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Hungry Farmers: A Political Ecology of Agriculture and Food Security in Northern Ghana

Hanson Nyantakyi-Frimpong
The University of Western Ontario

Supervisor
Rachel Bezner Kerr
The University of Western Ontario

Graduate Program in Geography
A thesis submitted in partial fulfillment of the requirements for the degree in Doctor of Philosophy

A POLITICAL ECOLOGY OF AGRICULTURE AND FOOD SECURITY IN NORTHERN GHANA

(Thesis format: Integrated Article)

by

Hanson Nyantakyi-Frimpong

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The School of Graduate and Postdoctoral Studies
The University of Western Ontario
London, Ontario, Canada

Abstract

Whilst Ghana has made momentous strides in national food security over the last decade, peasants in the rural north, indeed, those who produce the bulk of the country's food, are also the hungriest population. This paradox immediately raises profound questions for research in human-environment geography. The purpose of this thesis is to investigate some of these questions, with particular emphasis on why Ghana's food system is failing precisely those who produce food. The research combines insights from agrarian political economy and political ecology, and is informed by nine months of intensive fieldwork. Three carefully selected case studies uncover the full measure of struggle, suffering and resilience among peasant households in two savanna villages. A cross-cutting argument in the case studies is that peasant production systems are able to manage the inherent risks posed by the savanna ecology, and it is rather the induced vulnerability from external factors that undermines food production systems. Among the most far-reaching factors include land-grabbing, the introduction of Green Revolution technologies, and the rise and consolidation of neoliberal development. The study shows how these forces are interwoven, and layered upon gender politics to render women and children more vulnerable to food insecurity. In particular, land-grabbing has resulted in a landless class of peasants, who reproduce themselves through proletariatization in unrewarding sharecrop schemes. Theoretically, the thesis sheds light on how food insecurity is socially and politically produced, but continues to be cast as drought-induced. In the end, a strong case is made for an alternative agriculture that will keep peasants on the land, and feed the hungry population now and into the future.

Key words: Food Security, Small-scale Agriculture, Green Revolution, Climate Change, Land-grabbing, Political Ecology, Ghana

Co-Authorship Statement

This dissertation contains three research manuscripts either accepted for publication or under peer review. The manuscripts include the following:

Chapter Two: Nyantakyi-Frimpong, H. and Bezner Kerr, R. *A Political Ecology of High-Input Agriculture in Northern Ghana*. In Press. *African Geographical Review*.

Chapter Three: Nyantakyi-Frimpong, H. and Bezner Kerr, R. *A Feminist Political Ecology of Climate Change Resilience in Semi-arid Northern Ghana*. Under Review at *Global Environmental Change*.

Chapter Three: Nyantakyi-Frimpong, H. and Bezner Kerr, R. *Land-grabbing and Gendered Agrarian Change in Northern Ghana.* Under Review at *The Journal of Peasant Studies*.

While each manuscript has been co-authored with Dr. Rachel N. Bezner Kerr, my academic advisor, I hereby certify that the research process has been my full responsibility with constant guidance from Dr. Bezner Kerr. The interpretation of the results and content of all the manuscripts are my own original contributions with constructive feedback from Dr. Bezner Kerr.

Acknowledgments

I want to acknowledge the hungry farmers whose experiences are documented in this project. Among the most memorable times in my fieldwork were conversations with these farmers in the Upper-West Region, especially in the villages where I spent the most time. My special thanks are due to all those who answered my incessant questions. Their trust, humor and generosity cannot be adequately compensated. Unfortunately, I have altered names and personal information to protect privacy, and I regret that I cannot thank everyone by name. More than anyone, however, I would like especially to thank the person I call Pumpkins Tenye for helping me to visit northern Ghana for the first time. Not only did Pumpkins accompany me on that trip, but during the actual fieldwork, she vouched for me her family and friends who were amazingly welcoming. I am particularly grateful for the manner in which they facilitated my integration into the Dagaaba culture. As I think of the Upper-West, I would like to acknowledge as well the paramount chiefs of the two study villages. They were always supportive of my work and ensured that I received cooperation at every turn.

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maps and diagrams, all of which were hand-drawn sketches from field notes. She is a genuinely kind individual and I appreciate her great commitment even at short notice. My warmest personal thanks are also due to Michael Watts, Ruth Hall and Olajumoke Warritay for their encouragement and advice. A substantial part of this dissertation was written at 118 Honness Lane, Ithaca, New York, a serene space created by my friends Vladimir Micic and Holly Case. Their warmth, wisdom, and hospitality were immeasurable as I went through months of writing, revisions and grappling with writer's block. Again in Ithaca, regular hangouts with Jum Warritay kept my mind, soul, and spirit together.

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At the end of it all, my family members have been my strongest backers all along. I thank my Mum and Dad for the never-ending love, my siblings for enduring my absence with a cheerful heart, and Brianna Derbie-Derbs for all the little things. These are the people I love most.

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List of Acronyms

ADC	Agricultural Development Corporation
ADP	Agro-dealer Development Program
CIDA	Canadian International Development Agency
FAO	Food and Agricultural Organization
FASDEP	Food and Agriculture Sector Development Policy
FPE	Feminist Political Ecology
GDC	Gonja Development Corporation
GHI	Global Hunger Index
GPRS	Ghana Poverty Reduction Strategy
HFIAS	Household Food Insecurity Access Scale
IFPRI	International Food Policy Research Institute
IPCC	Intergovernmental Panel on Climate Change
MICS	Multiple Indicator Cluster Survey
NDPC	National Development Planning Corporation
NGO	Non-Governmental Organizations
NORRIP	Northern Region Rural Integrated Project
OGP	Optimum Growing Period
PRAAD	Public Records and Archives Administration Department
SADA	Savannah Accelerated Development Authority
SAP	Structural Adjustment Programs
SG-2000	Sasakawa-Global 2000
SPSS	Statistical Package for Social Scientist
WTO	World Trade Organization

CHAPTER 1

PROBLEM, THEORY AND SETTING

1.1 Introduction

This chapter sets the context for the key arguments in the dissertation. It is organized around four broad sections. Section one is the geography of global food insecurity, drawing attention to progress but significant disparities in the case of Ghana. Following this contextualization, the chapter raises key research questions and situates them within the broader context of the global food system. The following sub-section outlines a theoretical and methodological framework for the dissertation. Particular emphasis is given to how the theoretical framework guides the research questions, frames the methodology, and shapes the choice of methods and interpretation of data. The fieldwork villages are then introduced, with a description of the farming households studied, and the realities of ethnographic fieldwork in northern Ghana. The final section outlines three major manuscripts that set forth the main arguments in the dissertation.

1.2 The Problem: Hungry Farmers

For the uninitiated, a first-time road trip from southern to northern Ghana can be quite overwhelming. My own experience occurred in 2009, but continues to remain an indelible image. After crossing the Black Volta River and entering a small village called Bamboi, my travelling companion exclaimed that we have finally arrived in northern Ghana. It was a clear, blue day, with a hot and persistent harmmartan breeze. The landscape was striking in all respects. Contrary to the dense and verdant rainforest vegetation south of the Black Volta River, the northern portion consisted largely of open and rolling Guinea Savannah foliage. It was half-way into the dry season. Grasses were quickly withering, while trees were rapidly shedding their foliage. The bitter rip of the hammartan wind conveyed a sense of the world I was about to enter. Heading further north towards the Ghana-Burkina Faso border, there was a gradual thinning out of the woody vegetation. Inching down the less busy highway, I was especially struck

by the constant stream of foreign donor billboards publicizing relief programs for malnutrition, food insecurity and school feeding. According to my back-of-the-envelope calculation, there was an average of four different food security projects in every village, many of which were funded by CARE International, World Vision, the Canadian International Development Agency, the Danish International Development Agency, the UK's Department for International Development, the Adventist Development and Relief Agency, and the United States Agency for International Development (e.g. see Figure 1.1). In most villages, there were more food security projects than the combined number of schools, clinics, water, sanitation, and rural electrification facilities.

Figure 1.1 Food Security Signage, Temparzie Village, Upper-West Region

Source: Photograph taken by H. Nyantakyi-Frimpong.

When we pulled off the highway, unto lateritic roads connecting smaller villages, what caught my attention was even more unsettling and continues to have a strange echo several years since I first visited northern Ghana. Every village we entered, I saw men, women, and children sitting and looking blankly off into the distance,

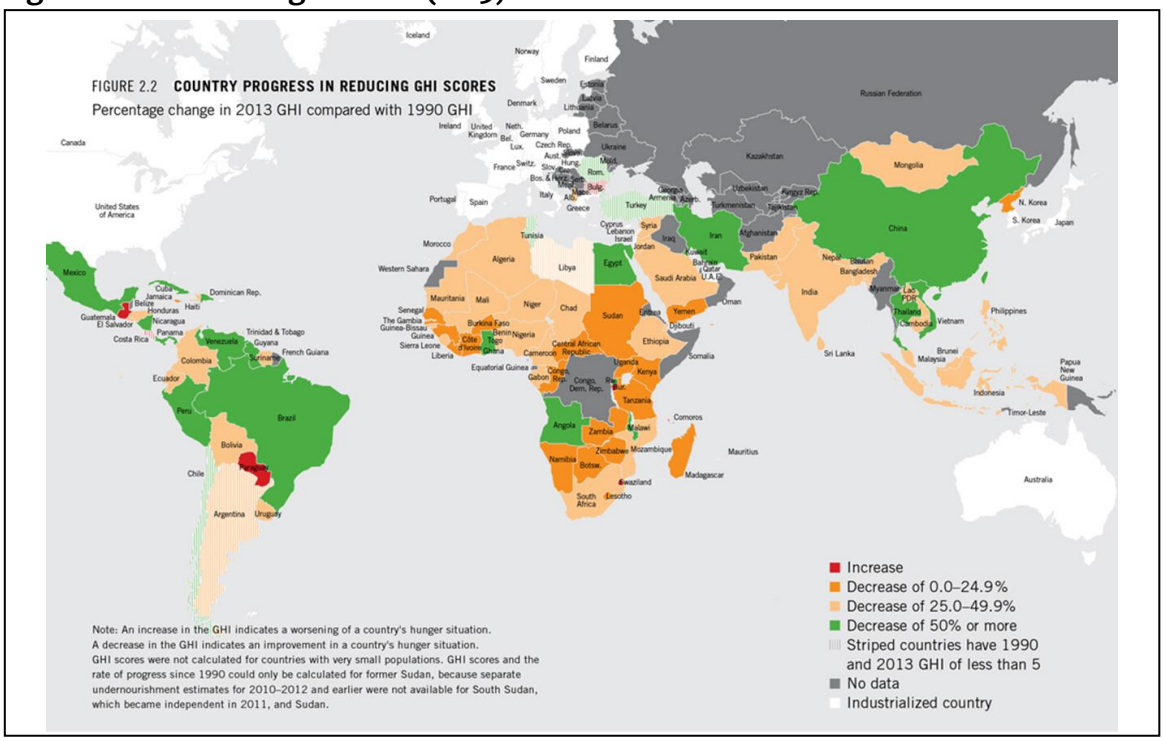
apparently unsure if they were waiting for something or nothing. There seemed to be no hope in their eyes. Upon inquires, I was told it was the pervasive annual "hungry season," a four to five month period each year when household meals are either cut drastically, or completely eliminated. As my travelling companion explained, "three meals become two, then one, and then, on some days, none. It's a hard experience." With a concerned look on her face, she continued to reveal some of the social miseries during the hungry season, stressing that what I was seeing was just a surface example of a multi-layered problem. Her comments were probably not far from the truth.

In the wake of recurring world food crises (McMichael, 2009; Timmer, 2010), Ghana has emerged as one of the rare agricultural success stories in contemporary Africa (Foster, 2011; World Bank, 2007). The global food price spike in 2007-2008, and again in 2010-2011, sparked spontaneous riots in African countries such as Algeria, Burkina Faso, Cameroon, Côte d'Ivoire, Egypt, The Gambia, Guinea, Madagascar, Mauritania, Morocco, Mozambique, Senegal and Uganda (Moseley, 2011; Patel and McMichael, 2009). In some countries such as Madagascar, food riots turned violent and contributed to the overthrow of the government. Urban West Africa suffered more of these disturbances than any other region in the world.

Ghana was among the few countries that did not experience any food-related protests. Since 1990, the country has registered "a sustained positive growth in per capita food production and declining food prices" (World Bank, 2007, p.47). In the most recent assessment of Global Hunger Index (GHI), the International Food Policy Research Institute (IFPRI) revealed that "only one country in Sub-Saharan Africa - Ghana - is among the ten best performers in improving their GHI score since 1990" (Von Grebmer et al., 2013, p. 15; see also Figure 1.2). A similar picture emerges from the Food and Agricultural Organization's (FAO) annual flagship report on *The State of Food Insecurity in the World*. For example, in the 2012 edition, the FAO revealed that Ghana is the country making the most significant progress in hunger reduction (FAO, 2012, p. 46). At the recent FAO annual summit in Rome in June 2013, thirty-eight countries,

including Ghana, were lauded for reducing hunger by half, well ahead of international targets set for the year 2015.

Figure 1.2 Global Hunger Index (2013)

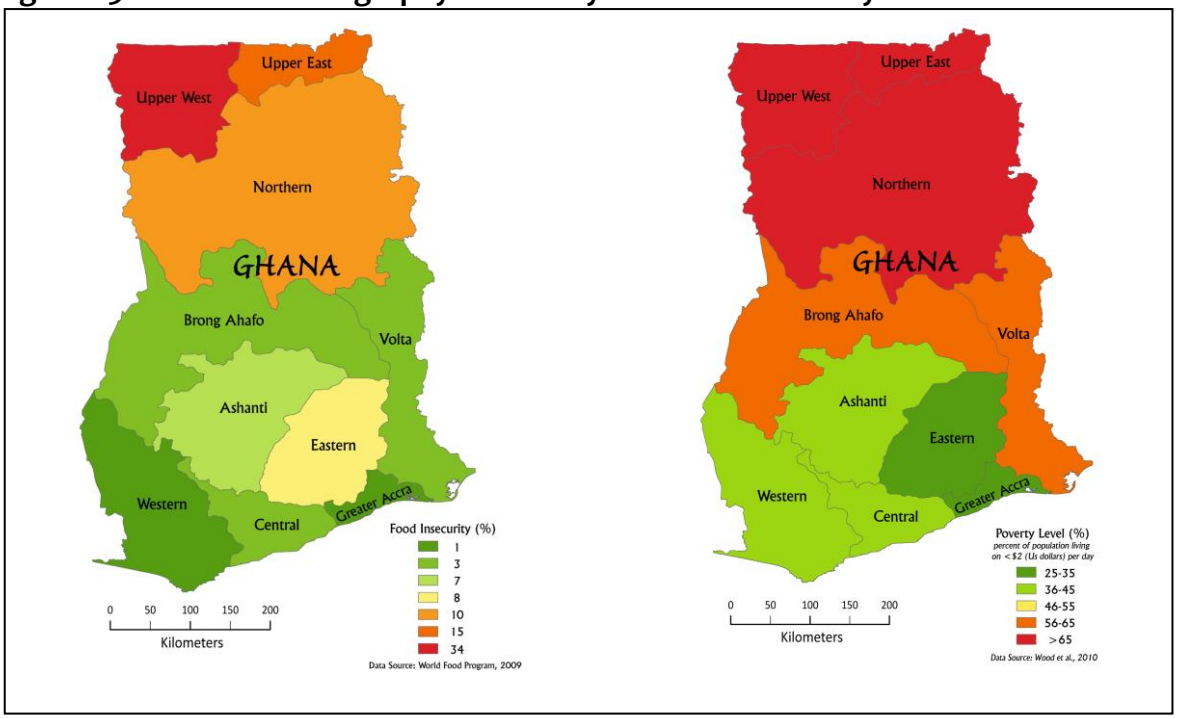


Source: Von Grebmer et al., 2013, p. 12.

When the lens moves from the country level to inter- and intra-regional statistics, however, there are significant disparities and an uneven geography of hunger. Whilst some social groups and some regions in Ghana achieve greater food security and wealth, people in other regions are highly malnourished and impoverished (see Figure 1.3). This disparity is nowhere greater than in Ghana's rural north(Gage et al., 2012). Northern Ghana boasts the country's highest agricultural output per hectare; yet, for the majority of northern households, food security today (Hjelm and Dasori, 2012) is no better than it was during the colonial period (Cardinall, 1921; Kirk, 1942). The statistics are staggering: stunting rate runs at almost 22 percent, while one in every nine children dies of malnutrition before reaching age five (Biederlack and Rivers, 2009, p. 13; Multiple Indicator Cluster Survey, 2006). According to a World Food Program assessment in 2009, close to 20 per cent of the northern population either go to bed

hungry each night, or do not know where their next meal will come from (Biederlack and Rivers, 2009, p. 13; see also Hjelm and Dasori, 2012). Particularly striking is the fact that peasant farmers, indeed those who rise every morning to cultivate food, are also the hungriest population in northern Ghana (Devereux, 2009); and this is the "hungry farmers" to which the title of this dissertation refers.

Figure 1.3 The Uneven Geography of Poverty and Food Insecurity in Ghana



Source: Food Security Data: Biederlack and Rivers, 2009, p.13; Poverty Data: Wood et al., 2010. Map prepared with the assistance of Karen van Kerkole, Western University Cartographer.

These contradictions immediately raise several thorny questions many of which strike to the heartland of critical scholarship in human geography:

1. Why is there an uneven geography of food insecurity in Ghana? And relatedly, why is it that those who cultivate food are also the casualties of hunger?

2. What have been governments' responses over time to address this challenge, and what have been the successes, shortcomings and failures of such responses?
3. Given northern Ghana's location in the southern fringe of the Sahel , an area subjected to severe climatic variability, are there ways in which these ecological constraints constitute threats to sustained food production?
4. How important is climate variability, compared to other factors known to influence agriculture?
5. How do northern Ghanaian farmers themselves view food insecurity, and how do these perspectives differ by gender, age and other axes of social differentiation?
6. Are there any interactions between local dynamics and broad-scale forces; and if so, how do they shape each other to influence food security in northern Ghana?
7. Finally, what can be done to reverse the hungry farmer paradox in northern Ghana?

This dissertation aims to explore and explain answers to these questions. What unfolds is a critical attempt to better understand the political ecology of food and agriculture in northern Ghana. The first two questions are the focus of Chapter 2. Questions three to five are examined in Chapter 3. Question six is taken up in Chapter 4, while the last question is examined in Chapter 5.

Although northern Ghana constitutes the primary analytical focus for this dissertation, the overarching argument speaks to broader contradictions in the global food system (Weis, 2007) and its failures to achieve food security for the world's population (Rosin et al., 2012). The current global food system is in a deep crisis. It is not only highly inequitable (Akram-Lodhi, 2013), but ecologically irrational (Weis, 2010) and on a trade system that maintains the status quo of recurrent hunger and climatic change (Pritchard, 2012; Weis, 2007). Despite marked growth in global per capita food production, we live in an era with over "1 billion of the world's population 'starved', another 1.3 billion 'stuffed' and 1 billion malnourished" (Kay, 2012, p.6; Akram-Lodhi,

2013, p.4; Rosin et al., 2012, p. xi; Watts, 2013, p. xli-xliii). These staggering statistics are compound by the fact that around the world, a child under age five dies of malnutrition every 7 seconds (Akram-Lodhi, 2013, p.4). Sub-Saharan Africa is among the worst affected regions facing acute food shortages and endemic undernourishment (Watts, 2013). According to the *2013 Global Hunger Index,* virtually all countries facing "alarming" and "very alarming" food shortages are African (Von Grebmer et al., 2013). When all is said and done, what is emerging from the global food system is terrifying on virtually every front.

A constellation of old and new drivers are combining to shape the failures in the current food system. Noteworthy among these drivers include the neoliberal-based insistence by World Trade Organization (WTO) that the principles of comparative advantage should determine where food is produced and the markets in which it is traded. Under the free trade architecture of the WTO, many developing countries no longer have sovereignty over their own food policy (Akram-Lodhi, 2013; Pritchard, 2012). They are induced to open up to global markets by intensifying their export thrust, while exposing themselves to imports from countries that generously subsidize their farming sectors. The principal consequence of this neoliberal food regime has been the dramatic reduction in farming capacity among smallholder farmers, many of who produce over 50 percent of the world's food (Akram-Lodhi, 2013; Weis, 2007).

This challenge is being amplified further by the new wave of land-grabbing in many food insecure regions across the world (White et al., 2012). Over the past couple of years, rich nations are investing in land offshore to secure their own food and fuel supplies against rising food prices, food rioting and ecosystem exhaustion at home. Since early 2001, nearly 230 million ha of farmland have been sold or leased, with the majority taking place in sub-Saharan Africa – in Ghana, Madagascar, Sudan, Ethiopia, and elsewhere (Cotula, 2013). This land rush represents the new stage in the emerging geopolitics of food scarcity. Large-scale land acquisitions are not only raising rural land prices, but unleashing profound social transformations among millions of small farmers, especially in rural Africa (Cotula, 2013).

Moreover, climate change and its projected impacts are adding a new layer onto ongoing problems in the global food system (Godfray et al., 2010). The FAO estimates that global temperature increases of 2-4°C over pre-industrial levels could reduce crop yields by 50 percent in Africa and Asia (FAO, 2012). Given these projected changes, together with the projected rise in world population to about 9.6 billion by 2050 (United Nations, 2012), some analysts have advocated that the only viable solution lies in agriculture that is highly dependent on chemicals, monocultures, and the top-down transfer of knowledge (e.g., Juma, 2011; Pingali, 2012). Yet, research has shown how such farming operations are implicated in climate change and the loss of agricultural biodiversity across ecoregions (Akram-Lodhi, 2013; Cribb, 2010; Weis, 2010).

All these driving forces of the global food system are being debated widely (Cotula, 2013; Cribb, 2010; Godfray et al., 2010; Juma, 2011; Pingali, 2012; Rosin et al., 2012; Watts, 2013; Weis, 2007; World Bank, 2007), especially their implications for peasants, the world's largest social class (Akram-Lodhi, 2013; Van der Ploeg, 2013). Geographical research in political ecology can critically inform and extend this discussion. I use the vantage point of political ecology from which to contribute to this broader debate. In many respects, the case study presented in this dissertation is a local version of events taking place around the world. All the empirical chapters are linked to inherent problems in the global food system, and further reveal the far less visible changes occurring at the micro level. The following sub-section presents the theoretical framework underpinning the arguments and methodology in the empirical chapters of the dissertation.

1.3 Towards a Political Ecology of Agriculture and Food Security

Each chapter in the dissertation empirically focuses on specific research questions and engages relevant theories to make its substantive arguments. Some of the underlying theories include resilience (Brown, 2014), vulnerability (Ribot, 2014), resource access (Ribot and Peluso, 2003), traditional ecological knowledge (Boillat and Berkes, 2013) and insights from agrarian political economy (Akram-Lodhi, 2013; Bernstein, 2010). The

study's overall design and general analytical strategy, however, builds upon, and contributes to, research in political ecology (Peet and Watts; 2004; Robbins, 2012; Rocheleau, 2010; Zimmerer and Bassett, 2003, Watts, 2013).

Political ecology is a cross-disciplinary conceptual approach that developed out of an uneasy marriage between cultural ecology and agrarian political economy. Within the field of human geography, the approach emerged in the early 1980s out of a concern to correct limitations in cultural ecology, a prevailing approach then used to interpret environmental degradation and hazards.[1] The cultural ecology approach tended to situate causes of, and solutions to, environmental crisis in local-based problems such as over-population and poor land management (e.g. Steward, 1972). While this approach produced interesting findings, it was heavily criticized for ignoring social inequalities, underestimating the importance of historical forces, and focusing too narrowly on the local to the exclusion of broad-scale processes (Watts, 1983a).

