so rely on their husbands for any agricultural information needed. Perhaps because of this background, among some of these women there was a belittling of their own knowledge and ability to acquire information. One woman said that men normally supplied information like weather forecasts [KA50IN4Aug], and another argued at the outset of the interview that it would be very short seeing as her husband had already been consulted and would have said everything about farming [AB27IN29Aug]. This relates back to the discussion of agency in the previous section, suggesting that women with better access to information and confidence in their knowledge would perceive better capacity to adapt to change.

Finally, organizations or companies sometimes provide information and have been shown to fill critical gaps (e.g. Buadi, et al. 2013), but these are not always accessible to those who might be interested. One woman reasoned that “if you have no formal education, then it is very bad. You can’t read, and many of the benefits from working with the companies or in a group like this requires literacy in order to enjoy” [AB59IN22Aug]. While this indicates a greater underlying need for education improvements, is also underscores the importance of information provision that caters to those who may not be literate, with fewer resources at their disposal to adapt to shocks, and as a consequence more vulnerable to climate change.

6.4.2 *Supporting Information and Knowledge*

Responses related to information access among women raised several important points about the type of information and means of disseminating. Authors such as Cherotich, et al. (2012) and Keitlhoilwe (2013) have suggested that extension services can play a major role in building adaptive capacity, and should be more demonstrative in terms of dealing with climate hazards and implementing adaptation strategies, such as more suitable and diverse

crop varieties. Yet one of the main shortcomings raised by most women was an absence of extension, in line with other studies illustrating the general inadequacy of extension agents and training attendance in Ghana (Asiedu-Darko 2013). Studies (like McOmber, et al. 2013) have shown that women better utilize extension services when there are also female extension agents. Despite past proposals to establish better gender balance among agents, any effort has so far not met with success.

Radio was an often-cited source of information, particularly among the indirect cocoa farmers, and could present a channel to provide robust weather forecasting and information tailored more towards non-cocoa farming. Other studies have shown that radio is a preferred means of delivering reliable information in the local language (Cherotich, et al. 2012), and could provide climate and agronomic information to women. According to Coe and Stern (2011), well-done seasonal forecasts can be an extremely useful tool with which farmers can plan, and as alluded to earlier, women farming food crops and trading at market can make decisions on relatively short time scales based on this information.

Finally, it is important to recognize that multiple sources of information are often used for different purposes, activities, or timelines, and that no one information source may suffice for adaptation among agriculturalists (Krasny, et al. 2010; McOmber, et al. 2013; Roncoli, et al. 2002). This is evident from speaking with some women who inherited cocoa farms, who relied on wisdom from a parent, often a mother, for the initial management of the farm but have also incorporated new practices from social interactions and extension agents. This mixture of sources corroborates Isaac, et al.'s (2007) finding in Ghanaian communities that farmers sought information from both within and outside of the community, each toward different ends. For example, troubleshooting pest and disease issues often relied on outside sources. They also found that “highly sought” individuals who consult extension agents served as bridges between formal external information sources and the exchanges within communities. While this would serve to augment the infiltration of outside information, it still may not meet the needs of some women because of the types of information or the accessibility of “highly sought” individuals.

Studies have confirmed the importance of social interaction and informal exchanges of knowledge for women (Collins & Ison 2009; Osbahr, et al. 2010), and in terms of developing adaptive strategies (Isaac, et al. 2007; Isaac 2012; Ketlhoilwe 2013). At the same time, education programmes dealing with agriculture and climate change provided by institutional actors (e.g. NGOs and government) play an essential role providing technical know-how that currently exists outside of farmers' decision-making tools (Buadi, et al. 2013; Cherotich, et al. 2012). Increasingly, studies have shown that combinations of observation, informal knowledge exchange, and formal extension provision play a role in building adaptive capacity (Newsham & Thomas 2011). It is therefore important to consider how to integrate traditional and informal with current scientific knowledge (Feldman & Welsh 1995). Finally, access to the right combination of information sources is important, but ultimately it is whether and how the information is employed that demonstrates its utility and effectiveness.