The work of Blaikie and Brookfield (1987), Hecht and Cockburn (1989) and Watts (1983b) among others, provided the intellectual and theoretical formulation to reveal weakness in cultural ecology. These scholars produced path-breaking studies that pushed beyond and irrevocably broke with conventional cultural ecology approaches. Their findings drove home the point that famine (Watts, 1983b), land degradation (Blaikie and Brookfield, 1987), and deforestation (Hecht and Cockburn, 1989) could all be socially and politically produced, and should not been seen simply as the inevitable consequences of neo-Malthusian determinism, droughts, and poor land-use practices.

From these works, political ecology came to be defined as an approach that "combines the concerns of ecology and a broadly defined political economy" as a means of grasping the interactive effects "between society and land-based resources, and also within classes and groups within society itself" (Blaikie and Brookfield, 1987, p. 17). This approach now functions as an important, if contentious, pathway to theorize geographies of human-environment relationships. Scholars adopting political ecology

[1] Some ecological anthropologists (e.g. Eric Wolf) were using the term around the 1970s (see Robbins, 2012 for a historical review). Here, I focus more on the geographical tradition, which is my home discipline.

draw insights from radical development geography, agrarian studies, human ecology, environmental history, and a Marxian-inspired political economy to deepen their scope of analysis (e.g., Peet and Watts; 2004; Watts, 2013; Zimmerer and Bassett, 2003). In the last two decades, the approach has greatly expanded its theoretical and empirical breadth. There are now substantive focuses on feminist political ecology, political ecology of violence, political ecology of health, and poststructural discourse analysis (Peet and Watts, 2004; Peluso and Watts, 2001; Rocheleau, 2010). Among other paths of inquiry, political ecologists have drawn upon detailed fieldwork to explore local knowledge, social relations, and power dynamics among resource users differentiated by gender, age, ethnicity, and race (e.g., see the collections in Paulson and Gezon, 2005; Peet and Watts; 2004; Zimmerer and Bassett, 2003).

As a field with such a wide range of theoretical and empirical breadth, political ecology is not without critics and internal debates. The strongest areas of disagreement are often among political ecologists themselves. Throughout the 1990s, the approach grappled with, and grew through key criticisms related to methodology and analytical foci. In particular, calls were made that gender relations demanded breaking open the household "black box," and not treating members as if they pool resources into a single conjugal fund (Carney and Watts, 1990). Vayda and Walters (1999) chided some political ecologists for being overly deterministic, too theory driven, and concentrating overwhelmingly on politics, to the point of neglecting ecology altogether. For some other critics (e.g., Watts, 1990), the first generation of political ecology research lacked enough politics and had an abstract conceptualization of political economy.

More recently, criticisms have pointed to the need to identify the most appropriate scale for analysis and figuring out how exactly to move across scales (Paulson and Gezon, 2005). In the early formation of political ecology, Blaikie and Brookfield (1987) suggested a "chains of explanation" approach, where analysis extended outward from the individual land manager, to the household, local, subnational, national and global scales. This conceptualization has been seriously

criticized for assuming that scale is given *a priori*, or is a hierarchy of nested spatial containers, rather than being relational and socially constructed (Zimmerer and Bassett, 2003). There is also an increasing debate on the thorny question of how exactly to conceptualize or theorize the *political* in political ecology.

Indeed, all these debates are legitimate and have contributed to strengthen political ecology's analytical purchase. Typically, whether a researcher privileges politics or ecology, or puts equal weight on both, depends on the nature of the problem being investigated and the research questions being asked. In adopting a political ecology approach, what is important is to specify "what sort of political economy, what sort of ecology, and what sorts of linkages" (Peluso and Watts, 2001, p. 27). It is equally imperative to specify how exactly will the linkages between the *political* and the *ecological* cast a different illumination on a key debate or a set of research questions.

For the purposes of this dissertation, I use political ecology in three interrelated ways to deepen and broaden the analysis of agriculture and food security in northern Ghana. My first goal is to explore whether agrarian political economy, especially the social relations of production (Akram-Lodhi, 2013; Bernstein, 2010; Watts, 2013), are a central part of problems related to agriculture and food provisioning in northern Ghana. Here, I am particularly interested in investigating how social relations of class, kinship, gender dynamics and politics (Bernstein, 2010; Carney, 2008; Schroeder and Suryanata, 2004) rework the rules governing who has access to, and control over, food production resources.

For small farmers whose livelihoods are tied to agriculture in the countryside, access to land and labour is a critical means through which subsistence can be sought and incomes generated. Thus the analysis presented here is sensitive to understanding the negotiations, conflicts, and resistance that arise when land access or property rights are reallocated or revoked. Property rights, negotiation and access (Ribot and Peluso, 2003) are played out often at the household level (Carney, 2008; Schroeder, 1999) and it is precisely at this scale that the analysis of politics should be based and

theorized. The analysis in this research is also acutely sensitive to how labour is mobilized, appropriated, disciplined and rewarded within the political arena of the household (Schroeder, 1999). At whatever scale the case studies are set, they pay special attention to who exactly is available to work in the household, when, how and for what returns. Indeed, the social relations around labour are deeply political (Carney and Watts, 1990) and should form a central part of any political ecology analysis of agriculture and food security.

While appreciating the micro-level dynamics of resource access and control, this study also recognizes that to varying degrees, these relations are bound up not only by historical forces, but broader political-economic changes (Watts, 2013). Attention is thus given to the historical political-economy of Ghana, especially its experience with Structural Adjustment Programs (SAP) implemented by the World Bank and the International Monetary Fund. Like most African countries, Ghana was hit hard by structural adjustment conditionalities of fiscal austerity, reductions in social spending, market liberalization, and desertion of small farmer development (Konadu-Agemang, 2000). These austerity measures left Ghanaian agriculture in deep crisis beginning in the late 1980s, and it is difficult to explain the current state of agrarian change without reference to SAP.

Likewise, this study is set within the long-term historical context of British Colonial development in Ghana from 1874 to 1957. Rather than building a more integrated and diversified economy, British administrators chose to develop and exploit those regions where the natural resources they were interested in were located . The scar of this unequal course of development is still visible today, with a landscape of severe inequalities between northern and southern Ghana (Songsore, 2003). One cannot hope to understand contemporary agrarian dynamics in Ghana without taking this historical context into account.

Finally, in keeping with political ecology's traditional focus on ecology, I integrate environmental change and land use practices more centrally into the analysis. I analyze in detail farmers' perceptions about environmental change, and how

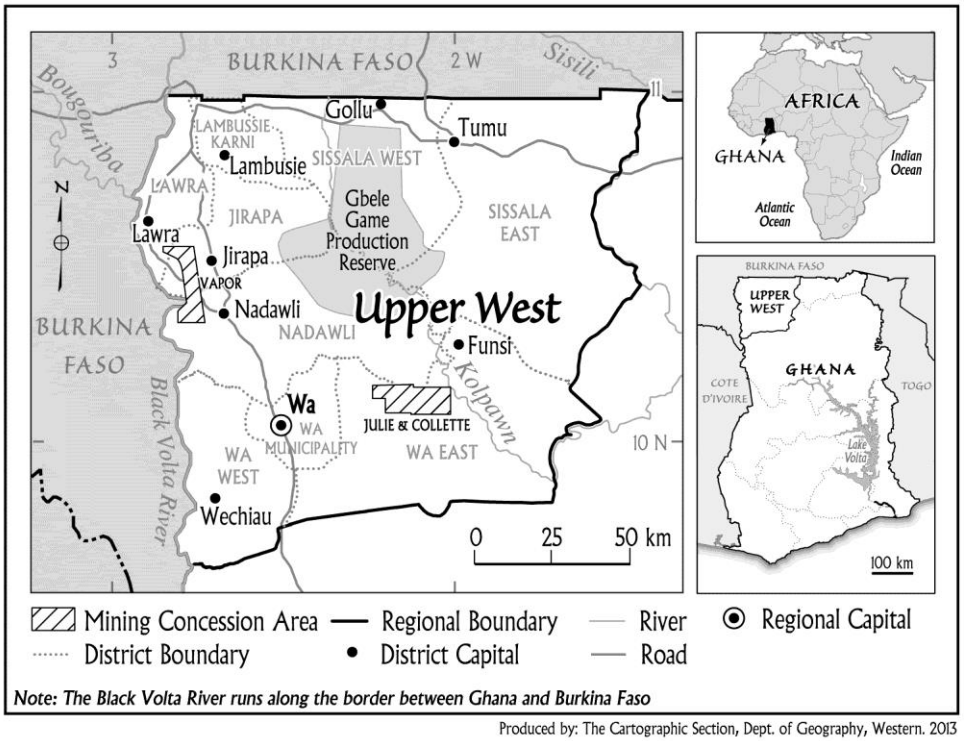
subsistence production is adapted to these changes. I am particularly interested in understanding how land use decisions are embedded within more holistic concerns about broader political-economic changes and the ecological history of the landscape. In so doing, my hope is to understand whether and how ecological and social factors intertwine and are mutually reinforced to shape contemporary agrarian change in northern Ghana. I now turn to a description of the regional geography of the study area.

1.4 Geographical Setting

Ghana's Upper-West Region is the focus of this study. The region is located close to the Ghana-Burkina Faso international boarder, between Longitudes 1˚25″ and 2˚45″ West; and Latitudes 9˚30″ and 11˚ North. It encompasses an area of roughly 18,476 km^2, with a population of 702,110 inhabitants (Ghana Statistical Service, 2012). It is a predominantly rural region and currently divided into nine administrative districts with a regional headquarters in Wa (Figure 1.4).

Two main reasons influenced my selection of the Upper-West Region as a study locale. Firstly, it was impossible to research all parts of northern Ghana. Focusing on a single region provided the opportunity to investigate socio-ecological phenomena more in depth, rather than in breadth. Secondly, among the three regions in northern Ghana, the Upper-West has the highest incidence of food insecurity (Biederlack and Rivers, 2009, Hjelm and Dasori, 2012), but the region is relatively understudied as compared to the central and north-eastern parts of the north. There is a large literature on food security, agriculture and intra-household gender relations among peasants in the Northern and the Upper-East Regions (e.g. Hesselberg and Yaro, 2006; Chalfin 2004; Devereux, 1989; Roncoli, 1994; Whitehead, 2006), but there have been limited studies on these topics in the Upper-West Region (e.g. Luginaah et al., 2009; Van der Geest, 2004).

Figure 1.4 Map of the Upper-West Region



Source: Map Prepared by Karen van Kerkole, Western University Cartographer.

While the Upper-West forms my broad frame of reference, I specifically focus on two agrarian villages and the agro-pastoralists who live, cultivate crops, and herd livestock within these locales. The two villages (hereafter referred to as Village 'A' and Village 'B') are approximately 42 kilometers apart and were selected for both theoretical and practical reasons. Theoretically, each was fairly representative of farming communities in contemporary northern Ghana (Yaro, 2013). The villages share a common regional history, economy and culture. However, they also vary dramatically in their degrees of physical isolation, population density, infrastructural development, and the impacts of droughts and floods. They also differ in terms of current farmland acquisitions for mineral extraction and biofuel production.

The first village (Village 'A') is a small, remote community located on a laterite road close to the middle banks of the Black Volta River. It is about 21 km west of Nadawli, one of the principal towns in the Upper-West Region. The dominant ethnic group is the Dagaabas. In 2000, the village had a population of 494 residents occupying

72 households (Ghana Statistical Service, 2005). The built up area of the village is relatively flat, but the adjoining village lands have an undulating topography with occasional sedimentary rock bluffs. These rocks contain heavy gold deposits, and are now under concession for large-scale gold mining. Towards the western end of the village, the land is seasonally flooded and often waterlogged when the Black Volta River overflows its banks. Soils comprise generally of laterites, but the Black Volta flood plains contain alluvial soils of great agricultural significance. These soils are used for dry season and flood recession farming. Landholdings are small, ranging up to 3.5 hectares, with an average of 0.6 hectares. During my fieldwork from January to August 2012, the village lacked all forms of infrastructure except one borehole, a primary school, and a radio signal. Mobile phone coverage was poor and unsteady.

The second village (Village 'B') is a large, dispersed settlement located on adjacent sides of a dirt road leading from Lawra, a major town in the Upper-West Region, to the Ghana-Burkina Faso international border. It is about 4 km east of Lawra. It covers an area of approximately 6 km^2 and is organized into ten sub-villages of varying distances apart. Individual compounds are scattered across the landscape. Each compound sits within an agricultural field that is intensively cultivated annually. In Ghana's 2000 national census, the village had a total population of 4,041 people residing in 704 households (Ghana Statistical Service, 2005). The Dagaabas constitute the dominant ethnic group. The soils are mainly laterites. Average landholding is 2.4 hectares, ranging between 1 and 6 hectares. During the time of fieldwork, Village 'B' had a phone, radio and television signals. It also had electricity, two primary schools, two Junior High schools, seven boreholes, a health post, four churches, and a community centre under construction.

In both villages, the main economic activities are rain-fed agriculture and pastoralism, but residents in Village 'A' also engage in small-scale fishing and artisanal gold mining. Agriculture is labour intensive, integrating different forms of intercropping systems, with limited or no technological inputs. The most important food crops are maize, beans, groundnuts, pearl millet, guinea corn, Bambara

groundnut, soybean and different kinds of vegetables. Cereals account for about 70 percent of the total cultivated area. The major livestock holdings include cattle, sheep and goats, which serve mainly as insurance against sudden income shortfalls, as well as being used for marriage transactions.

In terms of practical and logistical reasons, I selected these study villages because of the ease of gaining and securing access for ethnographic fieldwork. In both sites, I knew colleagues who are natives of the region. They introduced me to a number of gatekeepers in order to facilitate my entry and access for fieldwork. The following sub-section describes the fieldwork process and methodology in more details.

1.5 Methodology, Methods and Fieldwork

I first undertook a reconnaissance visit to the research sites in 2009, but the actual fieldwork for this study was carried out over the course of nine months between December 2011 and August 2012. On arriving in Ghana on 8th December 2011, I spent the first month sifting through colonial and post-colonial archives at the Balme Library and the Institute of African Studies, both at the University of Ghana; and the Public Records and Archives Administrative Division in Accra. I was able to obtain relevant information including agricultural development policies since the colonial era, and statistics on hunger, malnutrition and food insecurity in northern Ghana. Few of these archival materials are used in this dissertation, however, and only in the first manuscript.

After collecting these archival materials, I traveled to the Upper-West Region to conduct village-level studies. On arriving in the region, I initially traveled to Village 'B', where I was received by a farming household I had met during my reconnaissance visit in 2009. To stay and work in this village, as well as the second research site, I needed official permission from village heads and local government authorities. With the backing of my local host family, and a detailed description of the nature of my research, I received permission. These requirements were essential for establishing me as a trustworthy outsider.

From the outset, I decided to maintain a temporary home in Village 'B', while making one-to-two week forays to Village 'A'. In Village 'B', I made arrangements to live with my host family. Whenever I travelled to Village 'A', however, I stayed in a private Guest House due to insecurity stemming from land-grabbing in the village. The Guest House was approximately 2 km from Village 'A', and I commuted with a motorcycle or public transport. Due to the nature of the road and security concerns, I was compelled the leave the village at the beginning of dusk each time I visited.

In general, I adopted an ethnographic methodology for the village-level research (St. Martin and Pavlovskaya, 2009). This methodology was determined by my research questions (Limb and Dwyer, 2001) and the political ecology analytical approach. A political ecology framework demands multi-dimensional research questions, touching upon a range of issues from history and government policies, to ecology and social relations of gender, age and class (Zimmerer and Bassett, 2003). Empirically, to address all these questions required different research methods, ranging from surveys to interviews, and participating firsthand in daily village life. Participant observations were particularly useful for understanding social relations that could not be gleaned from interviews or surveys. Examples of these relations include the ways in which hierarchies of power are constituted, or how small acts of resistance are enacted. By choosing a methodology that privileged long-term village immersion, I also wanted to monitor the dry and rainy seasons in order to avoid snapshot impressions.

Building on Sayer's (2000) critical realist standpoint, my assumptions were that knowable reality is attainable if intensive and extensive methods are used appropriately. In particular, a variety of data collection methods could be combined with rigor when they are designed and implemented in a logical manner that fits their epistemological and ontological aims (Bradshaw and Stratford, 2005). Thus, whilst I adopted ethnography, I used a quantitative survey to identify broad trends and patterns, and complemented these findings with qualitative methods to give thick descriptions of survey results (Creswell and Plano Clark, 2011).

Through preliminary discussions with village elders and my host family, I identified a number of elderly men and women with significant knowledge about agriculture, drought and the farming system in the Upper-West Region. Five of these people were locally known as oral historians and skillful cultivators, with unusually broad perspectives on the issues I was researching. I started off the fieldwork by conducting extended oral historical interviews with these elders. These initial interviews allowed me to confirm the relevance and appropriateness of a survey questionnaire I developed in Canada, and to adjust it accordingly. After three weeks of oral historical interviewing and observations in the village, I quickly realized that many of the survey items needed to be revised in order to yield useful information. After revising, soliciting inputs, pre-testing and further revising, the result was a fourteen-page survey containing 113 items (see Appendix B). The questionnaire covered nine main themes, including socio-demographic characteristics; farmers' perceptions and ideas about climate change, including adaptation; asset ownership; household production, income and expenditure; household food security status; intra-household landholdings; and adoption of hybrid and local maize varieties. Several survey questions repeated similar themes in different words to approach the same issue from different angles, and to confirm the validity of responses.

With the help of a male and female research assistant, I administered the survey to a random sample of 249 households in Village 'B', and later, 155 households in Village 'A'. After completing the survey and identifying broad trends in both villages, I completed focus group discussions and in-depth interviews. I carried out household micro-studies by using participant observation, working more closely and intensively with a group of 30 households, selected to reflect different household structures, headship, food security status, and landholdings (see Table 1.1). I also interviewed agricultural extension officers and local government officials. On their own, none of the individual data sources would have been sufficient to explain the complexity of agriculture, food security, drought and agrarian change in the two study villages. The mixed methods design allowed me to balance different accounts and cross-check

against potential biases inherent in other methods. In each of the stand-alone manuscripts following this introductory chapter, I have fully discussed issues regarding sample size, sampling methods, data analysis, and validity as well as reliability.

Both in the natural course of living in the villages and as a conscious component of my research, I also engaged in participant and nonparticipant observations in a wide variety of settings. These arenas included households, farms, markets and other public spaces. Most importantly, I spent a considerable amount of time working with the peasant families described in Table 1.1. In order to understand their farming systems, I provided labour by hoeing, planting, drying maize, herding livestock, preparing ridges, working in women's kitchen gardens, and harvesting crops. I also conducted a series of plot walks to verify the size of household parcels. In many important ways, these participant observations provided some of my greatest insights from the field.

Table 1.1 Characteristics of 30 Households Selected for In-depth Micro Studies

Household Code	*Village*	*HH Size*	*Household Structure*	*Number of Productive Men*	*Number of Productive Women*	*No of Migrants Men/ Women**	*Children Below 10 Years*	*Size of Farm land (Ha)*	*Number of Months Granary is Empty*
H1	Village 'A'	7	De facto Female-headed, polyg, husband away, headed by 1st wife	1	2	1/0	4	0	10
H2	Village 'A'	9	Male-headed – polygamous, 2 wives	1	2	0/0	6	1.5	4
H3	Village 'A'	14	Male-headed –polygamous, 2 wives	5	5	2/2	3	3.5	2
H4	Village 'A'	13	De facto Female-headed, husband away, headed by 1st wife	3	4	3/0	6	0	11
H5	Village 'A'	9	De facto Female-headed , husband & first wife away, headed by2nd wife	3	2	3/1	4	0	11
H6	Village 'A'	6	De facto Female-headed , husband away, headed by wife	2	1	2/0	3	3	2
H7	Village 'A'	3	De jure Female-headed, widow with 2 children	0	1	0/0	2	1	4
H8	Village 'A'	15	De facto Female-headed	7	6	7/5	2	0	11
H9	Village 'A'	7	Male-headed – monogamous, 1 wife, 3 children, 2 unmarried brothers	3	1	1/0	3	2.5	5
H10	Village 'A'	3	De jure Female-headed, divorced with 2 children	-	1	0/0	2	1	4
H11	Village 'A'	18	Male-headed – polygamous, 2 wives	6	5	5/3	7	2.5	3
H12	Village 'A'	6	De jure Female-headed, divorced with 4 children	-	2	0/1	4	2	1
H13	Village 'A'	8	De jure Female-headed, widow with 3 children and 1 grandchild	-	2	0/1	5	0	11
H14	Village 'A'	6	Male-headed – monogamous, 1 wife, 2 children	1	1	0/0	2	2	0
H15	Village 'A'	12	De facto Female-headed, polyg, husband away, headed by 1st wife	1	2	1/2	8	2	10
H16	Village 'B'	21	Male-headed – polygamous, 2 wives	7	3	4/0	11	5	3
H17	Village 'B'	25	Male-headed – polygamous, 3 wives	6	6	4/2	13	4	3
H18	Village 'B'	10	Male-headed – monogamous	2	2	1/0	6	4	2
H19	Village 'B'	13	Male-headed – polygamous, 2 wives, 1 son plus wife	5	4	1/1	4	4	2
H20	Village 'B'	13	Male-headed – monogamous	2	3	1/1	8	5	1
H21	Village 'B'	16	Male-headed – polygamous, 2 wives	4	4	3/0	6	4	1
H22	Village 'B'	20	Male-headed – polygamous, 3 wives, 2 sons & wives	6	6	3/1	8	6	0
H23	Village 'B'	12	De jure Female-headed, widow with 6 children. No adult son	-	6	0/3	6	5	0
H24	Village 'B'	4	De jure Female-headed, widow staying with 3 grandchildren	-	1	0/0	3	3	2
H25	Village 'B'	6	De jure Female-headed, unmarried staying with 2 sisters with 2 kids	-	3	0/1	2	4	2
H26	Village 'B'	8	De jure Female-headed, divorced with 3 children. Two sisters	-	4	0/1	3	4.5	2
H27	Village 'B'	13	De facto Female-headed, polyg, husband away, headed by 1st wife	2	3	2/1	8	6	1
H28	Village 'B'	11	De facto Female-headed, husband away, headed by wife	2	4	2/2	5	5	2
H29	Village 'B'	12	De facto Female-headed, husband away, headed by wife	4	4	4/0	4	4	2
H30	Village 'B'	21	De facto Female-headed, polyg, husband away, headed by 1st wife	1	10	1/2	9	4.5	1

***** These are productive men and women included in total household size, but were absent at the time of the study

Source: Compiled from Field Notes, January to August, 2012.

I completed the fieldwork with a "member checking" exercise (Turner and Coen, 2008), collecting villagers' reactions, opinions and criticisms to a summarized version of my preliminary findings. Amidst the many responses were corrections of issues I misunderstood, and suggestions about other information I missed altogether. At the feedback workshop, all the women and men agreed with my initial findings, but a number of old men felt betrayed by what I had documented about gender politics. I incorporated their reactions, but did not shift my ground on some points, for example concerning the exploitation of women and their lack of access to household granaries. It is particularly for this reason that I do not openly identify any of my respondents by name, or reveal the actual villages where I conducted the fieldwork. Some respondents actually wanted to see their names in writing, but I do not openly identify any of them to avoid ethical dilemmas. In August 2013, I undertook a one-week follow-up visit to both villages to assess changes that had occurred since I completed the main fieldwork in August 2012. On the whole, not much had changed when I revisited both villages.

In the human geography literature, there is a critical discussion about the desirability and liabilities of conducting fieldwork as an insider versus an outsider (Limb and Dwyer, 2001). On the one hand, being already immersed in the uniqueness of a place by birth or strong familiarity (an insider) permits access, understanding, empathy, and cultural sensitivity. On the other hand, being unfamiliar with the setting (an outsider) provides a critical space to detect patterns that insiders may choose to ignore. In my case, I am originally from Ghana, but not a native of the northern region. The Upper-West field sites were all rural, and remarkably different from where I grew up in southern Ghana. As such, I was simultaneously an insider and an outsider, both positions of which enriched and complicated the research process in many ways. I had to constantly rework these positions as I undertook the fieldwork. Despite my attempt to be a "Ghanaian insider" as much as possible, on many occasions, I was often marked as an outsider due to my ethnicity and my inability to speak Dagaare fluently. On other occasions, however, I was accorded an

insider status as a result of my Ghanaian nationality, with my host family sometimes introducing me as their "son."

Although almost all the inhabitants in the two study villages spoke Dagaare as their first language, a greatest majority could speak either English, or Twi, my mother tongue. My Dagaare was very elementary. I did not have enough facility for qualitative interviewing, which requires the interviewer to deploy not only a sense of humor, but to be able to pick up the meaning behind subtle cues like facial expressions, body language, and different tones of voice. I therefore conducted all interviews in English and Twi, but found it imperative to work with my two research assistants to interpret interviews in Dagaare. I used the same research assistants for fieldwork in both villages.

The female research assistant was a social anthropologist, while the male was a medical student. Both of them are middle-aged and natives of the Upper-West Region, as well as small farmers in their own right. Their contributions to this research went far beyond survey administration and the interpretation of interviews. Their insights into the Dagaaba culture, and their ability to develop rapport with a wide range of people, proved especially useful for this research. In particular, the female anthropologist provided invaluable contributions whenever I needed to negotiate access to women's spaces.

As a male researcher interested in social relations of production and household politics, I encountered several field problems not experienced by women researchers. Being a male facilitated easy rapport with male respondents, but it also resulted in less socializing with women in this patriarchal setting. At the same time, however, my "foreignness" did grant me some invitation to women's domain, a space that male-gender researchers often find difficult to access (Schroeder, 1999). Given that women's and men's spaces were clearly defined in the villages I did the fieldwork, attempting to cross into women's domain (e.g., the kitchen) sometimes invited disapproving looks from men. Likewise, when I attempted to be very friendly, so as to probe into personal matters (e.g., income dynamics), some young women

misinterpreted my intention, thinking I wanted to make advances. Indeed, some women viewed me as an adulterer, having seen me hang around and talk to different women each day, and persistently in the company of a female research assistant. On several other occasions, the rich information gained from women was only possible by building trust first with their husbands, before negotiating access to communicate with their wives. Many men often disapproved and prevented close contacts or recurring interviews with their spouses.

My fieldwork was also shaped by the politics of development in Ghana. The period of village-level research coincided with Ghana's 2012 presidential elections, which was a tense and expectant one. In both villages, my presence was quickly linked to activities related to political party campaigns. For example, in Village 'A', rumors started that I have been contracted by a transnational company to pay compensation to households who had lost farmlands to a mining project. In Village 'B', my work was linked to an agricultural development project as part of political party campaigns. Such rumors did not only generate high expectations, but created significant difficulties in gaining and securing access. A majority of respondents came to expect material benefits by participating in the study. I made every effort to explain that my motives were purely academic and not related to the activities of political parties or transnational companies. I stressed that the main reason for this research was to learn more from the local people, who were the experts of their own agriculture and livelihoods. When I made these intensions clear, the participants collaborated with me in their own ways and emerged as the subjects with central voices in this project. While I cannot claim that I successfully transcended all of these fieldwork challenges, I strove for a nuanced research that was materially grounded and ethically sensitive. I hope that the arguments I make in this study succeed in presenting farmers' voices as they were presented to me.

1.6 Mapping the Chapters and Key Arguments

The dissertation is divided into five chapters organized as a set of integrated-articles. Three research manuscripts follow this introductory chapter. All the manuscripts are concerned with questions of food and agriculture in northern Ghana. However, each manuscript uses a thematic case study as an entry point to answer a set of related questions. In keeping with the political ecology framework, the empirical chapters offer a multilayered analysis pitched at different scales. While some chapters focus primarily at the household level, others try to understand the ways in which local processes are shaped by, and act on, wider political-economic forces. Each case study is substantially unique and offers its own set of lessons and conceptual advances. In adopting an integrated-article format, however, there is a slight redundancy when the dissertation is read as a whole. This redundancy has been inevitable, given the strong need to integrate theory, history, context, and methodology into each stand-alone manuscript.

Chapter 2 begins the thematic case studies by tracing the long-term trajectory of agricultural development policies in Ghana. It is argued that high-input agriculture constitutes the main thrust of agrarian development in northern Ghana. However, this farming approach is deeply contradictory because it is ill-suited to the prevailing political economy and ecology of production. Evidence is provided showing how these technologies are not only politicized at the household level, but undermine small farmers' agency in solving day-to-day farming problems. The chapter offers a critical geographical perspective highlighting the importance of place, history, and local-level politics in farmer decisions to use high-input agricultural technologies. It also brings to the fore what geographers can potentially learn from a political ecology analysis not entirely centered on formal state politics, but informal gender politics at the household arena. The paper has been accepted for publication in *African Geographical Review*.

Chapter 3 argues that the enduring problem with food provisioning in northern Ghana is not just a product of climatic variability, as has been conventionally

framed, but is inextricably linked to historical processes and social inequalities. Although there is considerable climatic variability in northern Ghana, the chapter argues that these events are not of acute concern among farmers. Indeed, many farmers appear to not see environmental change as a major worry. Instead, farmers are more concerned about inequitable access to and control over resources. The chapter further reveals how farmers are resorting to local farming innovations to respond to the impacts of climate change. The chapter does not aim to romanticize these local innovations, but to suggest how a better understanding of local resilience could contribute to sustainable food production in an era of climatic change. This chapter is currently under review in *Global Environmental Change*.

Chapter 4 argues that large-scale land appropriation is not only displacing the subsistence sector, but reworking agrarian social relations in northern Ghana. The recent wave of farmland enclosure has not only resulted in heightened land scarcity, but created a marked social differentiation within one of the research villages. The dominant form of inequality is land dispossession, with implications for intra-household property rights and labour dynamics. Due to acute land shortages, women's rights to use land as wives are becoming insecure, as their vegetable plots are being reclassified as male-controlled household fields. The chapter further reveals the painful choices made by landless farmers in order to make ends meet, including highly disciplined, yet low-waged farm labour and sharecrop contracts. In these livelihood pathways, there emerge, again, exploitative relations of production, whereby surplus is expropriated from land-dispossessed-migrant labourers and concentrated with farm owners. These dynamics produce a simple reproduction squeeze for the land-dispossessed. Overall, this chapter contributes to the broader literature in peasant studies by showing specific processes of agrarian change, and gendered differentiated impacts occasioned by land-grabbing in rural Africa. This chapter is currently under review in the *Journal of Peasant Studies.*

Chapter 5 knits the three manuscripts together and discusses the thematic unity amongst them. Through a meta-analysis, the chapter brings the two study

settings into a side-by-side comparison. It further puts the thematic case studies into direct conversation with one other, drawing connections and contrasts among cross-cutting issues. Attempt is also made to explain what the key findings might mean for agricultural development planning in Ghana. The chapter offers a strong call to action, providing practical suggestions for addressing each of the major challenges identified in the thematic case studies. As a concluding chapter, it also specifies the contributions of the dissertation to research in human geography more broadly, and political ecology literature most specifically.

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CHAPTER 2

A POLITICAL ECOLOGY OF HIGH-INPUT AGRICULTURE IN NORTHERN GHANA

Hanson Nyantakyi-Frimpong[a,*] and Rachel Bezner Kerr[b]

[a] Department of Geography
The University of Western Ontario
London ON, N6A 5C2, Canada

[b] Department of Development Sociology
Cornell University
Ithaca NY, 14853, United States

[*] Corresponding author. Email: hnyantak@uwo.ca

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Abstract

This study traces the trajectory of policy responses to food insecurity in northern Ghana. Historically, the path to agricultural development has been narrowly focused upon deploying technology to increase per capita food production. In the contemporary context, there is a renewed focus on a 'Green Revolution' type of agriculture. Combining village-level fieldwork and geographical perspectives in political ecology, this paper investigates farmer responses to these forms of agricultural intensification. It is argued that input-intensive agriculture is deeply contradictory in the northern Ghanaian context. Agricultural intensification is not only ill-suited to the prevailing political economy and ecology of production, but also undermines small farmers' agency in solving day-to-day farming problems. The findings further reveal how high-input technologies, especially hybrid seeds, are politicized even at the household-level of production. From a policy perspective, the findings suggest the strong need to encourage food security initiatives that are sensitive to local context, existing farmer knowledge and social relations of production. More broadly, the paper contributes to the ongoing debates concerning the form and necessity for a 'new Green Revolution' in Africa.

Keywords: Food Security; Food Policy; Gender Politics; Political Ecology; Northern Ghana

2.1 Introduction

During British colonial rule in the Gold Coast (now Ghana), the colonial administration acknowledged that food insecurity and hunger were severe, persistent and widespread problems in the Northern Territories.[2] Research by scholars and colonial official reports showed severe nutritional deficiencies among residents in the north during the British colonial rule (Cardinall, 1921; Kirk, 1942; Public Records and Archives Administration Department (PRAAD), 1939; Purcell, 1940)[3]. For instance, in a treatise by Cardinall (1921), the author wrote that in the Northern Territories, 'harvest is in June and July for early millet [*Eleusine coracana*], and November for guinea-corn and late millet [*Pennisetum glaucum*]…There is thus a long gap, which is tided over by storing the grain, but is most frequently a period of semi-starvation' (p. 85). In a memoir written in 1942, a British medical officer indicated a telling observation he made when he visited schools in the Lawra area (present day Lawra District). He reported that 'a number of boys showed weaker gain of weight after the holidays, than they did after the term had ended' (Kirk, 1942, p. 42). Apparently, children were in a better position to access nutritious and adequate diets in schools, than they did in their own households.

In another colonial report, an agricultural officer indicated that 'food supplies are often deficient; both in quality and quantity…Because of the distance of these areas from the roads and the relative poverty of the people, the northern savannas do not supplement their nutritional deficiencies by imported food-stuff. Fruits and green vegetables…are very lacking' (PRAAD, 1939, p. 2). A dietetic officer made a similar observation when he assessed food and nutrition in the Northern Territories. The officer wrote: 'in the north, nowadays, food is usually available, but very many can ill afford to buy it' (Purcell, 1940, p. 143). The report further showed a marked

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[2] The area that was referred to as Northern Territories during the colonial period is now called Northern Ghana, and encompasses three administrative regions, namely: Northern Region, Upper East Region and Upper West Region.

[3] We do not have archival evidence to consider the pre-colonial conditions of food security, or the role colonial rule played in fostering food insecurity in the Northern Territories.

infant mortality rate of 240 per 1,000 births in 1939 (Purcell, 1940, p. 145)[4]. For well over half a century after Ghana's political independence in 1957, the grim reality is that hunger has not improved in the northern regions. Arresting evidence of persistent food insecurity has recently been inventoried by the United Nations World Food Program (Biederlack and Rivers, 2009; Hjelm and Dasori, 2012).

Against this backdrop, we pose and examine two main questions in this paper. Firstly, what have been governments' policy responses over time to address food insecurity in northern Ghana? Secondly, why have these policy initiatives done little to alleviate food insecurity? A critical analysis of these questions is essential in order to examine the sequence in which agri-food policies have evolved, why they did or did not succeed, and what lessons can be drawn for the future. We situate our discussion within the broad analytical lens of political ecology. We take a long-term historical perspective, but also ground our analysis in the contemporary context using evidence from village-level case studies.

Our primary argument is that there is a principal contradiction embodied in government policies aimed at addressing food insecurity in northern Ghana. To date, official responses have largely focused upon agricultural intensification. Such an approach simply recycles the problem as solution. Based upon our village-level case studies, we find evidence suggesting that input intensive technologies are ill-suited to the prevailing political economy and ecology of production. Such farming techniques not only make small farmers vulnerable to market shocks, but also undermine their agency in solving everyday agricultural problems. Furthermore, this approach has adverse implications for intra-household gender relations, engendering tenuous spaces for on-farm labour mobilization. We therefore argue that there is a need for an agricultural approach that draws upon the best of modern technologies and the proven advantages of farmer-led experimentation. Overall, this study contributes to

[4] All these narratives are from colonial officers' perspectives. The evidence might therefore be prejudiced, considering that colonial and post-colonial administrators often use exaggerated, misconceived and crisis narratives to describe African agriculture and landscape change (see Fairhead and Leach, 1996).

a rich body of scholarship that critically analyzes the role of the colonial and postcolonial state in African communities, the implications of policy for agrarian transformations, and rural communities as repositories of rich knowledge that can be tapped to solve local problems. The paper further contributes to ongoing debates concerning the form and necessity for a 'new Green Revolution' in Africa.

Our discussion proceeds as follows: firstly, we discuss the political ecology framework, then, we trace the historical trajectory of agricultural development policies in Ghana. We then present a case study of hybrid maize seeds, which illustrates farmer perspectives on agricultural technologies, and makes us question some of the assumptions inherent in most Ghanaian agricultural initiatives. We conclude with a commentary on how agricultural policies might be approached differently to improve food security of smallholder households in northern Ghana.

2.2 A Political Ecology Analytical Approach

We adopt a political ecology approach, which is concerned with environmental, political and economic processes shaping human-environment relations (Robbins, 2012). Using a historical analysis to understand the current context, we focus on land users and their links to wider environmental and social processes (Zimmerer and Bassett, 2003). We examine social relations of production to illuminate how the micro-level politics of gender and household position influence farmer choices of agricultural technologies. With a focus on the 'land user,' we pay particular attention to how local environmental processes limit or enable different types of farming practices. Our analysis especially bears resonance with, and seeks to advance that of studies that have applied a political ecology framework to analyze input-intensive agriculture (e.g. Carney, 2008; Jarosz, 2012; Weis; 2012; Zimmerer, 2002)

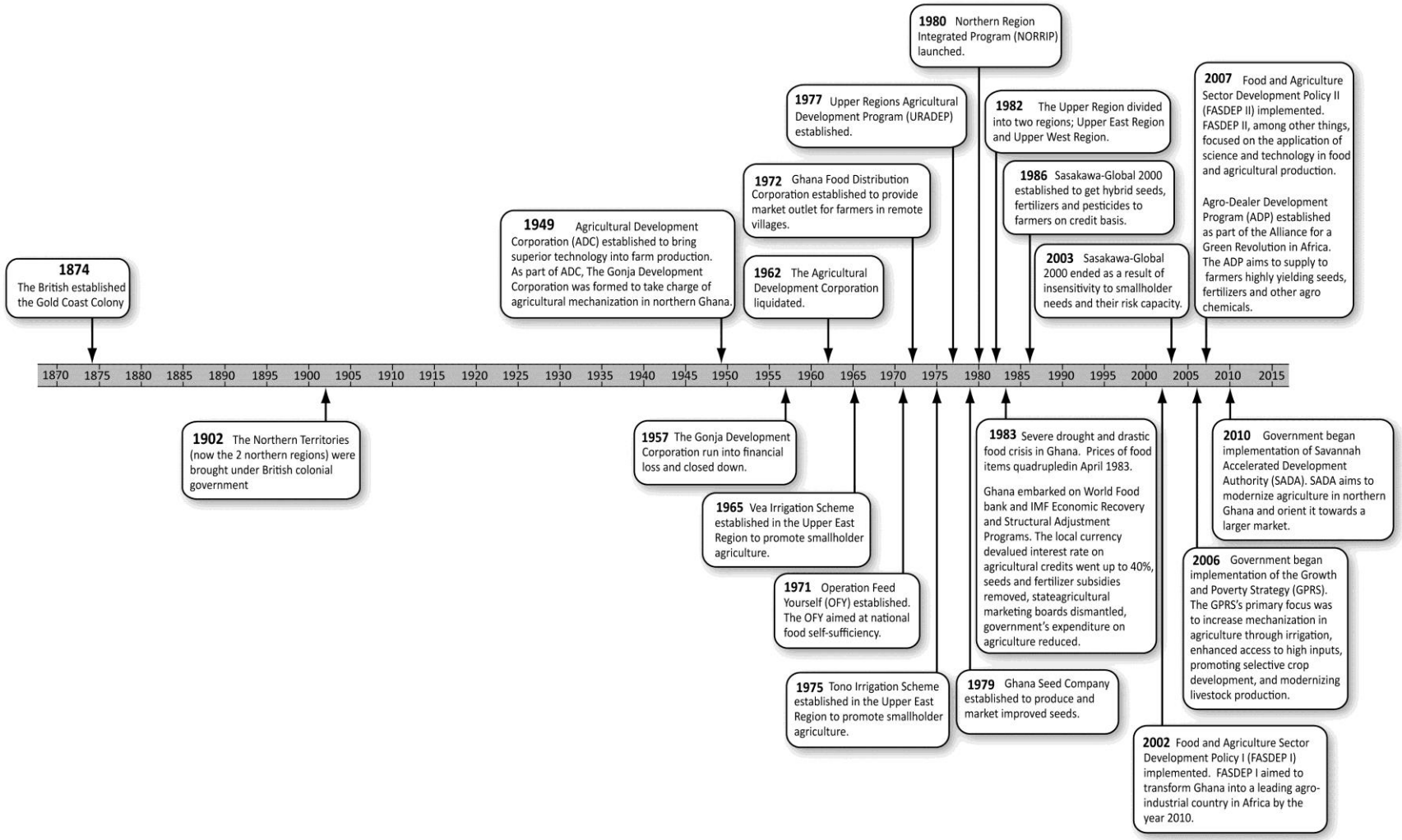
In The Gambia, Carney (2008) has shown how gendered social relations forcefully shape the success or failure of agricultural technologies (see also Carney and Watts, 1991). Zimmerer (2002) has investigated the role of social factors and agroecological variability in seed management, revealing how farmer selection

practices for traditional and modern seed varieties differed considerably according to socio-economic status and gender. Watts (2013) used historical and political-economic analysis to explain how food production and famine were shaped by state policies and patterns of surplus extraction in northern Nigeria. This paper builds upon these studies to argue that we must understand the intersection of local environmental practices, power relations and macro-level political economy to see why high levels of food insecurity persist in northern Ghana. In order to advance this argument, we first map out the long-term trajectory of food and agricultural development policies in northern Ghana.

2.3 Ghanaian Agricultural Policies in Historical Perspective

Ghanaian agricultural development policies have deep colonial roots, stretching as far back as 1874 (Figure 2.1). Whilst the British established the Gold Coast Colony in 1874, the Northern Territories were not brought under colonial rule until 1902 (Lund, 2003). Initial colonial policies focused upon the production of crops that offered the greatest potential for export to Britain (Seini, 2002). The colonial government paid little attention to the production of non-commercial and staple food crops. Policy emphasis on export crops led to extensive infrastructural development in southern Ghana, where the moist semi-deciduous vegetation supported the production of cocoa and coffee (Plange, 1979). Very little colonial revenue was spent in the north and the area remained, and still continues to remain, relatively poor and under-developed (Al-hassan, 2013; Shepherd et al., 2004). The only way the north was integrated into the Gold Coast economy was through the provision of labour for southern-based plantation farms and mines (Austin, 2005), which in turn reduced labor availability for food production in the North.

Figure 2.1 Timeline of Major Events and Agricultural Policies in Ghana



Source: Authors' Illustration

In 1949, the Gold Coast government made the first attempt to improve agriculture in the Northern Territories. As part of a larger and ambitious country-wide program, the government established an Agricultural Development Corporation (ADC). The aim of the ADC was to encourage high-input agriculture in the food crop sector in the Northern Territories, and in the cocoa and rubber sub-sectors within the southern Gold Coast (Asuming-Brempong, 2003). The ADC was premised on the assumption that indigenous agriculture was inadequate to meet the needs of a growing population and the cash crop economy in the south. Population pressure was further considered to be a major reason for low agricultural productivity. The Gonja Development Corporation (GDC) was therefore established as part of the ADC to help ease population pressure and boost food production in the Northern Territories. Initially, the GDC targeted 500 households who were to be resettled from densely populated zones to areas with low population density (Frimpong-Ansah, 1991). These households were encouraged to go into mechanized cash cropping.

However, the project failed to meet its objectives. Among other reasons, it could not realize the initial target of reaching 500 households, as many farmers refused to leave the presumed overpopulated zones (Hilton, 1960). Further, many farmers refused to adopt the mechanized farming system. One study showed that the "types of heavy machinery brought in were not suitable for the hard soil conditions; they suffered frequent breakdowns and maintenance was poor. Skilled operators were lacking and the initial land preparation often took away the fertile top soils…The farmers thought they had better traditional knowledge of farming methods" (Frimpong-Ansah, 1991, p.83). After independence in 1957, the post-colonial government viewed the ADC as a misguided agricultural initiative. It had accumulated high levels of debt, but made little impact (Hilton, 1960). Both the GDC and ADC were subsequently closed down in 1957 and 1962 respectively.

The post-independence era saw a number of initiatives to encourage 'modernization' of agriculture in northern Ghana, including encouraging the use of fertilizers, hybrid seeds and irrigation. In 1965, the government established the Vea

Irrigation Scheme, an irrigated area of about 468 hectares, to support dry season farming in the Upper East Region. Another large-scale irrigation project, the Tono Irrigation Scheme, was established in 1975 to enhance the diffusion of technology to smallholder farmers in the Upper East Region. In addition, the government established the Ghana Seed Company in 1979 to produce and market improved seeds to farmers. In 1980, the government further initiated the Northern Region Rural Integrated Project (NORRIP) with external funding from the Canadian International Development Agency (CIDA) (Seini and Nyanteng, 2003). The project had several phases, including an agricultural component that aimed at diffusing improved technology to small-scale farmers. Although a large number of farmers benefited from the project, it could not be sustained at the end of CIDA's external funding in 1989 (Botchway, 2001).

In the late 1960s and early 1970s, Ghana had a vibrant economy; it was the world's leading producer of cocoa and exported close to 10 percent of the world's gold (Konadu-Agyemang, 2000). A combination of factors, including government over-spending, a fall in cocoa prices, severe droughts and global oil price increase, led to a complete collapse of the economy in the early 1980s (Pearce, 1992). The government subsequently negotiated for a World Bank and International Monetary Fund Structural Adjustment Program (SAP) in 1983. The SAP came with a loan of US$1.4 billion, with several conditionalities, including deregulation of both input and output markets (Pearce, 1992). The prices of most agricultural chemicals were increased in excess of over 40 percent per annum, between 1986 and 1992 (Asuming-Brempong, 1994). In 1990, the government eliminated guaranteed minimum prices for food crops such as maize and rice. Fertilizer subsidies were removed in June 1992, while all state marketing boards were also closed down. By August 1992, fertilizer importation and marketing had been privatized (Nyanteng and Seini, 2000).