7. Chapter 7: Discussion and Conclusions

This dissertation set out to examine issues of climate change vulnerability, how a gendered analysis contributes to a more nuanced assessment of vulnerability, and where adaptation policy and practice stands in terms of integrating this nuance. A combination of reviewing literature, climate change projections, and policy documents and semi-structured interviews in case study communities provided initial insight into important considerations for adaptation policy. There is considerable opportunity for additional research at a local level, and effort devoted to linking national level policy formation to implementation at the district and local levels. This final chapter revisits the three initial research questions presented in Chapter 0, drawing together results and context. It then reflects on the research process and considers additional areas to explore, before ending with parting thoughts.

7.1 *Revisiting the Questions*

7.1.1 *In What Ways Are Women Vulnerable?*

The first question considered simply the ways in which women are vulnerable to the impacts of climate change on cocoa farming systems. Certain themes came across in relation to exposure, sensitivity, and adaptive capacity to climate change (Table 7.1). Though changes in high temperatures, total rainfall, and timing are projected in climate models, farmers primarily referenced extreme levels of precipitation as hindering their crop production. This holds with other studies conducted on farmer perceptions of climate change, but also indicates the importance of downscaling and relating climate projections to the types of conditions that farmers experience and understand. It also became clear that while farmers' were very cognizant of weather variables and that they factored into farmers' decision-making, other variables seemed to more fundamentally affect vulnerability. This supports the idea that climate change aggravates existing social vulnerabilities, rather than serving as a root cause. It is also a testament to how entangled climate change and development are, and how separating biophysical and socio-economic elements is merely out of ease for people to process rather than reflecting any semblance of reality.

Addressed as a factor in sensitivity, access to cocoa farming land proved to relate to complex systems of inheritance and sharecropping, which varied by ethnicity as well as community. It highlighted the importance of developing a strong understanding of the local history, but also

demonstrated the need to focus on the variables and level of detail that policy makers actually influence. Income diversification and off-farm sources were explored as a contributor to sensitivity, and related to a woman's ability to access land for cocoa. The literature suggests that less diversity and greater reliance on farm products indicate high levels of sensitivity to climate change. Interestingly, cocoa's limited climatic tolerances make it particularly sensitive, while food crops offer a greater range of possibilities that may be more or less sensitive to climatic conditions. Off-farm income sources varied, but the bulk of which fell into 'petty trading' activities and non-timber forest products, which still may be more sensitive to climatic variability and change than other businesses or service-based jobs.

Table 7.1. Summary Table outlining questions, key findings and the research methods.

Research Question	Main Findings (Sections)	Methods	
1. In what ways are women vulnerable to climate change?	<i>Exposure:</i> perceived climate variables correspond to projected impacts, but specific respondents experiences vary (5.2) <i>Sensitivity:</i> access to land and income diversification reduce sensitivity (6.1; 6.2) <i>Adaptive Capacity:</i> positive perceptions and access to information help (6.3; 6.4)	Semi-Structured Interviews with women farmers	Document and Climate Projection Analysis
2. How does vulnerability differ among women?	<i>Exposure:</i> direct cocoa farmers were more aware of temperature/sun and long-term (5.2) <i>Sensitivity:</i> direct cocoa farmers engaged in more off-farm income sources, had better financial resources from access to cocoa (6.2.1) <i>Adaptive Capacity:</i> both groups defied climate victim image, but more negative perceptions surfaced among indirect cocoa farmers (6.3.1). Direct farmers had a mix of formal and informal information sources (6.4.1)		
3. What are the implications for adaptation strategies and policy?	Current policies looks promising on paper, but has only recently been released (3.2). The effectiveness of policy in addressing the identified areas of vulnerability will depend on linking with local levels in implementation.		Document Analysis

Empowerment and agency were presented as an emerging lens through which to examine adaptive capacity, arguing that perceptions of self-efficacy and attitude may play an integral role to actualizing adaptive activities. This came through in interviews as positive outlooks and future orientations, but also related to intra-household power relations in terms of decision-making. Considering the depiction of women as climate victims in much of the climate change literature, it is important that empowerment and agency are explored further as forces influencing vulnerability. While there is certainly evidence that women will be disproportionately negatively impacted by climate change, the optimistic and enterprising attitudes adopted by many women also offer opportunities for adaptation measures perhaps not previously considered.

Access to information resources is often employed as an indicator of empowerment, as well as a vital component of adaptive capacity. For climate change and agriculture, such information would manifest as medium and long-term forecasts, advice on best management practices or appropriate crop varieties, and traditional knowledge for dealing with past variability and extremes, and could therefore be provided by extension service agents, radio programmes and farmer-to-farmer exchanges. It was evident that the more formal channels of extension were lacking in the communities, and might represent a barrier to conveying the science and technology developed at national and international institutions to the appropriate farmer audience. While NGOs, private companies, and community organizations can provide informal exchanges and some technical assistance, building a more robust system of extension falls under governmental purview and has policy implications.

7.1.2 How Does Vulnerability Differ Among Women?

Historically, the gender and development literature has struggled with treating women and men as homogenous groups of people, and more recently this trend has resurfaced in climate change and gender discourses. In this case study, access to cocoa appears to play a considerable role in dictating the sensitivity and adaptive capacity of women to climate change, and was employed as a means of further disaggregating the discussion of women's vulnerability to climate change. The 'indirect' and 'direct' cocoa farmer designations in this analysis were employed as a compromise between the homogeneous 'female' category and the complex diversity of land tenure systems for cocoa farms, which quickly becomes too

granular for public policy. Although it is difficult to say definitively that a certain “type” of woman is more vulnerable, there are visible differences amongst women in a community (Table 7.1). One of those differences is in planning horizons. The long-term outlook of ‘direct’ farmers speaks to time-scales on which climate change operates and lends itself to the transformative potentially required for adaptation. Conversely, ‘indirect’ cocoa farmers demonstrated a mind for seasonal and annual cycle more relevant to their food crop production, which may provide the flexibility need to cope with variability and extreme weather events, but might not sufficient for fundamental shifts in growing conditions.

Cocoa is a powerful enabling force in the lives of women with direct control over the management and income from it. While the crop itself exhibits considerable sensitivity to the projected climatic changes (e.g. to specific shifts in precipitation and temperature, long-term nature of management decisions and thus lack of flexibility), the industry is of such great importance to the country’s economy and of concern to large private sector players that it is often favoured for assistance to boost the adaptive capacity of those involved in the production. Moreover, direct participation in the cocoa industry to date places many of these women in a better position to adapt to impending climate change, enabling the accumulation of greater capital resources and fostering a more optimistic view of the future. For instance, there is a clear interplay between land and income, where access to cocoa serves as an important precursor to obtaining funds or credit to branch off into a greater number of ventures, which are more removed from primary production.

Subtle differences among women manifested in relation to empowerment and agency. This is perhaps most visible when women with ‘indirect’ cocoa access were described as having hopes, dreams, and plans but no means of achieving them, a potentially very disheartening circumstance to be in. These women also more frequently expressed resignation or negativity. Whereas, women with ‘direct’ access to cocoa might have similar (or even greater) aspirations, but also a more solid grasp of how they might realize those goals. The conspicuous differences in information sources are also worth noting, because they have different strengths and have implications for modes of future climate and agricultural information dissemination. As noted in the literature earlier, there are limitations to local knowledge and informal exchange, particularly under novel climate conditions. Direct cocoa

farmers, who are able to consult extension agents, may be better positioned to combine multiple types of information. Furthermore, this ability to obtain information when the need arises (e.g. disease worsens, seasonal markers shift) can boost confidence and the perception of control over success. Information sources also reflect a woman's background to some extent. Most 'indirect' cocoa farmers come from outside the communities, even with little or no experience with cocoa or farming, and inevitably depend on a spouse and indirect sources of formal information (i.e. radio). The greater use of formal extension services and parents for information are in line with the long residence of many 'direct' cocoa farmers in their respective communities.

7.1.3 Implications for Adaptation Policy and Practice in Ghana and Further Research

“Because the president's mother is not a farmer, he doesn't feel the pain.”

As this quote from one of the women in Aboabo Camp [AB93IN25Jun] illustrates, an obvious gap exists between what farmers feel they need in order to reduce vulnerability, and what mechanisms they perceive the government employing in order to assist with these aims. As the case study has demonstrated, there is a diversity of opportunities and constraints among women farmers, thus demonstrating that adaptation policies described to serve a broad or homogeneous group, must adopt more nuances as they move from high-level documents to local level implementation. This final section will suggest some of the implications for adaptation strategies and policy, first commenting on individual results of this case study and then drawing from the earlier description of the policy context in Ghana (section 3.2).