The effects of structural adjustment were most severe for farmers in northern Ghana where incomes were low (Alderman and Shively, 1996). The removal of tariffs depressed domestic food production by exposing local farmers to a flood of cheap,

subsidized rice and maize from foreign producers. Many smallholders abandoned farming completely, while others switched to export crops that had higher marketing value and received greater credit support (Konadu-Agyemang, 2000). A World Bank report in 1993 confirmed the hardship on northern Ghanaian farmers, stating that "the deleterious effect [of price liberalization] on incomes (and welfare) may have been more severe among households in northern Ghana where agricultural production is based largely on food crops" (World Bank, 1993, p. 31).

Whilst farmers were still dealing with structural adjustment impacts, an international non-governmental organization called Sasakawa-Global 2000 (SG-2000) launched its operations in 1986 (Puplampu, 2003). The project aimed "to bring new agricultural technology to farmers in a rapid and dramatic fashion" (Tripp, 1993, p. 2010). SG-2000 supplied input credit packages to farmers and encouraged them to plant new crop varieties. The project started with 40 plots in 1986; which quickly increased to 1,500 in 1987; 15,000 in 1988; and 76,000 in 1989 (Al-Hassan and Poulton, 2009, p. 20). Whilst SG-2000 was not a government initiative *per se*, it received full governmental support, with government extension agents recruited to assist with the diffusion of technology to farmers (Puplampu, 2003; Tripp, 1993). In northern savannah Ghana, greater emphasis was placed on sorghum and maize.

In the first three years of SG-2000, maize and sorghum yields were remarkable, with farmers recording as high as a 40 percent increase in output (Puplampu, 2003). These results received widespread international press coverage, with the *New York Times* carrying news about 'miraculous seeds' in Ghana (Tripp, 1993). However, SG-2000 proved to be another failure. A key challenge was the issue of credit recovery; according to one report, loan recovery rates fell from 90 percent in 1987 to 44 percent in 1989 (Al-Hassan and Poulton, 2009). Moreover, the program was narrowly focused on a few strains of crops (maize and sorghum), and was found to be insensitive to the resource needs and risk capacity of small farmers. When the input credit package ceased as a result of poor loan recovery, all farmers reverted to local seeds and traditional methods of improving soil fertility (Amanor, 2011). The SG-

2000 program was therefore closed down in 2003. There is also evidence that SG-2000 produced mixed results in other African countries (Howard et al., 2003; Keeley and Scoones, 2000).

Since the period after structural adjustment, there has been a continuity of high-input agriculture in Ghana. Under different policy initiatives, the government has placed a higher priority on agricultural technologies in order to double yields of farmers, with a focus on northern Ghana (National Development Planning Commission [NDPC], 2005). These initiatives include the Ghana Poverty Reduction Strategy (GPRS), the Food and Agriculture Sector Development Policy (FASDEP), and the Savannah Accelerated Development Authority (SADA). The primary thrust of the GPRS is 'to achieve accelerated growth through modernized agriculture, led by a vibrant and competitive private sector' (NDPC, 2005, p.29). The SADA program also aims to modernize agriculture in northern Ghana and orient farmers towards a larger market (Al-hassan, 2013). Since 2008, an Agro-Dealer Development Program (ADP) has been launched as part of the Alliance for a Green Revolution in Africa, supported by the Rockefeller and the Bill and Melinda Gate Foundations. As part of this initiative, about 2,400 agro-dealers have been trained to supply high-yielding seeds and fertilizers to farmers (International Fertilizer Dealer Center, 2011).

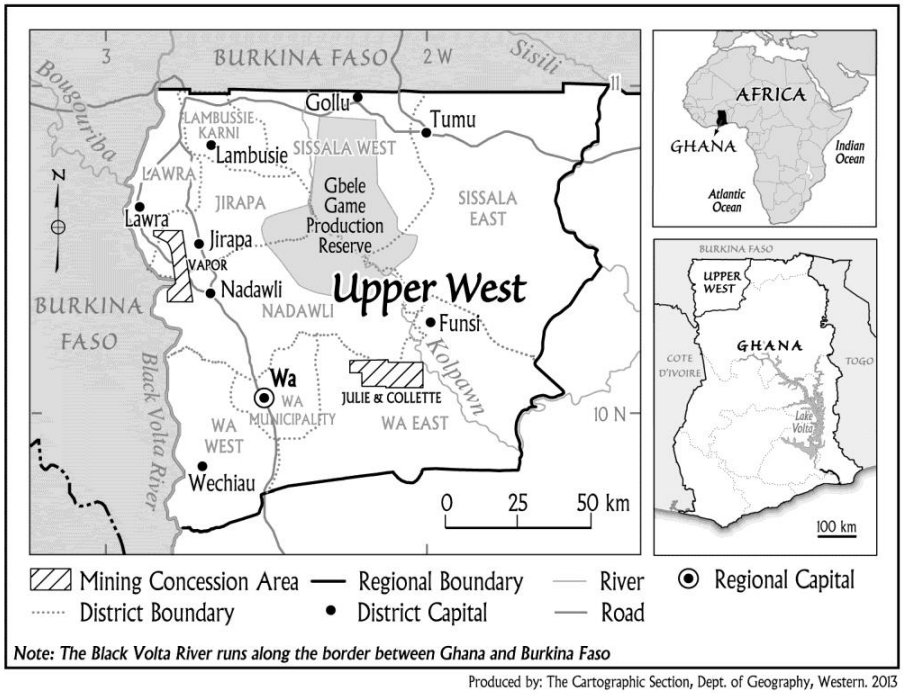
After more than half a century of pursuing these agricultural intensification initiatives, there continues to be deepening inequalities between northern and southern Ghana (Shepherd et al., 2004), while government circles continue to accept high-yielding technologies as the best way forward. In the remainder of this paper, we utilize a case study of maize to investigate whether and how farmers are responding to the mass promotion of input-intensive agriculture. Maize is a useful case study because it is a major staple crop in northern Ghana and the most widely grown cereal in Africa (McCann, 2005). Maize is also tightly linked to the promotion of inputs such as fertilizers, seeds and pesticides (Gage et al., 2012). In this paper, we use 'landrace' to refer to local seed varieties lacking formal crop improvement. In contrast, we use the term 'hybrids' to refer to cultivars of maize that have been

scientifically bred to have uniform and stable characteristics, as distinct from landraces (Villa et al., 2005).

2.4 The Research Setting

This paper draws upon research in two savanna villages in Ghana's Upper West Region (Figure 2.1). The Upper West has been one of Ghana's poorest regions for several decades; infrastructure, standards of living, literacy levels, health and nutritional status are all very low and worse than in any other part of the country (Ghana Statistical Service, 2008). The region falls within the semi-arid, Guinea savanna agro-ecological zone. The vegetation is characterized by a layer of grasses of varying heights, alongside drought-resistant trees. The topography is marked by a relatively flat savanna plains devoted almost exclusively to the cultivation of different kinds of cereals and legumes.

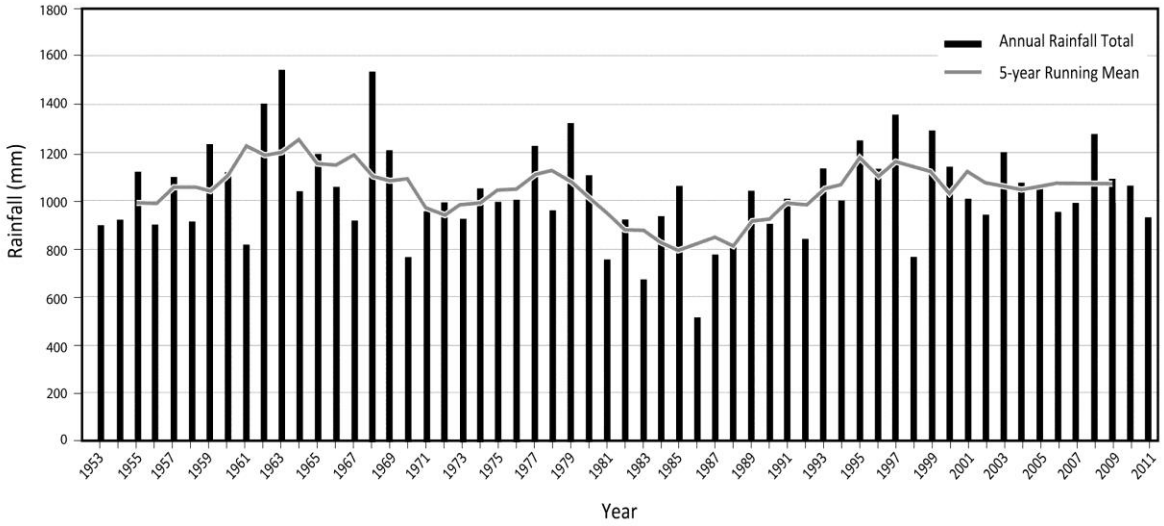
Figure 2.2 Location of the Study Area



Source: Map Prepared by Karen van Kerkole, Western University Cartographer.

There is a unimodal rainy season lasting for approximately five months, from May to September. The rest of the year is characterized by a pronounced dry season with cold and hazy harmattan weather. The rainfall regime fluctuates considerably between years and within a season. The mean annual rainfall for the period 1953 to 2011 was 1,036 mm, with the range varying from a minimum of 523.7 mm in 1986, to a maximum of 1500 mm in 1963 (Figure 2.3). Dry spells are thus a recurring phenomenon. Rainfall tends to occur in heavy torrents and is concentrated in a few days, thereby resulting in heavy erosion, instead of soil moisture recharge (Van der Geest, 2002).

Figure 2.3 Rainfall Variability in Upper-West Region, Ghana



Data Source: Ghana Methodological Agency, Accra, Ghana

The two research villages (hereafter referred to as Village 'A' and Village 'B') are predominantly remote and poor. Table 2.1 is a summary of site-specific characteristics and differences between the two sites. Both villages have laterite soils with a moderate acidic content [pH 5.7-6.4] (Adjei-Agyapong and Asiamah, 2002), but Village 'A' also has narrow strips of alluvial soils in the floodplains of the Black Volta River. These alluvial soils are less acidic as compared to the laterites (pH 4.7-5.2), and are extensively used for flood recession farming. Smallholder farming and herding are the principal livelihood activities in the two villages. Production is typically more

oriented towards household consumption than for market sales. Most households' livestock holdings include cattle, sheep and goats.

Table 2.1 Characteristics of the study villages

Study Village	*Village 'A'*	*Village 'B'*
District	Nadowli District	Lawra District
Population (census 2000)	494	4,041
Total households (census 2000)	72	419
Total households (2012)[5]	272	704
Households studied	57%	35%
Total houses/farmsteads	158	305
Distance to nearest town	21 km (Nadawli)	3 km (Lawra)
Ethnic composition	Dominated by Dagaabas (93%)	Dominated by Dagaabas (95%)
Electricity	Not available	Available
Market	Not available, 12 km to nearest market	Not available, 3 km to nearest market

Source: Compiled from Ghana Statistical Service, 2005a; Field notes, January to August, 2012.

Crops are planted in two types of agricultural fields: the compound field, which often surrounds the homestead, and the bush field, which may be several kilometres away from the village. Fields closest to compounds are intensively cultivated every year. Soil fertility is maintained with manure from livestock kraals and compound sweepings. Most households cultivate maize, often in addition to pearl millet, guinea corn, groundnuts and beans. Smallholder farming follows different types of multiple cropping patterns. It may include growing more than one crop on a field during the same farming season (intercropping), growing more than one crop after each other in a sequence (sequential cropping), or growing two or more crops with overlapping cultivation periods (relay cropping). Cereals are intercropped with, or succeeded by legumes, with vegetables cultivated in small patches within the field. This cropping system has a peak planting period from May to June.

Some household members might own individual farms, but a majority of households have a collective field to which junior members (age between 5 and 45

[5] These are unofficial estimates from our 2012 household survey. A new national census was conducted in 2010, but at the time of writing this article, the official report had not been published.

years) and active senior members (age between 46 and 75 years) are expected to contribute labour towards planting, weeding and harvesting. Our survey of time and labour allocation showed that women were more involved in farm operations after initial field preparation. Women's workload usually revolved around weeding, harvesting and post-harvest work in grain processing. All households had at least one common granary for storing grains harvested from the collective field. At regular periods after harvests, male household heads parcel out grains among the women of the compound. Married women cook for themselves and their children; co-wives alternate the task of cooking for their husbands, although there are some exceptions (in some polygamous households, each co-wife sends a bowl of the evening meal to the husband).

Both villages have significant seasonal migrant populations, most of whom are male. In our surveyed households, about 48 percent of members in Village 'A' and 25 percent of members in Village 'B' were absent at the time of our survey. During periods after crop harvest and low agricultural labour demand, young men and women migrate to work as casual labourers in subsistence and cash crops farms within southern Ghana. These migrant farmers, however, return to their home villages at the beginning of each farming season. The historical root of migration is linked to British colonial policies that largely neglected the north, and post-colonial policies that have further entrenched regional inequality in Ghana (Shepherd et al., 2004). As a result of the large migrant population, food and cash remittances are significant in the local economy (Luginaah et al., 2009).

2.5 Methodology

A political ecology approach required us to adopt an ethnographic case study design. As many geographers have emphasized, political ecology's emphasis on "local knowledge, environmental history, multiscale politics, and socially differentiated resource management practices requires intensive field study and multiple research methods" (Bassett and Zuéli, 2003, p.117). Our findings are therefore based on

ethnographic analysis integrating multiple methods for triangulation. From December 2011 to August 2012, the first author collected a series of data (Table 2.2) and spent a considerable amount of time observing, learning and interacting with smallholder farmers in order to understand their agricultural practices.

Table 2.2 Methods and data sources

Methods	***Scope and Description***	***Sample Size***
Questionnaire survey	Closed ended questions on farm household demographics, food security (using the Household Food Insecurity Access Scale [HFIAS][6], income, on- and off-farm labour allocation, land holding, and maize variety selection criteria.	$N^{\alpha} = 249^{a}$, 155^{b}
In-depth interviews	In-depth interviews and observations on household decision-making, division of labour, control over resources, recent crop successes and failures, and livelihood strategies. Analysis of how these characteristics influence the choice of agricultural technologies, especially hybrid maize varieties.	$N^{\beta} = 28^{a}$, 26^{b}, and 6 key informant interviews
Focus group discussions	Semi-structured, gendered and generational-based focus group discussions on farmers' criteria for maize variety selection. A systematic evaluation of characteristics that farmers considered to be important when selecting seeds.	N^{β} =75 participants in 8 groups
Oral history interviews	In-depth interviews with farmers who were locally known to be skillful cultivators and oral historians. Interviews aimed at identifying local crop taxonomy and landrace diversities present; how landraces were retained in storage from one agricultural cycle to the next; and systems for seed exchange.	$N^{\beta} = 5^{a}$, 3^{b}
Farm-based participant observations	Assisted labour in household farms to better understand how field-level agro-ecological conditions (climate, soil properties, weeds and vegetation) influence the choice of seed varieties and other agricultural technologies.	$N^{\beta} = 15^{a}$, 15^{b} farms

Note: N^{α} is a random sample; N^{β} is a maximum variation sample; [b] is total sample in Village 'A'; [a] is total sample in Village 'B'.

The first author conducted initial oral historical interviews with village elders, before proceeding with an exploratory survey with a random sample of 404 households (Table 2.2). The survey was subsequently followed by interviews with 18 women and 14 men, and 8 focus group discussions with a total of 75 participants. Following analysis of these data sets, further interviews were done with 16 women

[6] The Household Food Insecurity Access Scale (HFIAS) is a standardized questionnaire and scoring criteria for measuring household food insecurity (Coates et al., 2007).

and 12 men, after which theoretical saturation was reached in types of responses (Patton, 2002). Farmers were interviewed inside or near their agricultural fields or homes. Interviews were conducted in the language preferred by the participant: English, Twi or Dagaare. The first author conducted all interviews in English and Twi. Research assistants were hired to conduct and interpret interviews in Dagaare. Interviews varied in duration from 3 to 6 hours.

We used SPSS to perform statistical analyses. We estimated household food insecurity using a standardized Household Food Security Access Scale (Coates et al. 2007). Qualitative data from field notes, focus groups and in-depth interviews were analyzed following the methods outlined by Berg (2004). We used summaries and clustering to reduce the data sets, and hand-coded interviews and field notes for relevant themes. We recorded all key themes, coding categories, and the number of participants to articulate a particular category. We ensured validity and reliability by using triangulation with multiple methods (Table 2.2), and presenting preliminary results for verification by research participants (Patton, 2002). Our research methods were approved by the Non-Medical Research Ethics Board in our university. In the results section, we have included direct quotations to give voice to participants' own views on agricultural technologies. The quotes were selected based on three criteria: the ability to represent divergent perspectives; typical views expressed by many respondents; and the depth or clarity with which the idea was conveyed.

2.6 Research Findings and Discussion

The surveyed sample had characteristics fairly representative of households in the Upper West Region (Table 2.3). The mean age of household heads was approximately 56 years and ranged from 21 to 100 years. Household size averaged 7.6 persons in Village 'A' and 8 persons in Village 'B'. However, it was not uncommon to come across larger households composed of a male head (locally referred to as '*landlord*') and his wife or wives; the landlord's unmarried and married sons and their children; the landlord's junior brother(s) - some of whom may be married with one or more

wives and several children; and the landlord's unmarried daughters (see also Van der Geest, 2002). The average landholding was 0.6 hectares in Village 'A' and 2.4 hectares in Village 'B'. The large difference in landholdings is the result of farmland acquisitions for mining in Village 'A'.

Table 2.3 Descriptive statistics of surveyed households

Variable	*Village 'A' n=155*	*Village 'B' n=249*	*Full Sample n=404*	*Other Studies (Upper West Region)*[1]
% of household members between 0-14 years	42.8	43.2	43	43.4
% of household members between 15-64 years	50.3	50.6	50.5	50.5
% of household members 65+ years old	6.9	6.2	6.5	6.1
Mean age of household head (years)	58	53.6	55.8	55
Household head never attended school (%)	90.3	80	85.1	69.8
Mean household size	7.6	8	7.8	7.2
Male-headed households (%)	67.7	87.1	77.4	81.7
De facto female-headed households (%)	23	7.2	15.1	18.3
De jure female-headed households (%)	9.3	5.7	7.5	82.1
Households that are Dagaabas (%)	83.6	85.9	84.8	57.5
Mean landholding in hectares	0.6	2.4	1.5	2.7
Households severely food insecure (%)	45	34.5	39.8	34
Households producing maize (%)	100	100	100	100
Households with a migrant in last 2 years (%)	96.8	92.4	94.6	76.3

Source: Fieldwork, 2012

[1] Biederlack and Rivers, 2009, p. 13; Chamberlin, 2007, p. 7; Ghana Statistical Service, 2005b, p. 88-105; Van der Geest, 2002, p.153.

Whereas hybrid maize has been advertised as high-yielding, more pest-resistant and drought-tolerant, farmers' perceptions were different. The vast majority (76 per cent, n=404) of households planted traditional varieties of maize that farmers' themselves have produced and maintained, often for many generations. Farmers explained that they maintain a large collection of traditional maize seeds, each variety with unique characteristics to respond to the mix of conditions that unfold in an agricultural season. An older male farmer, with over 45 years of farming experience, stated that 'I plant seeds that I've maintained over the past 30 years. I think the local seeds are more reliable than the store-bought [hybrid] seeds. You can't trust the store-bought seeds. The local maize can produce some grains even in a bad rainfall year.' Similarly, a 65-year-old woman farmer, caring for six

grandchildren, described her experience this way: 'I've been planting maize nearly all my life, but I've never experimented with the modern varieties on the market. I use seeds that I've kept over the years.'

The large percentage of farmers who exclusively planted maize landrace was in sharp contrast with the percentage of farmers who planted only hybrid maize (8 per cent), or combined both hybrids and landrace (16 per cent) (Table 2.4). Using the derived scoring system developed by Coates et al. (2007), we identified three categories of food-insecure households in our sample: mildly food-insecure, 10 per cent; moderately food-insecure, 37 per cent; and severely food-insecure, 39 percent. Of these three categories, the majority in each group exclusively planted maize landraces. For instance, out of the 156 severely food-insecure households, 117 (75 per cent) exclusively planted maize landrace, while only 14 households (9 per cent) exclusively planted hybrids.

Table 2.4 Households' maize production characteristics based on food security status

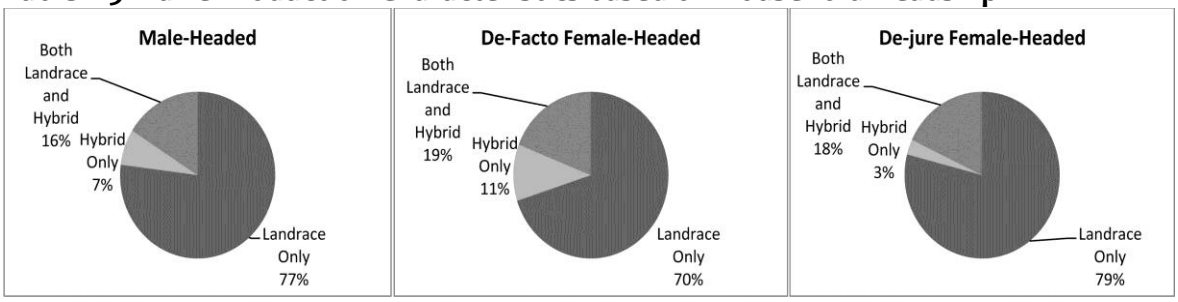
Variable	*Food Secure* *n*=55 (14%)	*Mildly Food Insecure* *n*=42 (10%)	*Moderately Food Insecure* *n*=151 (37%)	*Severely Food Insecure* *n*=156 (39%)	*All* *n*=404 (100%)
Households planting *landrace only*	42 (76%) (X^2=0.0)	36 (86 %) (X^2=0.6)	114 (75%) (X^2=0.0)	117 (75%) (X^2=0.1)	309 (76%) (X^2=0.8)
Households planting *hybrid only*	2 (4%) (X^2=1.2)	1 (2%) (X^2=1.5)	14 (9%) (X^2=0.5)	14 (9%) (X^2=0.3)	31 (8%) (X^2=3.6*)
Households planting *both landrace and hybrid*	11 (20%) (X^2=0.3)	5 (12%) (X^2=0.7)	23 (15%) (X^2=0.1)	25 (16%) (X^2=0.2)	64 (16%) (X^2=1.2)

Source: Household Survey, 2012; NB* Significant at p=0.01

Other studies in Ghana have shown that female-headed households were less likely to adopt improved maize varieties than male-headed households (Doss and Morris, 2001). We investigated whether hybrid maize adoption in our northern Ghanaian sample varied depending on household structure and the gender of household heads. With increasing male out-migration and the growing incidence of female-headed families (Luginaah et al, 2009), simply comparing male- and female-

headed households was inadequate. We therefore disaggregated female-headed households into *de-facto* (i.e. the primary household head was a man, but had either migrated, was ill or very old) and *de-jure* (i.e. the primary household head was a single, divorced or widowed woman). This disaggregation was useful in assessing whether women's agricultural decision-making power, especially whilst their husbands are away, influenced the type of technology adopted. In each type of household headship, the majority exclusively planted landrace maize (Figure 2.4). However, there was a statistically significant difference between male-headed and *de-facto* female-headed households planting landrace only. There was also statistically significant difference between *de-jure* and *de-facto* female-headed households planting landrace only. These differences may be due to a combination of factors, including decision-making authority, labour availability and cash resources to purchase hybrid seeds.

Table 2.5 Maize Production Characteristics based on Household Headship*



Source: Household Survey, 2012.

NB: *Z-test shows statistically significant difference between male-headed (77%) and *de-facto* female-headed households (70%) planting landrace only ($p<0.05$). There is also a significant difference between *de-jure* (79%) and *de-facto* (70%) female-headed households planting landrace only.