First of all, income diversification features in Ghana's policy documents, and has very tangible ways of materializing locally. Requisite financial resources, such as credit or savings, were identified during interviews and widely acknowledged in literature as a primary barrier to diversifying and venturing into off-farm income sources. Credit schemes that account for limited access of many women to assets for collateral, and micro-finance options to support longer-term savings, have precedence for addressing this need among women (Agrawala & Carraro 2010; Vonderlack & Schreiner 2002). Index-based insurance has recently garnered interest as a potential mechanism to reduce sensitivity to climate change by

easing hardship from variability and uncertainty (Mckinley, et al. 2014; Molini, et al. 2010; Asante, et al. 2015). The public sector could play a role in supporting both of these social safety nets (e.g. through development banks). Finally, the Second National Communication to the UNFCCC noted an increase in non-traditional agricultural exports, demonstrating the role of policy in supporting diversification into crops available to many women without direct access to cocoa by increasing their marketability (Oppong-Boadi, et al. 2011).

Stories of women's empowerment also provide concrete policy linkages. As Haigh (2010) noted, "when women are positively empowered, extraordinary solutions are possible." In some studies, this translated into more direct decision-making and engagement in policy processes at the local and national levels (Djoudi & Brockhaus 2011). In the interviews, community groups (e.g. women's groups or cooperatives) were conspicuously absent and identified as a potential boon to the community to serve as financial back-stoppers and venues for information exchange. A study in Botswana found that the local woman's group was absolutely central to building adaptive capacity, particularly as it boosted the sense of self-determination and control of those involved (Keithhoilwe 2013). In the absence of a local NGO's presence, or even in partnership, public support at a district level could serve as catalyst for the creation of these important institutions.

Finally, the Ministry of Food and Agriculture (MoFA) is directly tied to agriculture-related information provision, and currently tasked with building up the capacity of regional and district extension officers to mainstream climate change into their activities with farmers (Asante, et al. 2015). According to a baseline carried out in all cocoa producing regions, very few (<15%) reported receiving training and mostly for 'farm maintenance', and NGO-led training, not provided by the government, was most common in the Central Region (Hainmueller, et al. 2011). Understandable viewed as insufficient at present, especially in reaching women farmers, agricultural extension services are a potential far-reaching means of disseminating adaptive practices, new technologies, and weather information. The Women in Agricultural Development (WIAD) directorate established in 1989, with the objective of improving access of women to information on improved agricultural and post-production practices, has not adequately achieved those aims (McOmber, et al. 2013; Oppong-Boadi, et al. 2011). Proper implementation of the actions set out in the GSGDA II to support farmer-

and community-based organization and encourage public-private partnerships, could improve the current situation. However, this will require oversight and quality control to avoid the fragmentation that occurred when COCOBOD previously devolved ownership of its Farmer Field Schools to companies and NGOs (Asare 2013).

It is important to note the timeliness of discussing policy related to climate change and agriculture in Ghana. As discussed earlier (3.2), the policy context in Ghana is novel in many respects. The climate change policies (NCCP and NCCAS) in the country have only recently been released, and have not yet moved to implementation. So there is still time to ensure that this happens in a way that does justice to the ambitious social development plans and primacy bestowed on gender equity. Secondly, the climate-smart cocoa paradigm, which postures cocoa production as both a means to mitigate climate change and adapt to its impacts, has received a prominent place in the country's REDD plans. Still very much in its infant stages, climate-smart cocoa's elevated status recognizes the critical interplay between climate change and the cocoa system. It is also vital that this opportunity not be missed to integrate the social development emphasis of the NCCP and the technical support of climate-smart cocoa.

Overall, while access to cocoa may be an important underlying variable of vulnerability, it may be that the culturally embedded systems of inheritance and tenure arrangements are beyond the scope of government intervention. Policy efforts can concentrate on attainable actions rather than norms that, while dynamic and evolving, are culturally dictated and heavily entrenched. Adaptation strategies still require input from the local level to respond to specific contexts (Sarpong & Anyidoho 2012). A major critique of policy generally in the country is the lack of successful implementation and full realization of benefits, despite policies that on paper would imply otherwise (Cameron 2011). The success of Ghana's policies in addressing climate vulnerability will hinge on the ability to take the lessons from the local level, coordinate actions and interests across sectors and policies, and move from well-documented policies to well-implemented ones.