During oral historical interviews prior to the household survey (see Table 2), we asked participants how their preferences and circumstances influence their decisions to adopt a particular maize variety. We found that the selection of maize varieties followed a well-defined criterion. The most important considerations included production characteristics such as yield stability, early maturity, drought tolerance, pest resistance, grain weight, cost of seeds, and labour as well as fertilizer

requirements. A second key consideration was consumption and processing characteristics, including taste, ease of threshing and shelling, storability, and flour-to-grain ratio. These characteristics formed the basis of a set of seed preference survey questions (Table 2.5).

Table 2.6 Maize Variety Selection characteristics

Variables	***Local Varieties***				***Hybrid Varieties***		
	All n=404	*Village 'A'* n=155	*Village 'B'* n=249		*All* n=404	*Village 'A'* n=155	*Village 'B'* n=249
Production Characteristics							
Guaranteed Minimum Yield	274 (68%)	87 (56%)*	187 (75%)*		130 (32%)	68 (44%)*	62 (25%)*
Early maturity	38 (9%)	12 (8%)	26 (10%)		366 (91%)	143(92%)	223(90%)
Drought resistance	361 (89%)	136 (88%)	225 (90%)		43 (11%)	19 (12%)	24 (10%)
Insect/pest resistance	360 (89%)	141 (91%)	219 (88%)		44 (11%)	14 (9%)	30 (12%)
Lodging resistance	345 (85%)	130 (84%)	215 (86%)		59 (15%)	25 (16%)	34 (14%)
Grain weight	326 (81%)	125 (81%)	201 (81%)		78 (19%)	30 (19%)	48 (19%)
Labour requirement	369 (91%)	141 (91%)	228 (92%)		35 (9%)	14 (9%)	21 (8%)
Cost of seeds	379 (94%)	148 (95%)	231 (93%)		25 (6%)	7 (5%)	18 (7%)
Planting seed availability	382 (95%)	148 (95%)	234 (94%)		22 (5%)	7 (5%)	15 (6%)
Fertilizer requirement	388 (96%)	149 (96%)	239 (96%)		16 (4%)	6 (4%)	10 (4%)
Consumption Characteristics							
Taste	386 (96%)	149 (96%)	237 (95%)		18 (4%)	6 (4%)	12 (5%)
Storability	372 (92%)	142 (92%)	230 (92%)		32 (8%)	13 (8%)	19 (8%)
Ease of threshing and shelling	352 (87%)	134 (87%)	218 (88%)		52 (13%)	21 (13%)	31 (12%)
Flour-to-grain ratio	378 (94%)	146 (94%)	232 (93%)		26 (6%)	9 (6%)	17 (7%)

Source: Household Survey, 2012; Note: *Chi-square test of homogeneity shows significant differences between Village 'A' and Village 'B' at $p < 0.01$

For each of the characteristics, we asked farmers if they preferred landrace or hybrid varieties. The majority of households indicated that they plant landrace maize because of characteristics such as guaranteed minimum yield (68 per cent), drought resistance (89 per cent), low labour requirements (91 per cent), low cost of seeds (94 per cent), higher grain weight (81 per cent), and little or no fertilizer requirement (96 per cent) (Table 2.5). Furthermore, the vast majority of households indicated that they plant landrace maize because these varieties taste better (96 per cent), are highly resistant to storage pests (92 per cent), are easy to thresh and shell (87 per cent) and have a higher flour-to-grain ratio (94 per cent). Culinary characteristics formed another key factor influencing household decisions to plant landrace, with

many farmers remarking that 'local maize dough sticks together better in making Tuozaafi [a thick maize gruel]', whilst others mentioned that 'the dough from local maize does not turn sour as quickly as that from agric [hybrid] maize.' These findings are similar to smallholder farmer concerns in other parts of northern Ghana (Amanor, 2011). The results also support studies indicating that in different parts of sub-Saharan Africa, poorer, food insecure households are more likely to grow landrace maize because of better quality flour, lower cost, yield stability and higher flour-to-grain ratios (Chirwa, 2005; Lunduka et al., 2012; McCann, 2011).

We performed a comparison test to assess whether the differences between Village 'A' and Village 'B' - for example, soil heterogeneity and distance to input and output markets (Table 2.1) - will produce variations in farmer responses. Except for one characteristic, that is, yield stability, there were no significant differences in farmer perceptions in both villages (Table 2.5). Participant observations and in-depth interviews revealed nuanced social dimensions into these survey results. We now turn to a discussion on social relations of production and seed planting ecology to explain *why* farmers select particular maize varieties or allocate them to different growing environments.

2.6.1 Social Relations and Production Politics

> [C]ropping patterns or marketing choices are not the result of a single economic calculus, but are the outcomes of negotiation between husbands and wives, between co-wives and between them and their children. (Scoones et al., 2005, p.3).

During interviews and focus groups, farmers repeatedly stressed that the cultivation of hybrid seeds was a labour-intensive process. Farmers often described hybrid seeds as 'weak', 'sensitive' and to 'require extra care.' Farmers further emphasized that hybrid maize demands a stricter timing of cultural practices, especially weeding and fertilizer application. For instance, a 69-year old farmer with three wives and thirteen children, summarized a recurring concern as follows: 'agric seeds [hybrids] should be

weeded early in the season, otherwise yield will be poor…This [need for early weeding] increases household labour problems.' Another old farmer (70 years) with two wives and seven children, described his experience by saying: 'agric maize can be good, but not for everyone. It is for the farmer who has something. The farmer who has money. The farmer who has labour. Not every labour, but it means your family members are available and prepared to work harder and carefully. All members should be available to undertake re-planting in case there is a seed failure, or undertake first weeding not later than the first five weeks after planting. The available labour should also be prepared for an additional, second weeding if fertilizer is applied.' Thus, in the annual cropping cycle, the ability of a farmer to mobilize 'a disciplined familial labour force' (Carney and Watts, 1990, p. 231) was a factor that strongly influenced decisions to plant landrace or hybrid maize (see also Moseley, 2000).

Household labour availability was also undermined by the high rates of seasonal out-migration. The complexities and gender dynamics of household migration were such that labour mobilization, coordination, and control could not be feasibly planned. Farmers emphasized that seasonal migrants usually schedule their return around the annual rainfall pattern, an event which in itself was highly unpredictable (Figure 2.3). Furthermore, men migrants often resisted returning home, as they tried to do more casual labour in order to accumulate enough food and income remittances. Women typically tried various means to coax men to return, but were often unsuccessful. These negotiations often prevented hybrid seeds from being planted, compelling households to instead plant landrace maize, which as described by one female farmer, 'is sturdy and can withstand delays in weeding without a major lost in yield.' Another interviewed woman who has a migrant husband and children, made a similar observation. She said:

> 'much labour is needed to cultivate hybrid maize as compared to landrace. If I'm sure I can get more labour early in the farming season, I plant hybrids. If not, I plant traditional maize, which can suffer delays in weeding. In the past, we've lost about 70 per cent of our hybrid maize as a result of delays in weeding and fertilizer application.'

Another recurrent theme was women and junior men's resistance to labour-intensive work routines. Agricultural intensification, using hybrid seeds, was a characteristically coercive process. It often increased the domestic labour demands of certain household members. This configuration is what Carney and Watts (1991, p. 652) have described as 'getting people to work harder, a process that is social and gendered (getting *some* people to work harder than others).' In a culture intimately structured by patriarchal gender relations, we found in particular that hybrids' strict weeding schedules fell upon the shoulders of women, whose domestic work was already overburdened with cleaning, washing, tending the kitchen garden and fetching firewood and water. 'Our husbands will have nothing to do with weeding the maize plots!' remarked one woman who was very eager to share her story in a focus group meeting. Another woman complained by saying: 'we do most of the weeding while our husbands go drinking. In the evening, the woman has to cook and in the night the woman has to satisfy the man.' Indeed, what was noticeable during field observations was that, in the majority of cases (28 out of 30 households), women and junior men were the locus of crop production after the farm plot had been prepared. Among women, however, juniors, for example, second and third wives, were required to work harder than their senior co-wives.

In some households, these unequal and 'back-breaking work routines', as described by one second wife, have animated struggles over gendered and generational divisions of labour. As a way of signaling dissatisfaction with strict weeding schedules, some women and junior men adopt quite subtle and indirect strategies. For example, a village headman lamented about the issue of women and young boys '…not weeding carefully, and deliberately destroying sprouting seedlings.' In another telling account, a 56-year male farmer said: 'the over-reliance on agric [hybrid] maize can cause trouble in the household. Women and other household members can withdraw their labour, leading to insufficient food production.' When asked what he meant by labour withdrawal, he replied by saying

'the women and boys will intentionally delay their return from Techiman [southern Ghana] if they know there will be a lot of hard weeding schedules in the season.' One woman respondent, who was a third wife, explained why women often resist efforts to intensify their labour. She said it 'reduces the hours [they] are able to devote to [their] own vegetable plots, or collect fuel wood for sale.' Eighteen farmers who exclusively planted maize landrace said they do so in order to avoid 'verbal disagreements', 'hatred' and 'women quarrels' that are always engendered by the division of farm labour.

2.6.2 The Ecology of Seed Production

Our interview findings showed that compared to hybrids, many farmers preferred landrace maize because of the greater ease to intercrop with groundnuts, cowpea, beans and bambara nuts. All our interviewees argued strongly that landraces' agronomic practices were fundamentally different from that of hybrids. The traditional maize landrace agronomy involves planting two or three seeds per stand, at regular spacing of about 80 by 40 cm. However, farmers observed that instead of this regular spacing, short-season hybrid maize come with a recommended planting density of 25 by 25 cm row spacing. Interviews and field observations revealed that the higher planting density ensured rapid canopy closure and sunlight interception. Deviations from this recommendation often resulted in considerably lower yields. A majority of farmers however lamented that the higher planting density discouraged intercropping with leguminous crops. Farmers explained that intercropping is only possible when the plant population is lower in order to reduce competition for limited soil moisture at the onset of the rainy season.

One farmer, with over 30 years of farming experience, revealed that 'you have to plant the hybrid maize closer together, which means you can't add beans, groundnut and millet.' Similarly, another farmer stated that 'if you plant agric [hybrid] seed, it is hard to add sorghum, groundnuts and beans.' When asked why he was interested in integrating sorghum, groundnuts and beans into his farming

system, the farmer explained that '…you need to plant those crops if you can't buy fertilizer or get farm labour.' Whilst the farmer did not explicitly employ the language of 'agroecology,' the connection he made reflects leguminous crops' ability to suppress weeds, increase soil porosity, reduce crop pests, and build soil nutrient through nitrogen fixation (Altieri, 2009; Snapp et al., 2010). Indeed, many farmers (33 out of 54) expressed similar reasons for why they intercropped maize with legumes.

Twenty-eight farmers said intercropping legumes with maize (either landrace or hybrids) and adding manure provided greater productivity increases than inorganic fertilizers. Studies in other parts of sub-Saharan Africa have found similar impacts from legume intercrops on maize productivity (Snapp et al., 2010). A male farmer, who planted both hybrid and landrace on different plots, was an excellent source of information regarding yield differences between fertilized-maize and maize-legume intercrops. He attempted to compare yields from his two separate maize plots. He explained that he harvested 'five baskets [approximately 150 kg of threshed maize] from the maize-cowpea field, but 3 baskets [approximately 90 kg] from the fertilized-maize field. I plant the local maize here [pointing to a piece of land on his plot] because I don't want to mix it with the hybrid maize, so it keeps pure.' In seven of the eight focus group discussions, participants unanimously agreed that apart from building soil nutrients, intercropping had at least two other benefits. Firstly, farmers said intercropping maize with early millet ensured a quick harvest after the long dry season. These early harvests enable farmers to defray debts and restock depleted granaries. Secondly, farmers argued that intercropping maize with legumes or other cereals insured against production in the face of a variable climate. As one farmer noted 'in case you lose your maize to drought, there is no food to fall back on if you are planting only hybrid maize with no ability to intercrop.'

Field observations and interviews further revealed that landrace varieties were preferred locally because of their yield stability in drought-prone northern Ghana. The most common phrase farmers used to express this view was landrace's 'ability to produce something even in a poor rainfall year.' At the time of this study,

hybrid maize seeds were being advertised as short maturing (60 to 90 days) and drought resistant. However, farmers argued that droughts come at different times in a crop's life cycle, thus, a short-maturing period of 60 to 90 days did not necessarily imply that hybrids were drought resistant. One male farmer said his long-term farming experience showed that hybrids were unsuited to the agro-climatic conditions in the Upper West Region. He stressed that 'whilst landrace varieties are able to endure droughts and produce cobs under extreme droughts, agric [hybrid] seeds can die or fail to yield if droughts come earlier than anticipated.' Another interviewed middle-age woman expressed similar frustrations with hybrid maize. She said '…in 2008, we lost our entire hybrid maize to late season droughts.' An agro-input dealer, who was engaged in the sale of hybrid seeds, was asked about his views on some of these farmer concerns. His response was that 'it's a different type of farming and it needs a lot of convincing!'

2.6.3 The Cost of Seeds and Fertilizers

Farmers explained that whereas hybrid seeds must be purchased every season to maintain high yields, local seeds were readily available at no cost. Local farmers relied heavily on informal systems of farmer-to-farmer seed exchanges within and across villages, as well as farmers' own production and careful selection from harvests. In an interview with one village elder, with over 50 years of farming experience, he stressed that informal seed systems have ensured 'access to highly adaptable seed varieties.' During field interactions with farmers, we found women to be at the forefront of seed exchanges. The head of an informal seed exchange group shared this perspective: '…even in exchanging seeds with our friends in other villages, we collect those seeds that will survive in our village environment. We don't exchange any seed. My daughter brought a local maize seed from Wenchi [southern Ghana], but it didn't do well here.'

Furthermore, according to farmers, local maize varieties are less beset by the pest and diseases that affect hybrids. In 14 out of the 30 farms that were visited,

farmers noted that although *striga* in landrace can be controlled by using ash and onion residues, the same method could not be used to control *striga* in hybrids. Farmers complained that they needed to purchase agro-chemicals, which were too costly for extensive and timely use. In fact, the cost of seeds was one of the greatest worries facing farmers. Several farmers complained about the ever-increasing nature of seed and fertilizer prices, and the inability to procure credits from financial institutions. In a joint interview with two co-wives, one said 'hybrids produce more yield than landrace'; but the other quickly interjected by saying 'yes, but hybrids also require more fertilizer to produce more cobs.' When asked about farmers' ability to procure loans from financial institutions, farmers often responded by saying 'forget, small farmer, you won't get it.' Nine farmers complained that they had run into debts by borrowing money from friends to purchase seeds, fertilizers and pesticides. A widow with three children narrated the following concern: 'I borrowed money from my neighbours to buy the agric [hybrid] seeds. They all died, so I couldn't pay back.'

2.7 Conclusion

In this article, we have examined the historical and current pathways to agricultural development in northern Ghana. Historically, the path to agricultural development has been narrowly focused upon deploying technology to increase per capita food production. Yet, this approach has not produced solutions to benefit smallholder farmers, as food insecurity is still an enduring problem in northern Ghana (Biederlack and Rivers, 2009; Hjelm and Dasori, 2012). Using a political ecology framework, we have examined whether and to what extent farmers are adopting high-input agricultural technologies. In both case study villages, the data suggest that there is low adoption of high-input seed technologies, a finding consistent with studies in different parts of northern Ghana (Amanor, 2011) and elsewhere in sub-Saharan Africa (Lunduka et al., 2012). The analyses further reveal how technology adoption decisions are tightly linked to the coupling of processes operating at a variety of scales. These processes include micro-level gender politics, a semi-arid climate with

unreliable rainfall, and larger-scale political-economic structures. These political-ecological configurations have produced a context whereby "technological fixes" entrench structural problems facing smallholders.

The analyses suggest that high-input technologies tend to undermine farmers' agency in solving everyday agricultural problems. An example includes intercropping strategies that improve soil nutrients, reduce crop pest, and ensure crop diversity. Moreover, while hybrid seeds and fertilizer inputs might increase farm productivity, the capital investments are unaffordable in Ghanaian markets already affected by global market restructuring, and domestic market liberalization (Konadu-Agyemang, 2000). At the same time, smallholder access to credit has been firmly curtailed by the lingering impacts of structural adjustment programs. Thus, expensive technologies are being promoted in a system where the local political economy offers little support for the small farmer. The lack of farmer support for the uptake of these technologies raises questions, as Scoones and Thompson (2011) point out, about who benefits, who loses and whose interests are being served with high-input agriculture.

In addition to capital requirements and environmental concerns, our empirical findings point to how gender politics and intra-household labour relations shape maize variety choices. Hybrid seeds impose a radically different labor requirement on households, demanding a firm labour commitment for timely weeding and fertilizer application. Given the customary division of labour by task, age and gender, female labour power, together with that of junior men, is increasingly used to meet labour requirements. Women and junior men often struggle over labour and resent these intensified work regimes, thereby discouraging increased adoption of hybrid seeds. Farmers contended that the struggles over labour have implications not only for conjugal relations, but create tenuous spaces for labour mobilization in subsequent agricultural seasons. While many agricultural intensification initiatives claim to be labour-saving for the benefit of women in particular, our findings provide contrary evidence, adding depth to other political ecology studies which show how high-input

agricultural methods often marginalize women and other disadvantaged groups (e.g., Carney, 2008).

Currently, the socio-ecological problems facing farmers and their sheer complexities mean that productivity cannot be maximized simply by higher use of technologies. In northern Ghana, many farmers face constraints not directly related to crop yields *per se*, but severe inequalities in resource access, including land grabbing and unfair trading systems (Laube et al., 2012; Tsikata and Yaro, 2013). Women in particular have difficulties in acquiring land, securing tenure, and participating in household decision-making (Tsikata and Yaro, 2013). In this sense, a technology-driven approach, and its narrow focus on productivity, may be a flawed strategy to improve food security. Our argument is not to undervalue the need for technological investments in agriculture. In the face of severe climatic variability in the region (Laube et al., 2012), it is clear that farmers require additional strategies to build soil health and improve long-term food security. Yet, agricultural intensification does not provide answers to these problems. Rather, there is the need for a multifunctional agricultural approach that values farmer knowledge, considers ecological context, and is sensitive to social inequalities, including class and gender-based access to resources. Unless these multifaceted issues are carefully considered, promoting input-intensive agriculture will achieve little. A major characteristic of agriculture in northern Ghana is that many soils are poor to start with (Adjei-Agyapong and Asiamah, 2002). Thus, the leaching forces of synthetic fertilizers and other agro-chemicals could have effects on the long-term sustainability of agriculture in the region. Instead of accelerating the use of input-intensive agriculture, policy attention could focus more on supporting diversified farming practices, encouraging on-farm biological diversity, and less use of costly external inputs. Together, such an approach offers greater potential to improve food security and leads to more sustainable and resilient farming systems (McIntyre et al., 2009; Pretty et al., 2006; Snapp et al. 2010).

While our findings are specific to northern Ghana, the broader argument speaks to ongoing debates about the need for an African Green Revolution (Jarosz, 2012; Moseley, 2012). Over the past couple of years, biotechnology, hybrid seeds, synthetic fertilizers and increased links to global markets are being promoted as the best and only strategy to address food production deficits in Africa. This exclusive focus on productivity and global markets ignores historical experiences that were associated with the Asian Green Revolution, including catastrophic depletion of soils, greater inequalities in incomes, and dramatic decreases in crop diversity (Weis, 2007). This model of agriculture is also insensitive to social differentiation, especially gendered constraints that shape agricultural decisions. As several case studies have shown (e.g., Carney, 2008), gender and class-based relations are crucial factors influencing who can adopt and benefit from agricultural intensification. In the light of the findings presented in this article, together with that of many others (e.g., Snapp et al., 2010), it is important to rethink the New African Green Revolution, especially its implications for the long-term sustainability of farming in the region.

Finally, our findings and research approach have relevance for human geographical studies in political ecology. Critical research in this field has explored why neoliberal development interventions often fail to address livelihood needs in specific places, and especially at the local scale (Zimmerer and Bassett, 2003). This article contributes to these studies by demonstrating how micro politics and social relations contribute to the failures of generic development policies. As the empirical findings illustrate, it is not only agriculture that is being transformed by high-input technologies. So too, are the intra-household relations of resource access and control. The empirical findings also illustrate the subtle ways in which women and junior men contest and renegotiate the authority of household patriarchs. While these everyday politics and resistance fall short of a broad-based social movement, they can nevertheless be effective in constituting change. Geographers have made numerous calls for political ecology to "extend the definition of politics from the electoral politics of the state and class to one that includes the political arenas of the

household" (Watts and Peet, 2004, p. 33). This paper makes a contribution in this regard. It provides evidence on how state policies conjoin with micro-level gender politics to shape day-to-day agricultural decisions.

Attention now turns to a further exploration of gender and household politics using a feminist political ecology perspective.. The chapter further reveals the connections between human agency and environmental change in semi-arid northern Ghana.

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CHAPTER 3

A FEMINIST POLITICAL ECOLOGY OF CLIMATE CHANGE RESILIENCE IN SEMI-ARID NORTHERN GHANA

Hanson Nyantakyi-Frimpong[a,*] and Rachel Bezner Kerr[b]

[a] Department of Geography,
The University of Western Ontario
London ON, N6A 5C2, Canada

[b] Department of Development Sociology
Cornell University
Ithaca NY, 14853, United States

[*] Corresponding author. Email: hnyantak@uwo.ca

Under Review: *Global Environmental Change*

Abstract

This paper argues that the enduring problem with food provisioning in northern Ghana is not just a product of climate change or drought, as has been conventionally framed, but is inextricably linked to historical processes and social inequalities. Although there are considerable dry spells and rainfall variability in the region, these events are not of acute concern among some farmers. Instead, farmers are more concerned about inequitable access to and control over resources. The paper especially reveals that the impact of climate change is differentially experienced, and rural women, given their marginal location in patriarchies, bear the most brunt. Moreover, contrary to what is often portrayed in the literature, the findings suggest that traditional farming methods are not static, technologically primitive and unproductive. Indeed, many farmers are resorting to locally-developed, agroecological practices to limit the impacts of climate change. The aim is not to romanticize these local innovations, but to suggest how a better understanding of local resilience could contribute to sustainable food production in an era of climatic change. Ultimately, the paper contributes to the broader literature by demonstrating the need to bring into the resilience debate issues of inequality, power relations and gender politics. Further, it shows how the lens of feminist political ecology could be powerfully deployed to analyze these social relations in the context of resilience.

Keywords: Resilience, Climate Change, Food Security, Local Knowledge, Feminist Political Ecology, Ghana

3.1 Introduction

Global climate change is recognized as one of the greatest threats to smallholder farming in sub-Saharan Africa. Recent assessments by international climate scientists reveal that in Africa, seasonal mean temperature has significantly increased, while precipitation has also reduced over the last fifty years (Abdrabo et al., 2014). These changes are projected to intensify in the coming decades, with significant consequences for agriculture and food security (Jalloh et al., 2013; Roudier et al., 2011). Under climate change, it has been predicted that many areas in sub-Saharan Africa will experience decreases in crop yields, truncated growing seasons, and in the West African Sahel in particularly, "livestock keeping is projected to replace crop cultivation by 2050" (Abdrabo et al., 2014, p.19). There is also evidence that the adverse impacts of climate change will fall disproportionately on poor farmers engaged in small-scale, rain-fed agriculture (Roudier et al., 2011).