7.2 *Future Research Directions*

This analysis struck the tip of the iceberg, offering a framework and initial case study for examining gender and climate change vulnerability and adaptation. Methodologically, gender

analyses consider both male and female stories and the interactions of the two. In order to demonstrate intra-group differences, this study focused just on women, but further fieldwork to collect data from male counterparts would fill in gaps. Semi-structured interviews were employed to tease out issues of importance and to test the validity of the conceptual framing. Complementary household surveys, using the same framework and disaggregating within the household, would provide quantitative support to the story. Land character and location likely also contribute to the exposure and sensitivity to climate change, but were not adequately captured in this research. Mapping and incorporation of ecological data would more strongly link the biophysical and social, and also depict points of vulnerability in more detail.

There are factors left under-examined in this research that additional work could expand upon. There is scope for inquiry into tenure arrangements and inhabitants' origins, as the case study suggested migrant versus resident groups vary in relation to cocoa farms and thus have different levels of vulnerability. Future iterations of this type of work could focus on information needs and the means of disseminating. Networks are complex, and mapping of these would provide better insight into what types of information spread and by what means, in order to better identify gaps. The distribution of decision-making within a household, as well as themes around joint management of land and natural resources, began to surface during interviews. Further exploration of this theme would fit well with a gender analysis, and also better capture the extent of flexibility and options under different climate scenarios. However, in practice, this type of data is difficult to collect, especially on a scale that would yield statistical significance.

7.3 Conclusions

A few final points stand out in concluding this dissertation. First of all, it is necessary to recognize that climate change is not necessarily the primary concern of people (Nyantakyi-Frimpong & Bezner-Kerr 2015) or for the system itself (Nielsen & Reenberg 2010), yet money and international pressures necessitate considering climate change as a dominant risk factor. While it is a valid and serious concern, it is critical that other important development processes don't suffer as a result. Funding will likely continue to be earmarked for climate change projects, directed through various policy instruments to be implemented in some way on the ground. Therefore, ensuring the alignment of climate change, agriculture, and

development policy - from what is on paper to how it is implemented at a local level - should be a key consideration, and stimulate more cross-sectoral and cross-scale coordination.

This dissertation also contributed to the debate on the polarized depictions of rural women described in the literature review (section 2.3.2). The danger with depicting women on a whole as climate victims is that simple solutions might be overlooked, but could serve as an empowering force. Denying agency to these women, despite demonstrating their determination and future planning, treats them as less capable human beings and undermines their capacity to make changes and actualize future goals. Discussing women as active participants in adaptation may broaden the realm of possibilities and allow for innovation, particularly as research related to gender and climate change continues to grow.

Finally, there is obviously heterogeneity among rural women, in terms of background, wealth, etc. The climate change vulnerability and adaptation studies that only pay heed to ‘men’ and ‘women’ (if that) might lose sight of important policy-relevant distinctions, lead to biased or ineffectual solutions, and could ignore pivotal social drivers of vulnerability. This study has demonstrated the importance of acknowledging heterogeneity. This applies even to broad brush policies with mentions of gender sensitivity and equality, determined in a top-down fashion at a national level. A more complete and nuanced understanding of the factors underlying vulnerability and the ways in which these differ within a community are needed for translating policies into how resources are employed to support projects and programmes on the ground.

8. References

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9. Appendices

9.1 Appendix 1: Interview Guide

Introductions

1. Is it OK to interview? Note that all interviewees will remain anonymous, unless they specifically ask to be named, and are free to withdraw from the interview at any time.
2. Introduce ourselves and ask for interviewee(s) name(s).
3. Quick summary of the project: student from Oxford University as part of the ECOLIMITS project working in this area.

Version #1

Background Information

1. Please tell me a bit about your farm. Follow-ups if not addressed:
 - a. How long have you lived in the area? How long have you been farming cocoa?
 - b. How much land do you farm? Where is it located in relation to the village?
 - c. Do you own or share the land, or work another community member's land?
 - d. Who makes the decisions about what to do on the farm?
 - e. Who taught you to farm? Do you use the same practices or have modified them?
 - f. What type of cocoa do you grow? (hybrid seeds, etc.)
2. What crops do you grow now, if any, in addition to cocoa? Follow-ups if not addressed:
 - a. Is there a particular stage in your farming in which you plant these crops?
 - b. What is the reason for planting X (e.g. cassava)?
 - c. Have you or your family always planted X? If not, when and why did this change?
 - d. What practices on your farm are the same as when your father farmer? Which are different?
3. Do you apply any type of fertilizer? Follow-up if not addressed:
 - a. If not, for what reasons? Would you like to if able?
 - b. If not, do you add alternative sources of nutrients (e.g. manure)?
 - c. What did your parents use to improve soil fertility?

Understanding Pest and Disease Mechanism

1. What problems with disease and pests do you experience? Follow-ups if not addressed:
 - a. During what time/conditions is disease/pest the worst?
 - b. How does it spread between pods and between trees?
2. Are disease/pest problems the same or different from when you first started farming?
 - a. When your father/mother was farming?
3. What do you do to fight the disease/pest? Besides spray?

Trees

1. Are there any trees on your farm (e.g. Odum, framo, emire, onyina, nyakyere)?
Follow-up if not addressed:
 - a. Did you plant them, or were they already there? If planted, why? If left, why?

- b. Do you want trees? If so, why?

Bioclimatic Influences

1. What weather is most suitable for growing the best cocoa? Follow-ups if not addressed:
 - a. How often is the weather like this?
 - b. Is this the same or different from when you started farming? From when your father started farming?
 - c. How do you estimate if rain/sun is more or less than usual?
2. Tell me about any events that seriously impacted cocoa production. Follow-ups if not addressed:
 - a. What did you do?
 - b. How often do these types of events happen?
 - c. Have you changed of your practices in response?
 - d. What did you do to help the farm recover?
 - e. If a younger farmer, ask about in time of his father

Other Topics to Bring Up

1. Have you had any problems with elephants?
2. Government policy changes? Extension service help?
3. Do the practices of other farms influence what you do?
4. If female-owned farm, ask about inheritance and prevalence of women's farms.
5. Biggest concerns for coming year? Future?

Version #2

Background Information

1. Land tenure and farm circumstances
 - a. Who inherited your parents' land?
 - b. Who will inherit your/your husband's land?
 - c. Farm size? Multiple farms?
2. Crops and income sources
 - a. Do you use any materials from the forest?
 - b. When do you sell or eat the food crops?
3. Unique practices
 - a. Anything you do that your parents did not?

Income, Information, and Decisions

4. Division of labour and decision making
 - a. Who decides what changes to make for cocoa? For food crops?
 - b. What information do you use to make management decisions?
 - c. Do you have to hire labour? When?
5. Information sources and accessibility
 - a. Do you use different information from you husband?
 - b. What information do you with was available?
6. Support groups
 - a. Are there any group that provide financial, information, or other resources?
 - b. What type of groups for support and information would be helpful?

- c. What would their function be? Who would organize?
- 7. Income and Access to markets
 - a. What does income from cocoa vs. food crops support?
 - b. How do you make ends meet between cocoa harvests.
 - c. In terms of a successful year, how does food crop production compare to market access in terms of importance? What happens if no car comes?
 - d. Does cocoa face the same constraint?

Climate and Weather

- 8. Climate Change
 - a. What weather most influences the farm? Is this different for cocoa and food?
 - b. How did 1983 affect you and your farm management?
 - c. How would you describe the weather patterns in a year? From year to year?
 - d. How important is it to know the weather forecast?
 - e. What do you do if the weather turns out differently than expected?
- 9. Coping strategies
 - a. What do you do in a “bad year”
 - b. How feasible is it to change crops in a bad year? How likely are you to change how you currently do things? Change to what/where?
 - c. Have you changed practices in the past? Why?
- 10. Specific impacts on cocoa
 - a. What happens if drying beans spoil? During which harvest does this happen?
 - b. If dry season is very bad and seedlings die, what happens?
 - c. What actions do you take if black pod disease is serious in a year?
- 11. Household consequences
 - a. What would be the first thing cut from the household if yields decrease?
 - b. How does a bad cocoa year differ from a bad crop year?

Empowerment and Agency

- 12. Future Outlook
 - a. Do any of your children farm/do you expect any to?
 - b. Education levels and ages?
 - c. How do you see the future of cocoa and your involvement?
 - d. Under what circumstances, if any, would you stop farming?