Given these predicted and on-going changes, there is a need to strengthen adaptation (i.e. preparing for and adjusting to future climate), and build more resilient farming systems (i.e. farming systems that can withstand or recover from the impacts of climate change) (Nelson, 2011). In order to strengthen socio-ecological resilience to climate change, one possibility is to foster agroecological practices that build upon local environmental knowledge, especially innovations that land users are already trying and testing (Boillat and Berkes, 2013; Mortimore, 2010). It is also important to understand whether there is a threshold beyond which climate change becomes more or less important, especially from the perspective of those who are deemed vulnerable (Tschakert, 2007). Similarly, it is instructive to understand the interactions between climate change and other economic, political and social factors operating at multiple spatiotemporal scales. Indeed, there is a broader recognition in the existing literature that compared to climate change, other stressors figure as more prominent issues for farmers and local communities (Adger et al., 2013; Leichenko and O'Brien, 2008; Eakin, 2006; Ribot, 2010; Silva et al., 2010; Tschakert,

2007). In this article, we build upon insights from these studies to address two core objectives.

The first objective is to investigate farmers' perceptions of climate change, and whether there are factors at the household, community, or national level that farmers consider to be critical in enhancing resilience to perceived climatic changes. We are especially interested in understanding how these perceptions vary by gender, age differences, kinship relations, and other axes of social differentiation. A second objective is to examine how local knowledge about climate change shapes agricultural practices and on-farm innovations, and how these practices could be made increasingly resilient to projected climatic changes. In general, the analysis is guided by three specific research questions: (1) What factors do farmers identify as most relevant for climate change resilience? (2) How important is climate change as compared to other factors that shape smallholder farming and food security? (3) How do local knowledge and perceptions of climate change shape on-farm agricultural practices? We investigate these questions with a novel application of a feminist political ecology framework (Elmhirst, 2011; Rocheleau, 2010), integrated with theories of vulnerability and resilience (Adger, 2006; Brown, 2014; Folke, 2006; Nelson, 2011) as well as indigenous environmental knowledge (Boillat and Berkes, 2013).

We argue that in order to understand socio-ecological resilience to climate change, explicit consideration should be given to deeply entrenched gender inequalities and how these interact further with ecological changes and social relations of production. We present case studies demonstrating that although climate change is manifesting itself in recurring droughts and floods, these events are not of acute concern among some farmers. Instead, farmers are more worried about inequitable access to and control over food and agricultural resources. Compared to climate change, we find that intra-household property rights, liberalized markets, and land tenure regimes are seen as more critical challenges for farmers. The article does not intend to downplay the threats posed by the ongoing impacts of climate change

in Sahel-savannah West Africa (Abdrabo et al., 2014; Jalloh et al., 2013). Rather, the paper brings to the fore cultural, gendered and political economic dynamics that loom equally large and intersect with climate change to shape food security and smallholder farming.

A second strand of our argument concerns local knowledge and climate change adaptation. Contrary to what is often portrayed in the literature, we argue that African traditional agriculture is not static, technologically primitive and unproductive. Indeed, many farmers are resorting to agroecological and climate-resilient farming practices to limit the impacts of climate change. Our aim is hardly to romanticize these local innovations; indeed, we are well aware of the dangers of idealizing indigenous knowledge (Briggs, 2005). We instead wish to suggest how a better understanding of farmer-driven experimentation, local knowledge and resilience could contribute to sustainable food production in rural Africa. Evidence to illustrate these arguments comes from eight months of village-level ethnographic research in semi-arid northern Ghana.

The paper is organized as follows. In order to set the context for understanding how significant climate change is perceived to be, as well as farmers' resilience to these changes, we first discuss the political economy of agriculture and food security in northern Ghana. We then present our theoretical approach and give a description of the research villages. Next, we describe our methodology before presenting the research findings, which are organized into three key parts. The first part is a comparison of the long-term meteorological data and farmers' perceptions and ideas about climate change. The second part reveals how different gender- and generational-based groups evaluate their resilience (operationalized as well-being) in relation to climate change, agriculture and food security. Finally, we demonstrate the dynamic and innovative quality of indigenous agricultural practices, including soil and water conservation techniques, and the complex calibration of crop sequencing. We assess the limits and logic behind these practices, especially how each is selected on the basis of seasonal material needs, household composition, and labour availability.

We conclude with a discussion that links our findings to the broader literature, and shows the implications for climate change resilience, adaptation and mitigation efforts.

3.2 The Research Context

Semi-arid northern Ghana remains a great paradox on virtually every front. At least 80 percent of the population is engaged in agriculture; yet, one in every five persons is food insecure, while one in every nine children dies of malnutrition before age five (Biederlack and Rivers, 2009, p. 14). Particularly striking is the fact that subsistence-oriented food crop farmers are those who suffer from chronic malnutrition and food insecurity (Biederlack and Rivers, 2009; Devereux, 2009). The region is also mired in abject poverty. The Ghana Statistical Service estimates that nearly 88 percent of the population subsist on less than one dollar a day, compared to barely 20 percent in southern Ghana (Ghana Statistical Service, 2000, p. 13). A longitudinal study by anthropologist Ann Whitehead clearly revealed the persistence of poverty in the region. Among households in the north-east, the study showed that "(62 per cent) were in the same poverty category in 1989 as they had been in 1975"; while another 13 per cent were much poorer over that same period (Whitehead, 2006, p. 288).

Three major reasons have been proffered in the literature to explain these paradoxes. These reasons include recurring droughts and climate variability, British colonial rule, and neoliberal development policies (Songsore, 2003; Yaro, 2013). As will be shown in subsequent sections of the paper, northern Ghana falls within the southern fringe of the Sahel . It therefore experiences severe droughts and climatic variability, with important implications for agriculture and food security.

A key part of Ghana's colonial political economy was that the colonial administrators established a system of migratory labour from the northern to southern parts of the Gold Coast (Songsore, 2003). In order to intensify the exploitation of natural resources, colonial officials treated northern Ghana as a labour reserve, where active men were recruited to work in mines and cocoa

plantations in the southern parts of the country. The construction of road and railway infrastructure also relied on labour from northern Ghana. A number of mechanisms were used to enforce this labour recruitment from the north. Among the most notable mechanisms included recruitment by force and coercion, and asking local chiefs to supply a given number of young men in exchange for money (Abdul-Korah, 2004). This labour recruitment deprived the northern territories of its labour power and affected the level of food production and hunger. The historical pattern of north-south migration has persisted to the contemporary period, and continues to intensify under different political and economic contexts (Songsore, 2003; Yaro, 2013).

Around the late 1970s, the Ghanaian economy slipped into a debt crisis. The crisis was precipitated by a combination of factors, not the least of which included the oil price hikes in the early 1970s, concurrent worsening terms of trade, balance of payment problems, severe droughts, and food shortages (Hutchful, 2002; Pearce, 1992). The government responded to the crisis by negotiating for an economic recovery loan of over $1.4 billion from the World Bank and International Monetary Fund (Pearce, 1992, p. 15). The loan came with several conditionalities, which were the standard features of structural adjustment programs (SAP) in sub-Saharan Africa. More than any other sector in the Ghanaian economy, agriculture saw the most intensive restructuring (Hutchful, 2002). Noteworthy among structural changes included the removal of subsidies for fertilizers, seeds and insecticides. The government further retrenched agricultural extension services and dismantled marketing boards that serviced smallholder input requirements (Hutchful, 2002; Pearce, 1992). Other policy measures included increasing support for large landholders, and the abandoning of smallholder development. The government further lifted all restrictions on foreign direct investments and privileged food security policies that are based on international commerce (Hutchful, 2002).

These reforms unleashed profound social and economic transformations in the Ghanaian countryside, marking a great watershed in the viability of smallholder farming (Pearce, 1992). The majority of small farmers were squeezed out of

agriculture as their purchasing power became dramatically eroded. Additionally, input and output markets became volatile, constricted and competitive. Local produce such as rice, maize, meat and poultry faced stiff competition from highly subsidized and cheap imports from Europe, Asia and North America (Hutchful, 2002). The effects of structural adjustment programs were geographically uneven across the country. Northern Ghana experienced the most severe impacts because of general underdevelopment and limited opportunities for non-farm incomes (Konadu-Agyemang, 2000; Songsore, 2003). Thus, structural adjustment intensified the already uneven regional development in Ghana. With persistent poverty and reduced agricultural productive capacity (Whitehead, 2006), a large number of small farmers were driven to cities where they worked as day labourers for minimal wages (Abdul-Korah, 2011).

Today, the political economic patterns initiated during colonial rule, together with the impacts of structural adjustment programs, are still lingering in northern Ghana (Yaro, 2013). Food importation continues to undercut domestic production in many ways (Laube et al., 2012). Contemporary agricultural policies emphasize intensification of the food sector, often to the benefit of large-scale farmers. The post-millennium period has seen more radical changes in the northern regional political economy. As part of opening up the country to foreign investments, many transnational corporations have been granted long-term leases for biofuel and mining projects in semi-arid northern Ghana (Tsikata and Yaro, 2013). Corporate farmland acquisitions have meant the curtailment of access to land by smallholder farmers. Consequently, many farmers have lost their livelihoods (Tsikata and Yaro, 2013), further spurring migration from villages. It is within this context that we examine farmers' perceptions of and resilience to the ongoing impacts of climate change.

3.3 Theoretical Approach

Academic and applied research on global environmental change increasingly draws upon theories of social vulnerability and resilience (Adger, 2006; Brown, 2014; Lei et

al., 2014; Nelson, 2011; Ribot, 2010). Resilience is a contested concept with many definitions (Brown, 2014). The fields of ecology and complex systems analysis have had the most significant influence in the application of resilience in climate change research. Within these fields, resilience is broadly understood as the capacity of a system to absorb disturbances without changing its structure and functions (Folke, 2006). Resilience also involves the ability of a social or natural system to self-organize, learn, innovate and develop under conditions of risk and uncertainty (Nelson, 2011).

The concept of vulnerability is defined as "an aggregate measure of human welfare that integrates environmental, social, economic and political exposure to a range of potential harmful perturbations" (Bohle et al., 1996, p. 37). The vulnerability of a system is conceptualized as a function of three elements: exposure, sensitivity and adaptive capacity (Adger, 2006). Exposure and sensitivity refer to the presence of and the extent to which a system (e.g., local group, resource) is affected by or responsive to a hazard or risk (Lei et al., 2014). Adaptive capacity is the attributes of a system that allow it to withstand or self-organize itself to endure present or future threats (Adger, 2006; Lei et al., 2014).

The vulnerability literature has been criticized on several counts (e.g. Adger, 2006, Bohle et al, 1996; Ribot, 2010). One of the major critiques is how this literature downplays the degree to which different social groups (e.g. class, gender, and age) experience hazardous events (Bohle et al., 1996); or how political-economic dynamics define the vulnerability outcomes of poor, marginalized, and underrepresented groups (Adger, 2006; Ribot, 2010). As Jesse Ribot properly notes, vulnerability "does not fall from the sky", and the differential impacts of events like droughts, storm surges, and climate changes are shaped by "place-based social and political-economic circumstances" (Ribot, 2010, p.49). In settings as diverse as Argentina, Bangladesh, Brazil and Kenya, the author shows that poorer people, women, and the landless are disproportionately vulnerable to the impacts of environmental change. Given these differentiated impacts, Ribot (2010) argues forcefully that any vulnerability analysis

should be attentive to social inequalities, political economic dynamics, and the historical trajectories of place (see also Adger, 2006; Bohle et al, 1996).

In part, these criticisms have called for the need to move beyond investigating climate change in isolation, and to simultaneously consider broader economic, political, historical, and cultural forces that shape sensitivity to climate impacts. A number of integrated frameworks have therefore emerged for the analysis of multiple stressors on systems resilience. One such framework is the concept of "double exposure" used to examine the impacts of climate change in the context of economic globalization (Leichenko and O'Brien, 2008). Various case studies have fruitfully applied this integrated framework to show how climate change conjoins with economic globalization to deepen the vulnerability of smallholder farmers (e.g. Silva et al., 2010). Within the "double exposure" framework, however, there is little recognition for key social relations that operate at the local scale, for example, property rights, class dynamics, and intra-household politics, which are all central to understanding the social context of environmental change. Indeed, a "double exposure" framework casts analysis at two broad scales – the dual impacts of *climate change* and *economic globalization* – thus, leaving household-level processes completely unrecognized and undertheorized.

In this paper, we build on insights from the "double exposure" framework and adopt a feminist political ecology approach to investigate social resilience and adaptation to climate change (Elmhirst, 2011; Rocheleau, 2010; Rocheleau et al., 1996). A feminist political ecology framework builds on critical scholarship in political ecology (e.g. Watts, 2013), which investigates how historical forces and political-economic dynamics influence relations between land users and their environments. Feminist political ecology "seeks to understand and interpret local experience in the context of global processes of environmental and economic change" (Rocheleau et al., 1996, p.4). Thus, this analytical approach can pay attention to climate change and globalization, whilst equally focusing on material practices within the local and household arenas.

Feminist political ecology is particularly useful in examining the ways in which resilience and adaptation are shaped by social power relations and environmental change. It allows for a more complex discussion of how gender roles and identities shape responses to environmental change, and how these responses are in turn shaped by broad-scale processes. As well, feminist political ecology casts the analysis of human-environment relations to include the local scale (e.g., household level), but also points to the limitations of analyzing the farm-household as an unpoliticized arena (Rocheleau, 2010). Another major strength of a feminist political ecology framework is its recognition of the exploitation but also the agency and innovation of marginalized women and men in resource-dependent communities (Rocheleau et al., 1996). In analyzing forms of access to and control over resources, a feminist political ecology framework does not only focus on gender as a social relation, but also pays explicit attention to other forms of social difference such as age, ethnicity, kinship relations and economic inequality (Elmhirst, 2011).

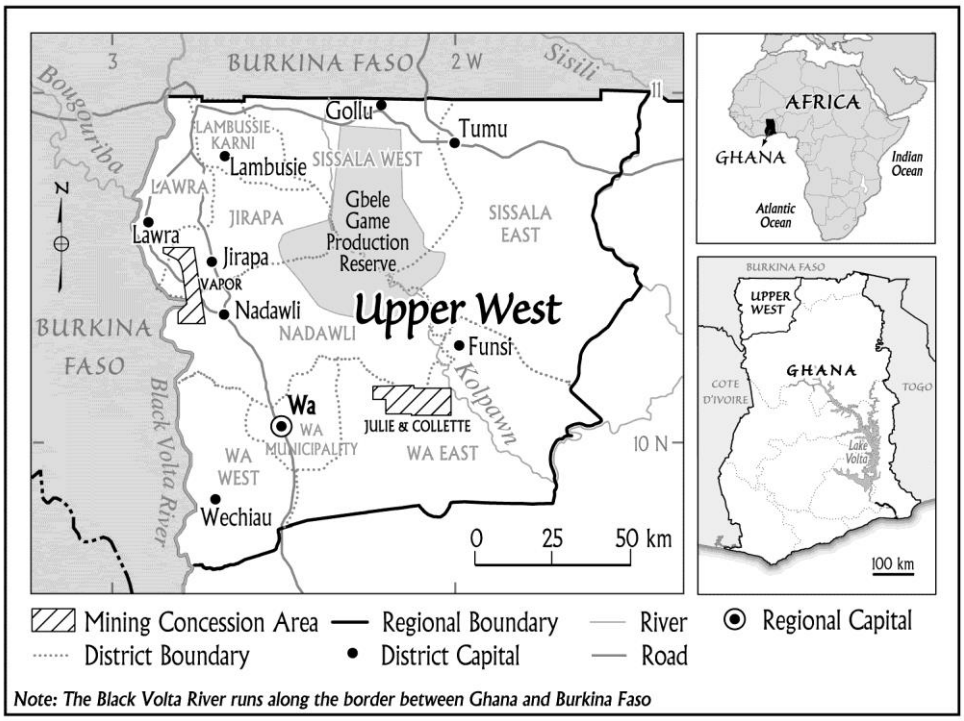
The literature on traditional ecological knowledge could be usefully combined with feminist political ecology to investigate adaptation and resilience to climate change. Traditional ecological knowledge refers to "a knowledge-practice belief complex, based on multigenerational transmission and cultural continuity, but also as a process open to change (Boillat and Berkes, 2013, p.1). In Sahelian West Africa and other resource-dependent regions, local farmers have observed and interpreted the environment for millennia (Mortimore, 2010; Watts, 2013). These observations have guided seasonal and inter-annual community practices. It is increasingly being recognized that this knowledge-base could serve as a useful starting point for resilience to climate variability and change (Boillat and Berkes, 2013). In this article, we focus on how farmers draw on their environmental knowledge to devise climate adaptation strategies, and how these strategies are shaped by broad-scale processes.

3.4 The Research Villages

This article draws upon a case study of Ghana's Upper-West Region (1˚25″ and 2˚45″ W; 9˚30″ and 11˚ N), an area of roughly 18,476 km^2. The region falls within the

savannah belt in the southern fringe of the Sahel and has a unimodal rainy season from late May to early September, and seven to eight months of dry season. We conducted fieldwork in two savannah villages called in the Upper West Region (Figure 3.1).

Figure 3.1 Map of the Upper West Region



Source: Map Prepared by Karen van Kerkole, Western University Cartographer.

Two major reasons influenced our selection of these villages. Firstly, we wanted to capture a range of ecological, historical, cultural and social characteristics salient in the debate about environmental change and agriculture in the West African savannahs (Bassett and Crummey, 2003; Watts, 2013). Secondly, there were local contacts who were willing to assist us to integrate into the culture for intensive ethnographic fieldwork. Both villages are approximately 47 km apart. They share broad similarities such as the presence of significant migrant populations, a common ethnic make-up, and a similar set of ecological problems. However, they also differ in aspects such as size, access to land, infrastructural development, livelihood

diversification, subsistence orientation, and proximity to input and output markets (Table 3.1). These micro-geographies were salienct in comparing whether and how local level opportunities and constraints shape climate change resilience.

In both villages, the main economic activities are rain-fed agriculture. Agricultural production is labour- and knowledge-intensive, integrating different forms of intercropping systems, with limited or no technological inputs. The most important food crops are maize, beans, groundnuts, pearl millet, sorghum, Bambara groundnut, soybean and different kinds of vegetables. Cereals account for about 70 percent of the total cultivated area. The major livestock holdings include cattle, sheep and goats, serving mainly as insurance against sudden income shortfalls, and for marriage transactions.

Table 3.1 Key Characteristics of the Study Villages

Study Village	***Village 'A'***	***Village 'B'***
District	Nadowli District	Lawra District
Elevation	262 metres	294 metres
Population (census 2000)	494	4,041
Total households	272	704
Households studied N (%)	N (57)	N (35)
Total houses/farmsteads	158	305
Distance to nearest town	21 km (Nadawli)	3 km (Lawra)
Road conditions	Rough and unpaved roads	Rough and unpaved roads
Ethnic composition	Dominated by Dagaabas (93%)	Dominated by Dagaabas (95%)
Electricity	Not available	Available
Market	Not available, 12 km to nearest market	Not available, 3 km to nearest market

Source: Compiled from Ghana Statistical Service, 2005a; Field notes, January to August, 2012.

3.5 Methodology

Our objectives in this paper required the need to understand divergent perspectives and put farmer experiences front and center. The analytical lens of feminist political ecology also required the need to work across scales and embed findings within a broader set of social relations. We therefore adopted intensive ethnography, which is one of the most effective ways to investigate these themes (St. Martin and

Pavlovskaya, 2009). From January to August 2012, the first author conducted village-level fieldwork by residing and working in the agricultural fields with farmers, engaging in daily farming practices such as field preparation, planting, weeding, and harvesting. This experience was critical for gaining first-hand familiarity with the dry and rainy seasons in the savannah. The continuous engagement with, and learning from, farmers was also crucial for developing an understanding of local knowledge, farming techniques and social relations of production.

Our data collection incorporated a sequential, multi-method triangulation technique (Creswell and Plano Clark, 2011). We began with oral historical interviews with village elders, and then continued with a survey of 404 households (Table 3.2). Walking along village footpaths and streets, we randomly surveyed every fifth household until we obtained the required sample size. The survey instrument was prepared through a review of the literature and pre-tested for content, context and clarity. The 404 households represented approximately 41 percent of all households across the two villages. The purpose of the survey was to gather background information, identify different household types, food security status, and general perceptions of climate change and resilience.

Following preliminary analysis of the survey data, we used qualitative techniques including in-depth interviews, focus groups and participant observations to help situate and provide depth to the quantitative findings (Creswell and Plano Clark, 2011). Our approach to qualitative data collection and analysis was an iterative process. As the data collection and analysis unfolded concurrently, we decided what kinds of additional data were needed and who to target as additional key informant (Patton, 2002; Miles and Huberman, 1994). We initially conducted in-depth interviews with 18 women and 14 men, and held 8 focus groups with a total of 75 participants. Following analyses of these data sets, we conducted further interviews with 16 women and 12 men, after which we reached theoretical saturation in types of responses (Patton, 2002). Six of the interview participants were key informants,

including 3 agricultural extension officers, 1 NGO worker, 1 nutritionist, and 1 health surveillance assistant.

Table 3.2 Descriptive Statistics of Surveyed Households

Variable	*Village 'A' n=155*	*Village 'B' n=249*	*Full Sample n=404*	*Other Studies (Upper West Region)*[1]
Mean age of household head (years)	58	53.6	55.8	55
Household head never attended school (%)	90.3	80	85.1	69.8
Mean household size	7.6	8	7.8	7.2
Male-headed households (%)	67.7	87.1	77.4	81.7
De facto female-headed households (%)	23	7.2	15.1	18.3
De jure female-headed households (%)	9.3	5.7	7.5	82.1
Households that are Dagaabas (%)	83.6	85.9	84.8	57.5
Mean landholding in hectares	0.6	2.4	1.5	2.7
Households severely food insecure (%)	45	34.5	39.8	34
Households with a migrant in last 2 years (%)	96.8	92.4	94.6	76.3

[1] Biederlack and Rivers, 2009, p. 13; Chamberlin, 2007, p. 7; Ghana Statistical Service, 2005b, p. 88-105; Van der Geest, 2002, p.153.

We used maximum variation sampling to select participants for in-depth interviews, oral history and focus group discussions (Patton, 2002). We do not intend this sample to be statistically representative. Rather, it allowed us identify and make theoretical points about common experiences cutting across divergent household types, food security status, genders, age groups, educational levels, and historical circumstances. Interviews varied in duration from 3 to 6 hours. They were conducted inside or near agricultural fields or homes, and in the language preferred by the participant: English, Twi or Dagaare. In order to moderate cross-gender and cross-cultural sensitivities, we hired a female social anthropologist, born and raised in the research area, to conduct interviews with women. Interviews were tape recorded with permission (45 participants); otherwise, we took detailed notes (15 participants).

In each village, we conducted separate focus group discussions with young men (*n*=10 in Village 'A'; *n*=9 in Village 'B'); young women (*n*=10 in Village 'A'; *n*=11 in Village 'B'), elderly men (*n*=8 in Village 'A'; *n*=10 in Village 'B'), and elderly women (*n*=9

in Village 'A'; *n*=8 in Village 'B'). Participants' ages ranged from 18 to 72 years. The female social anthropologist moderated focus groups with young and elderly women, whilst the first author moderated focus groups with young and elderly men. Building upon the approach by Tschakert (2007), we used participatory ranking and scoring to enable farmers conduct their own analysis of resilience to climate and other stressors. Like similar complex and intangible concepts, the question of *resilience* could not be asked directly because there is no word for this concept in the Dagaare or Twi languages. Instead, we asked focus group participants to identify what constituted *well-being* (locally translated as *eng-maarong* in Dagaare, and *yie diɛ* in Twi) in the context of smallholder agriculture and food security. We asked each group to, firstly, free-list major worries in their well-being; secondly, rank these worries in order of importance; and thirdly, use different sizes of stones to show the severity of these worries. We displayed the results diagrammatically on a flip chart sheet. We then asked participants to explain each factor and the rationale behind the rank order and severity. During follow-up interviews and participant observations, we asked more in-depth questions about issues raised in the ranking and scoring exercises. It is important to stress that we did not frame the work as a climate change project; neither did we use the term *climate change* before the focus group activities. We introduced it as a topic for discussion after the ranking and scoring activities.

We analyzed the survey data using descriptive statistics including two-sample test of proportions in SPSS Version 21.0. We organized and analyzed qualitative data as follows; to make data identification manageable, we used unique alphanumeric codes to label all interview transcripts and field notes. We then hand-coded all interview data and associated field notes for recurrent themes (Patton, 2002; Miles and Huberman, 1994). The participatory ranking and scoring data were analyzed separately, following a method by Tschakert (2007), to understand local notions of resilience. For each factor identified by participants, we calculated an incidence index [*I*] (number of participants identifying each factor); importance index [*P*] (rank order

of a factor); and severity index [*S*] (number of stones participants assigned to each factor) (see Tschakert, 2007, p. 386). The incidence index [*I*] ranged from 0 (not mentioned) to 1 (mentioned by all). The importance index [*P*] ranged from 0 (lowest rank) to 1 (highest rank). The severity index [*S*] ranged from 1 (least severe) to 10 (most severe). This analysis allowed for a graphic portrayal of the ranking and scoring responses, such that the most important and higher incidence factors could be plotted in the first quadrant of a graph. In order to guard against threats to qualitative validity and trustworthiness, themes from preliminary analyses were verified and validated by participants in two feedback workshops (Patton, 2002). In the results section, we have included some interview excerpts for clarity, representation and to give voice to participants' own perspectives.

3.6 Research Findings

3.6.1 Climate Change and Variability in Ghana's Upper-West Region

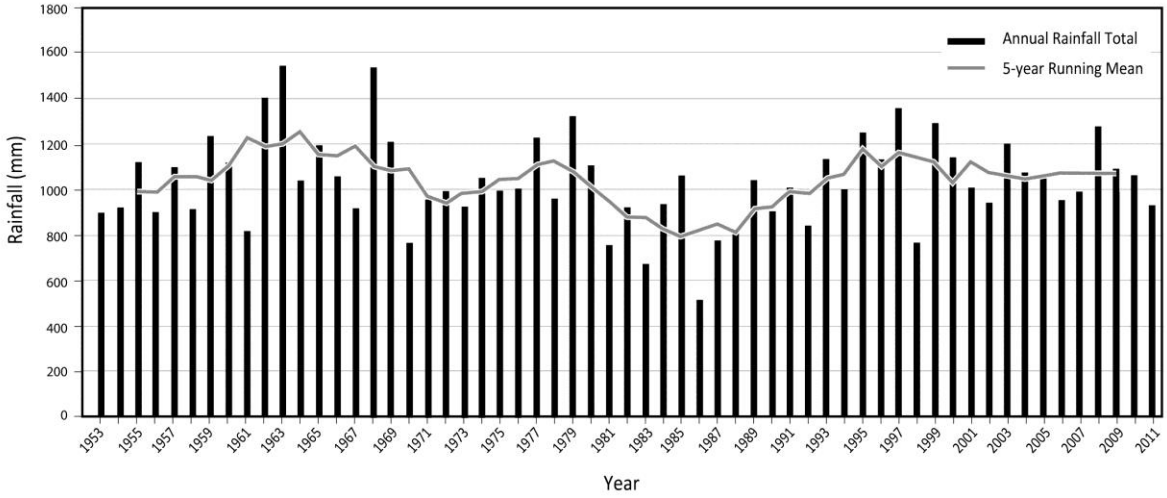
The purpose of this section is not to prove whether or not there is climate change in Ghana's Upper-West Region. For a more scientific assessment of climate change scenarios for Sahel-savannah West Africa, of which our study area is part, readers should see the recent report by the Intergovernmental Panel on Climate Change (e.g. Abdrabo et al., 2014). What this section rather seeks to do is to assess how farmers' climate change perceptions and ideas compare with the long-term meteorological data. It is important to understand farmers' perceptions of climatic impacts because such views shape and form a basis for adaptation strategies (Boillat and Berkes, 2013; Mortimore, 2010; Tschakert, 2007).

Ghana Meteorological Agency provided us with climate records for the Wa station, Upper-West Region. The data consisted of monthly rainfall totals from January 1953 to January 2012; and mean monthly temperature, wind speed, and evapotranspiration data from January 1982 to January 2012. This period of climate record was long enough to examine temporal variability. There were no wind speed data from March to December 1983; the entire of 1984 and 1985; and from January to

April 1986. Evapotranspiration data were also missing from March to December 1983; the whole of 1984, 1985, 1986 and 1987; and from August to December 2011. We plotted the data as time series to examine long-term trends and compared the results with farmers' perceptions. We fitted a five-year running mean on the rainfall data in order to smooth out short-term fluctuations and highlight long-term trends.

The analysis revealed that in the Upper-West Region, total annual rainfall is characterized by tremendous temporal variability, with sporadic surges, halts and retreats (Figure 3.2). The region experienced poor rainfall from 1981 to 1988, a particularly bad year in 1986 (523. 7mm), and a sudden upsurge from 1995 to 1997. Over the last decade, only two years (2003 and 2008) have recorded above average precipitation. The long-term (1953 to 2011) mean annual rainfall was 1,036 mm, with the highest rainfall (1,500 mm) recorded in 1963.

Figure 3.2 Rainfall Variability, Wa Station



Data Source: Ghana Meteorological Agency, February 23, 2012

Figure 3.3 Village-level Rainfall Data (Village 'B') [7]

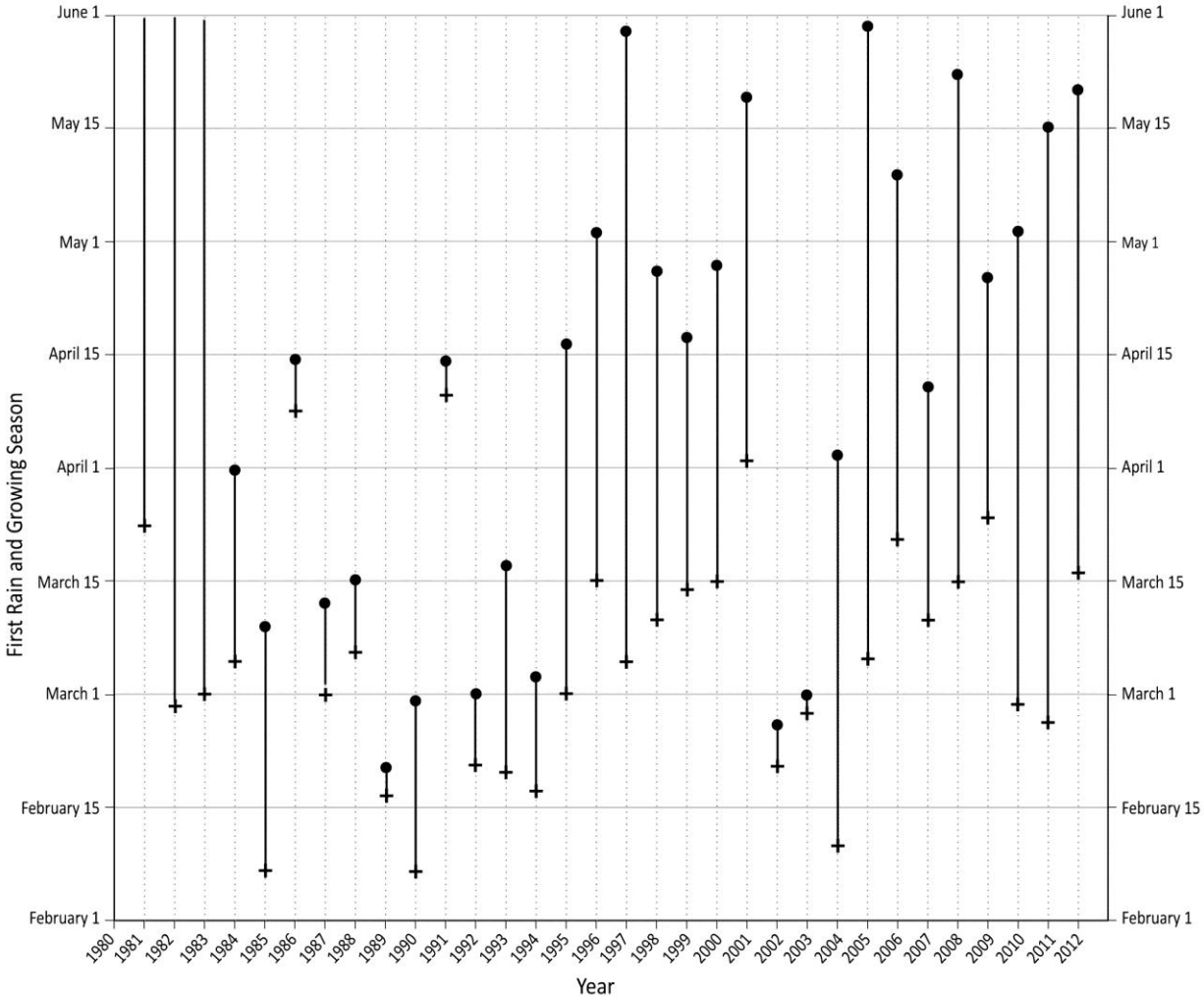


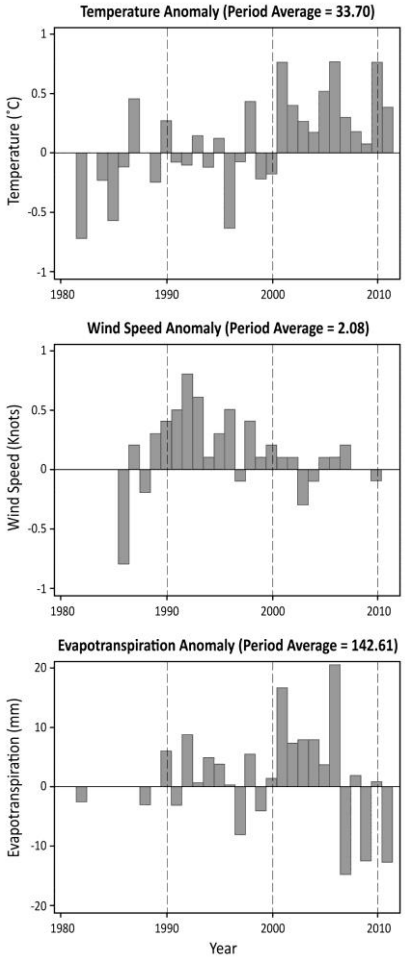
Figure 3.3 illustrates village-level rainfall data for one of the study communities. The graph shows the long-term trend in the arrival of the planting rains, the beginning of the growing season, and the length of dry spells from 1981 to

[7] This data was obtained from a retired agricultural extension officer and a smallholder farmer. The data should be interpreted and used with caution. It is possible that the rainfall records might not be accurate because the farmer takes measurements with an improvised rain gauge. A second limitation of the data is that the spatial coverage is highly limited. It comes from only one village, and does not reflect regional dynamics in the agricultural season within Ghana's Upper-West Region.

2012. A key finding from this data is that the planting rains have shifted markedly from an early start (mid-February to mid-March) around the 1980s and early 1990s; to a late start (mid-April and mid-May) over the last two decades. As explained by farmers, planting rains are defined as the accumulation of approximately 20-30 mm of rainfall, followed by a period of no more than 10 consecutive dry days in the subsequent four weeks. In the agro-climatic literature, this is referred to as the onset date of optimum growing period (OGP) (Laux et al., 2008). The OGP guarantees seed germination and survival after sowing. On the one hand, when sowing is carried out too early before the OGP, seeds are lost in the event of long dry spells. On the other hand, when sowing is carried out too late after the OGP, there is an abnormal growth of seeds because of stiff competition with weeds that set up after the first rains (Laux et al., 2008). From Figure 3.3, it is clear that within the study village, dry spells and the OGP occur with unexpected duration and timing. For example, the shortest dry spell was recorded in 2003 (3 days; from February 25th to March 1st); whilst the longest was recorded in 1982 and 1983 (more than 6 months – according to village elders, there was no rainfall in 1982 and 1983).

The long-term variability in the region's temperature, wind speed and evapotranspiration is illustrated in Figure 3.4. Mean monthly temperature for the period 1982 to 2012 was 33.7°C, but since 1999, temperature has consistently been higher and never fallen below the long-term average. Similarly, since 1988, wind speed has barely fallen below the long-term mean (2.08 knots). As a result of higher temperatures, evapotranspiration has consistently been above average (142.61 mm) since the early 2000s. However, since 2006, there has been a marked frequency and intensity of below average evapotranspiration records (Figure 3.4).

Figure 3.4 Temperature, Wind Speed and Evapotranspiration Anomalies, Wa Station



Data Source: Ghana Meteorological Agency, February 23, 2012

3.6.2 Are Smallholder Farmers Perceiving a Change in Climate?

When these meteorological records were compared with local farmer perceptions, the results were more or less consistent. All the respondents reiterated that the savannah is markedly seasonal and drought is a normal part of annual fluctuations . For instance, within the study sample, the oldest respondent (96 years) remarked that "it [climate] has been like this ever since!" A majority of farmers perceived that within the past two decades, there has been a decrease in total rainfall, an increase in temperature, and increased frequency of droughts, floods, stronger winds, and "false starts" (Table 3.3). However, farmers' perceptions of decreasing rainfall decrease were contradictory with the meteorological data, which shows a relative

increase in rainfall in the past two decades (Figure 3.2). This contradiction might be due to accuracy of recall, as many farmers typically do not keep climate records.

Moreover, many farmers felt that there is now significant irregularity in the onset and cessation of the planting rains, which used to start in February or March, but now oscillate between April and May (Table 3.3; Figure 3.3). According to farmers, these capricious shifts and the associated dry spells have tremendous implications for crop agronomy. Almost all farmers asserted that a dry spell in late May or early June could severely damage germinating seeds, especially hybrid varieties. Similarly, a dry spell in mid-July to early August could result in poor tasselling and pollination, thereby compromising grain yield. A dry spell in late August was however perceived to be advantageous because it could facilitate crop harvesting, drying and storage.

Table 3.3 Survey of Farmers' Perceptions of Climate Variability

Variables	*Village 'A' (%) n=155*	*Village 'B' (%) n=249*	*Test of Significance (z-scores)*
Noticed an increase in total rainfall events over the past 20 years	4	3	0.54
Noticed a decrease in total rainfall events over the past 20 years	72	92	-5.38*
Noticed a change in the start and end of first (planting) rains	89	96	-2.74*
Planting rains used to start in Feb/Mar, but now starts in Apr/May	90	98	-3.56*
Rains used to end in Oct/Nov, but now ends in Jul/Aug	92	96	-1.71
Rainy season has become shorter	74	92	-4.94*
Rainy season has become longer	3	5	-0.97
Dry spells and "false starts" are more freq. over the past 20 years	72	95	-6.51*
Noticed severe droughts over the past 20 years	83	94	-3.55*
Temperature has increased over the past 20 years	85	93	-2.60*
Temperature has decreased over the past 20 years	3	5	-0.97
Noticed severe floods over the past 20 years	96	20	-14.86*
Noticed stronger winds over the past 20 years	87	96	-3.35*

* Significant at $p = 0.05$

A female farmer, for instance, indicated that "these days, the rain stop very early, may be in the middle of the eighth month [August]. And the weather is already dry from the ninth month [September] till Christmas." Another elderly male farmer explained that "we now farm for 3 months than the usual 5 or 6 months in the olden days. Now, rainfall in the third month [March] and fourth month [April] has totally

disappeared." "That's very true," the man's wife concurred, whilst nodding slowly. Other studies in Burkina Faso, Mali and Niger have also identified farmers' concerns about the timing of the first rains, recurring dry spells and "false starts" (e.g. Mertz et al., 2011).

Our comparative analysis revealed statistically significant differences in the proportion of farmers who reported increasing climate variability in both villages. These differences could be explained by the dissimilar micro-geography of the two study sites. For example, 96 per cent of farmers in Village 'A' perceived that floods have become more pronounced in the village, whereas only 20 per cent of farmers reported increased episodes of floods in Village 'B' (Table 3.3). This significant variation (z=-14.86; p=0.05) is perhaps a reflection of Village 'A''s locational disadvantage relative to Village 'B'. Village 'A' is located adjacent to low-lying valleys of the Black Volta River (Figure 3.1) and hence has greater exposure to river overflows.

Furthermore, the analysis of interview data revealed that farmers had a remarkable, almost visceral, knowledge of droughts and climatic variability. Many elderly farmers mentioned, with greater specificity, years of noteworthy droughts and unsatisfactory crop performance (Table 3.4). For instance, more than half of the respondents vividly remembered an exceptionally long and devastating drought and poor rainfall from 1980 to 1983. This finding was consistent with the meteorological data (Figure 3.2), and corroborated findings from other studies in the Upper-West Region (Van der Geest, 2002). In one of the oral histories, for example, an eighty-year-old farmer recounted his household's experience in 1983, saying: "we lost all our 12 cows, 21 goats and 11 sheep. It was bad, really bad, but these problems persist." Moreover, about 80 per cent of the respondents recalled severe dry spells in May 2007, destroying early millet; and heavy rains in August and September that same year, further destroying late crops such as sorghum and groundnuts (Table 3.4). Some of the elderly respondents noted that the 2007 and 2008 farming seasons were

the worst they have seen in contemporary times, in terms of heavy rains and recurring droughts.

Table 3.4 Major Weather Events and Poor Agricultural Years

Year	*Major weather and agricultural-related events remembered*	*Percentage of Respondents (n=60)*	*Average Age of Respondents who Remembered these events*
1973	Drought	5	82 years
1974	Drought	5	
1976	Drought	5	
1977	Prolonged period of desiccation	5	
1978	Rains started very late, drought	5	
1979	Drought, extremely warm temperatures	5	
1980	Drought	56	58 years
1981	April, May, June and July were severely dry	64	
1982	Complete crop failure, strong winds, high temperatures	60	
1983	Widespread drought, no grain harvest, severe hunger	70	
1984	Severe drought, strong winds, poor rainfall, severe hunger	23	
1986	Rains started late,	23	
1990	Less rainfall	70	50 years
1991	Rains started very late	33	
1998	Less rainfall than normal	20	
2001	No rain until April. Rains stopped in August	52	46 years
2007	Dry spell in May affected early millet. Heavy rains in August/September resulted in floods destroying late sorghum and groundnuts, strong winds	80	
2008	Floods, more pests destroying crops	85	

Source: In-depth Interviews, Oral Histories, Field Notes.

3.6.3 Are Farmers Worried About Climate Change?

Although farmers have a remarkable knowledge of droughts and climatic variability, a more surprising finding from the study was that most of these farmers are not worried about these environmental changes. In the participatory ranking and scoring activities, farmers identified multiple factors constraining their well-being in the context of climate change. We conducted comparative analyses of the results to assess differences and commonalities between generational groups, genders and villages. The results are shown in the graphs in Figures 3.5 to 3.8. Each graph indicates the *incidence* (*I*), *importance* (*P*) and *severity* (*S*) indices of different factors

as mentioned and evaluated by men, women, the young, and elderly. The incidence index is plotted on the (*x*-axis), while the importance index is indicated on the (*y*-axis). The severity index is shown through the size of the bubble.

Figure 3.5 Participatory Ranking and Scoring: Results by Gender, Age and Village

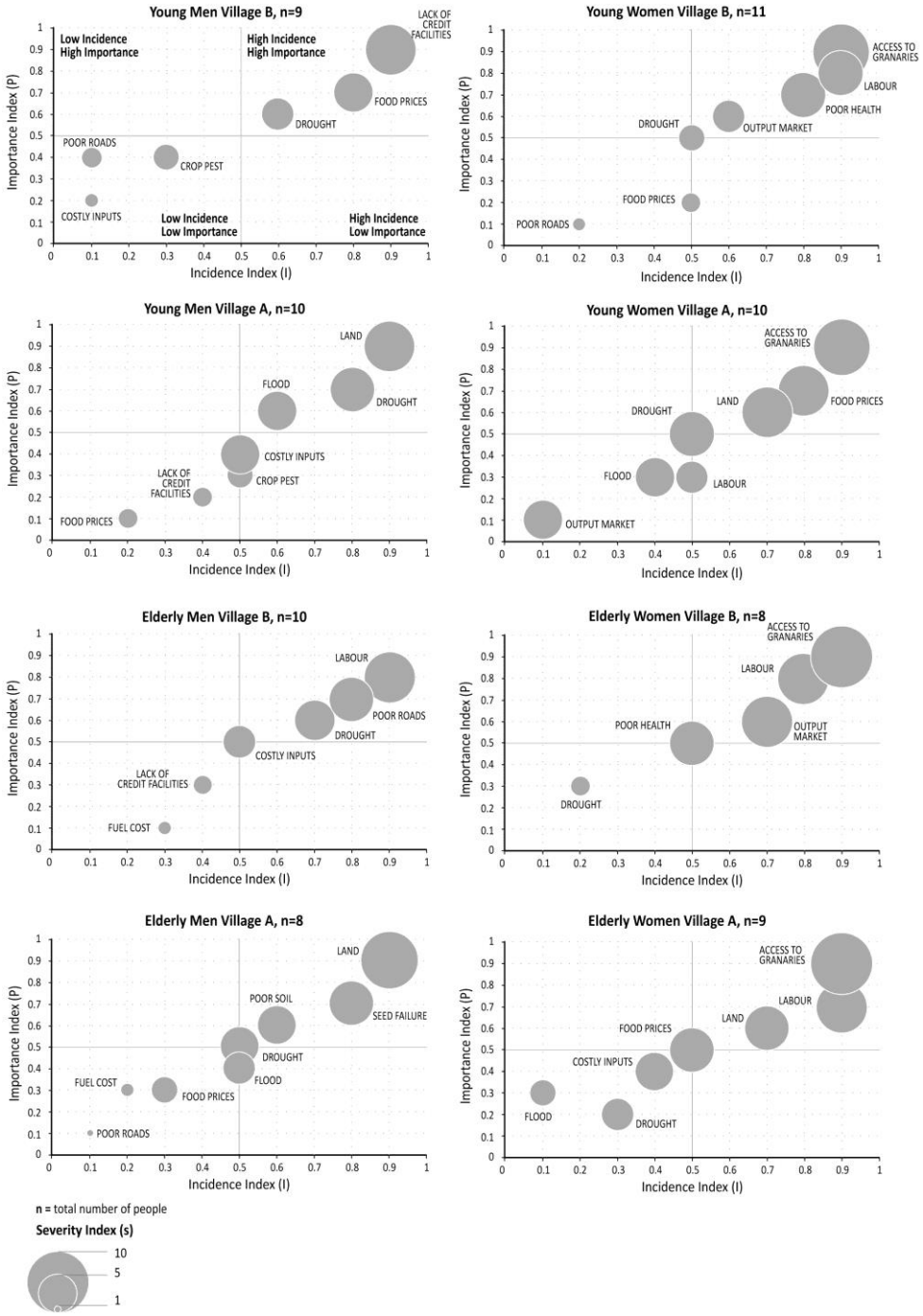


Figure 3.6 Participatory Ranking and Scoring: Results by Gender and Age

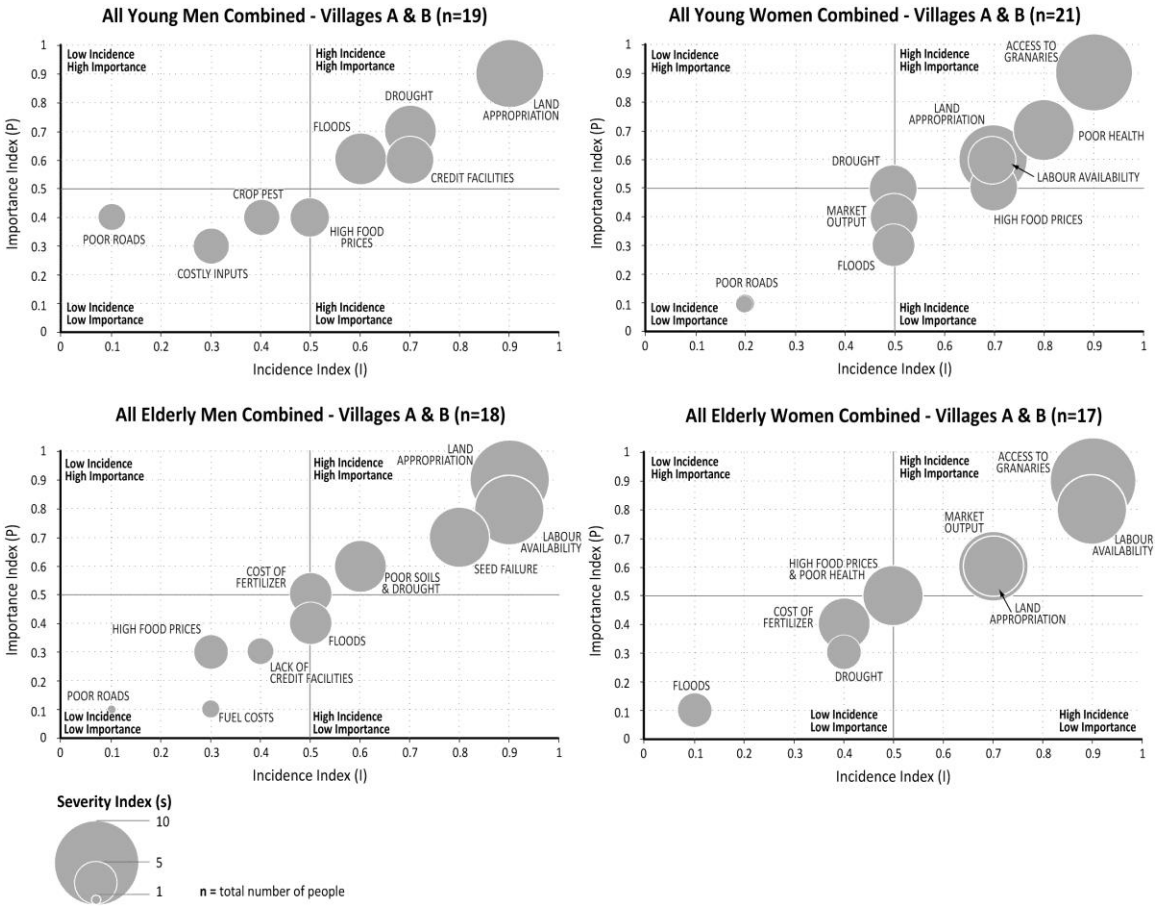


Figure 3.7 Participatory Ranking and Scoring: Results by Village

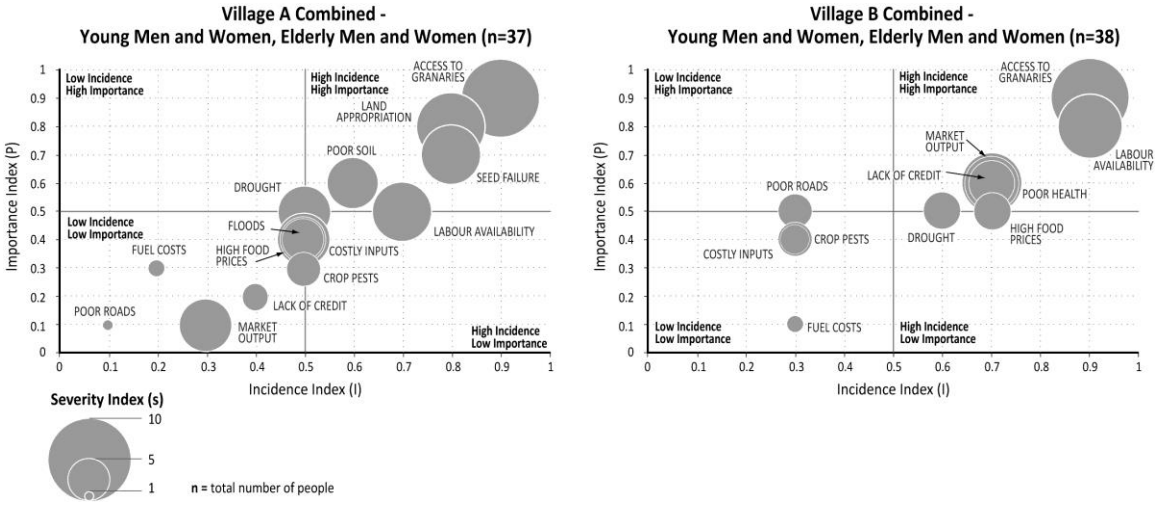
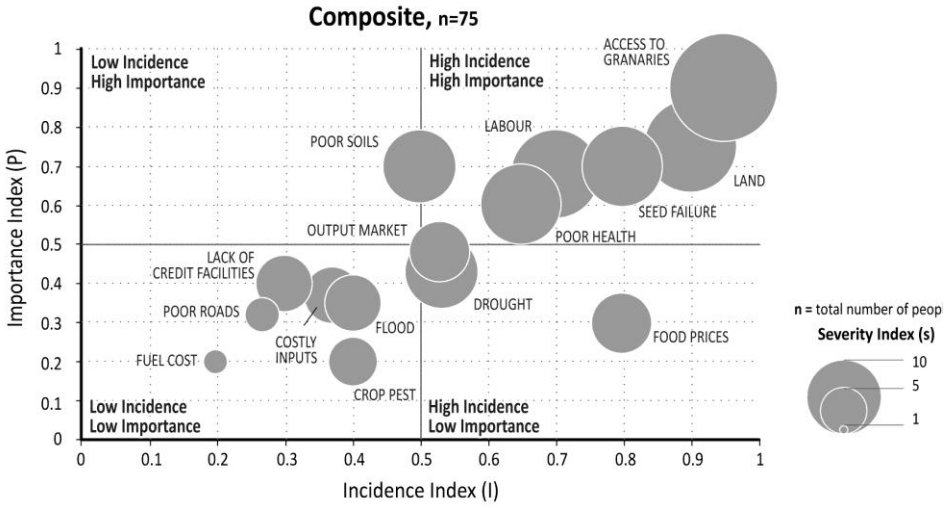


Figure 3.8 Participatory Ranking and Scoring: Composite Results



The results illustrate significant differences in what women, men, the young and elderly perceived as critical in the context of resilience (well-being) and climate change. For young and elderly men in each village, the most frequently identified problems included droughts, floods, seed failure, high food prices, poor roads, and lack of credit (Figure 3.5). These respondents indicated that extreme weather events like dry spells and heavy rains had become increasingly common and were affecting crop production. In addition, the farmers revealed that new seed varieties were being introduced by agricultural extension agents and private seed sellers, but these seeds were failing to yield given recurring dry spells. More specifically, hybrid maize varieties were identified as non-resistant to the emerging ecological conditions in northern Ghana. Young and elderly men also identified problems relating to increasing food prices, as well as smallholder farmers' inability to procure credit facilities from banks. Conversely, young and elderly women noted that their greatest challenges were access to household granaries, access to farmlands, labour constraints, and poor health (Figures 3.5, 3.6 and 3.7).

Whereas all groups of women mentioned drought and floods, these factors were ranked relatively lower in terms of importance and severity. Among the factors that were identified by young and elderly women, access to household granaries was

identified as the greatest worry (Figures 3.6 and 3.7). During focus groups and follow-up interviews, all the women respondents revealed that their husbands were denying them access to household granaries, as crop yields had become increasingly smaller in the face of climate variability. With a dejected tone, a young woman summed up a recurring concern by saying "our husbands will not give us enough food." At one of the focus group discussions, an elderly woman, who was enthusiastically clamouring for her turn to speak, described the problem more vividly:

> "We're three wives. I'm the senior. I've seven children. Our husband enters the granary every fourteen days and distributes food. I get a calabash of maize, a calabash of millet, and a calabash of beans. Yofaa [second wife] has one child and gets the same quantity of food. Zugle [third wife] is now pregnant and gets the same quantity of food. My food is always not enough for my family to live. That's the main problem. A woman never gets to take her own food from the granary. That's the problem"

With exasperation in her voice, another woman added to the above comments by saying: "No, you can't go inside the granary, you will break a taboo."

Within the study area, there are strong norms of patriarchy and socially constructed relations of gender and property rights (Abdul-Korah, 2011). These relations restrict women's direct access to granaries to take food that they themselves have helped to produce. Male household heads retain the power to distribute food. Food distribution is based on cultural norms emphasizing an equal share among women and their offspring. Although an ideology of fairness surrounds this distribution process, wives with fewer children benefit to the detriment of those with more children. Thus, culturally constituted rights and control over resources have meant that among co-wives, those with larger families face recurring food insecurity even when household granaries are full. It is these patriarchal and cultural norms that all the women identified as pivotal in their resilience to climate change. Table 3.5 illustrates farmers' own narratives on some of the other challenges identified.

Table 3.5 Summary of Responses and Sample Quotations

Type of concern	*# of participants who mentioned*		*Sample Quotations*[β]
	Focus Groups (n=75)	*Follow-up In-depth Interviews (n=60)*	
Access to granaries	(38) 51%	(42)[α] 70%	"Drought isn't our problem. Our problem is our husbands. They don't give us more food. They cheat us in everything that we do together."
Land-grabbing	(42) 56%	(54) 90%	"… Have you ever seen a farmer without land? That's the life here and you can't support 8 people on that type of life… You've to travel to look for land somewhere to feed your family."
Seed failure	(68) 91%	(49) 82%	"Agric [hybrid] seeds are not good, but the officers [extension agents] say we need to use it because of poor rainfall. When the rains come early or late, it can kill all the agric seed. But when the rains come early or late, it can't kill our local seeds."
Labour availability	(45) 60%	(41) 68%	"… Because the government is taking our land, all our family members are migrating to Techiman and Accra [southern Ghana]… Now there is no one to do the farming."
Poor health	(29) 39%	(48) 80%	"Most people here are sick because they work too hard, but they don't get any support. And many people don't eat well. So you see that it is poor health, hunger and many worries that are bigger than drought and go over and over…
High food prices	(70) 93%	(53) 88%	"… as I've told you, I'll never say the problem is drought. Why I'm I saying this? Because dry fish used to be very cheap. Now you can't buy. Now you sell your maize at the market, and the money you get, you can't buy fish that will last two days.
Droughts	(21) 28%	(24) 40%	"When we were young, the rains came much earlier in February and there were more droughts… Now, there are also more droughts… and the normal planting season starts around mid-May to June."
Output markets	(38) 51%	(42) 70%	"… Burkina [Burkina Faso] farmers sell all their vegetables and cereals in our local market. Many people have tomatoes and maize, but there is no market. And I'll tell you another problem. Now the government brings in too many tin [canned] tomatoes from Dubai, China and Italy. When you do that, you kill we the farmers in your own country.
Costly inputs	(36) 48%	(32) 53%	"… I'll give you one example. Now, you don't give me credit, but you are telling me to buy seed and fertilizer every year… Do you see what I mean? How is that possible?"
Lack of credit	(32) 43%	(55) 92%	"For a small farmer, you'll never get credit."

Source: Focus Group Discussions and In-depth Interviews, January to August, 2012.

[α] These respondents include 8 elderly men who openly confirmed the gender politics over household food reserves. Ultimately, these men and others in the sample felt betrayed by what their wives had revealed to the researchers.

[β] These quotations are representative rather than extreme cases.

In general, some of the identified problems were found to be less important and severe in Village 'A' than in Village 'B' (Figure 3.7). For instance, in Village 'B', farmers perceived that market output was a problem of higher incidence and higher importance, but this was not a major worry in Village 'A'. Information from our in-depth interviews helped to explain some of these differences. We found that as compared to Village 'B', farmers in Village 'A' had little farmland for subsistence production, let alone obtain surpluses for the market. In Village 'B', many farmers complained that they could not sell their products at good prices, given regular gluts in rural markets, especially cheap vegetables and cereals from Burkina Faso (see also Laube et al., 2012). As one male farmer put it, "many people have maize and millet, but there is no good market." Moreover, land appropriation was the second most important and severe problem in Village 'A' as compared to Village 'B'. The household survey showed that since 2005, approximately 93 households (60 percent) have lost their farmlands through dispossession. These farmlands have been appropriated by the Ghanaian government and given to an Australian mining company as a concession for mineral extraction. Before the land dispossession, 64 of these households were relatively land rich, owning more than the regional average landholding of 2.7 ha. The remaining 29 households owned between 0.1 and 2.7 ha of farmlands. Field interviews showed that the land dispossession was compelling farmers to migrate to southern Ghana where they rely on sharecropping and farm labour to make a living. Given the problem of land appropriation, ensuing migration and household dynamics, the majority of farmers saw climate change as a lower priority.

In a composite assessment of the results from the eight focus groups, the problems that were identified by more than half of all the participants (I>0.5) and ranked highest in terms of importance (P>0.5) included access to granaries, inadequate agricultural land, seed failure, household labour, and poor health (Figure 3.8, 1st Quadrant). Among these major problems, the most severe, as evaluated by participants, included access to granary (S=9.5), inadequate agricultural land (S=8),

and household labour (S=7.4). The analysis showed that drought was severe (S=5.4), and of higher incidence (I=0.53), but of lower importance (P=0.48). These findings are very similar to those documented in other drought-sensitive regions in West Africa (e.g. Tschakert, 2007), Southern African (e.g. Silva et al., 2010), and Latin America (e.g. Eakin, 2006). For instance, in drought-prone rural Mexico, intensive ethnographic research revealed that close to "20 percent of the factors defining 'bad years' in each community were nonclimatic in nature" (Eakin, 2006, p. 87). Such findings do not necessarily downplay the importance of climate change, but strongly suggest that other factors loom equally large in the daily lives of rural farmers.

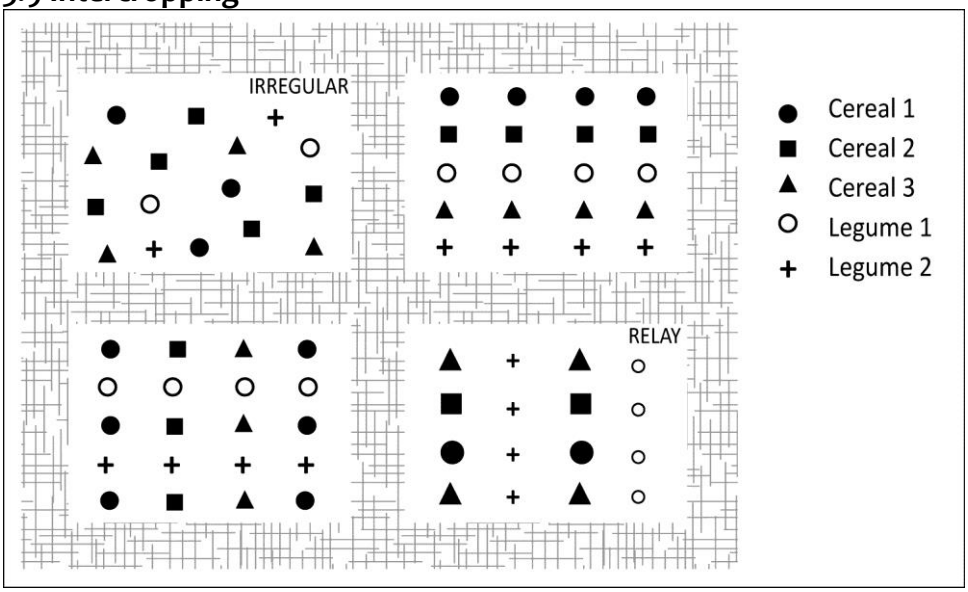
3.6.4 Local Knowledge, Agricultural Innovations and Climate Resilience

The above findings prompted a closer examination of farming practices for a better understanding of why most farmers were not worried about drought or climate variability. Ethnographic observations revealed that small farmers have learnt to deal with the difficult environment that characterizes agriculture in the Ghanaian savannahs. Farmers draw upon their cumulative ecological knowledge to orchestrate farm-management practices that minimize the adverse effects of droughts, declining soil fertility, price fluctuations, and labour shortages. Some of the strategies are spontaneous practices, while others involve planned actions oriented towards long-term livelihood security. A number of the identified adaptation strategies are more frequently applied in Village 'B' than in Village 'A' and vice versa. The differences can be explained by the contrasting biophysical conditions and socio-economic contexts shaping livelihoods in both villages. Indeed, farmer strategies are diverse, intertwined and defy a simple classification. The following are some of the common adaptation measures that were being employed to limit the impacts of and climatic variability and economic change.

3.6.4.1 Crop Sequencing and Biological Pest Control

Farmers used complex intercropping systems to improve soil fertility, and crop rotation to take advantage of soil heterogeneity. Primary crop associations and sequencing patterns are illustrated in Figure 3.9, but this list is not exhaustive. We identified close to twenty-four crop combination and rotation patterns. It was not uncommon to identify up to seven different crop species on the same intercropped field. Farmers explained that this mixed intercropping was used to take advantage of moisture resources, to outwit pests, and to limit the spread of crop diseases.

Figure 3.9 Intercropping



Source: Authors' Illustration based on field observations

Eighty-five percent of the interviewed farmers stressed that if the planting rains are unreasonably late (example, around mid-May and beyond), crops such as groundnuts are removed from the planting schedule because of lower resilience to moisture stress. This concern was best reflected in the following statement by one young farmer: "if the rains come in the middle of the fifth month, it's surely going to be a short farming season, so I'll drop groundnut." Different crops are planted on different soils based upon fertility and moisture-retention capacities. In areas of sandy soils with lower nutrient content, fields are cultivated with millet, groundnuts,

sorghum and beans, with lower planting densities. For relay intercropping, the second set of crops, mostly legumes (e.g. groundnut, beans, etc.), are planted into standing maize, millets and sorghum before these cereals were harvested. The timing of the relay is not reliant on a calendar date, but a combination of factors, including the physiographical stage of the cereals, the moisture content in the soils, how the season unfolds, and whether the OGP began too early or too late.

Intercropping is labour-intensive; thus, farmers carefully schedule planting and weeding to coincide with household labour availability. A major problem for millet, maize and sorghum is the damage caused by a parasitic weed called *Striga* (*Striga hermonthica*). In response to this challenge, a majority of farmers are using traditional control methods such as the application of ash (82 per cent), and cereal-legume intercropping (79 per cent).

3.6.4.2 Tied and Round Ridging

Almost all farmers cultivate on tied-ridges, whilst a smaller percentage combined both tied-ridges and round ridges (mounds). Farmers explained that compared to mounds, tied-ridges prevent gully erosion, have deep rooting volume and higher soil moisture-holding capacities. Tied-ridging quickly builds up soil organic matter when lightly hoed and crop residues incorporated. On household fields, tied-ridges are built to follow the contours of the field. Furrows between ridges are linked by cross-ties to create closed micro basins of 1 to 3 meters long. These micro basins hold up runoff, so that water has more time to infiltrate in order to increase soil water storage. Additionally, farmers explained that tied-ridging prevents grain dislodging because it increases the depth and density of plant rooting. Yield benefits, according to farmers, are greater in tie-ridging systems even during years of severe dry spells.

Approximately 83 percent of farmers indicated that in round ridging, inter-row cultivation helps not only to control weeds, but to keep the ridges in shape. Rows are often used to cultivate cowpeas. Field observations revealed that the spreading property of these leguminous crops helps to maintain a continuous plant cover,

which prevents evapotranspiration and soil compaction resulting from raindrop splash. Farmers who adopt round ridges carefully position crops to take advantage of moisture contents. For example, moisture-demanding cereals like maize are planted at the zenith of the mound, whereas millet and sorghum are planted at the tails because of their better resilience to moisture stress. Three-quarters of farmers interviewed mentioned that at the beginning of each farming season, both tied- and round ridges are re-hoed to facilitate nutrient transfer from subsoil to topsoil.

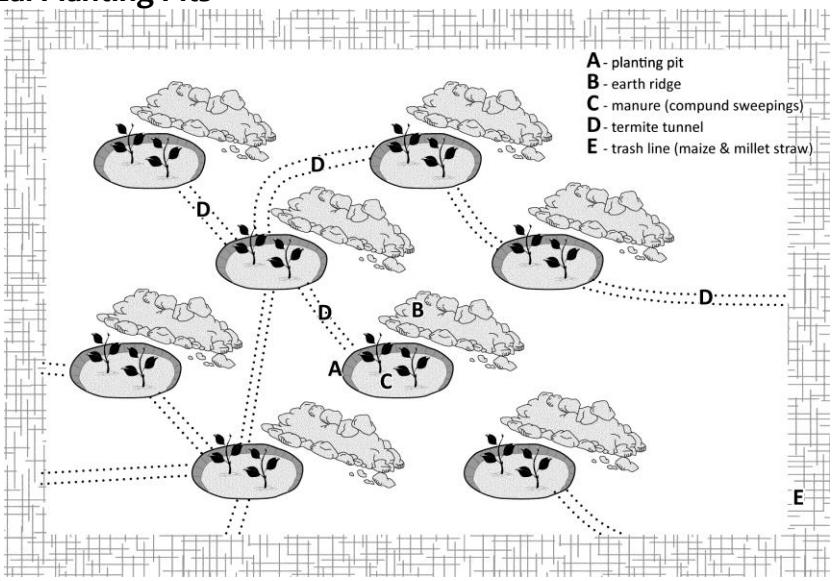
3.6.4.3 Zaï Planting Pits and Trash Lines

One major innovative strategy is the adoption of *zaï* planting pits. This technique is being used for soil fertility restoration and moisture conservation on lateritic soils. All farmers adopting *zaï* learned the technique from neighbouring villages in Burkina Faso, where *zaï*s have been in existence since the early 1980s (Reij and Waters-Bayer, 2001). In this technique, small pits with diameters of 20-40 cm and depth of 10-20 cm are dug using a hoe (Figure 3.10). The excavated soils are ridged half-way around the pit to capture surface run-off, debris and sand. Manure or composted organic matter is added to each pit. Preparing *zaï* pits in the dry season, according to farmers, gives the manure enough time to decompose in order to attract soil microorganisms such as earthworms, termites and beetles. These microorganisms create biopores that loosen soils, improve aeration, drainage, and plant growth. Decomposed trash lines are put along field borders and in narrow strips across fields to attract and increase the population of earthworms, termites and beetles. According to those farmers who were interviewed, these trash lines are a newer innovation to the original *zaï* practice borrowed from Burkina Faso.

When the first rains arrive, the surface of the pit is covered with a thin layer of soil. Seeds are then planted when rains became fully established. According to farmers, the exact portfolio of cropping variety, density, and pattern is calculated based upon the nature of the first planting rains. For instance, one farmer explained that if early rains are intense and consistent within a 14-day period, *zaï* pits are put

into the cultivation of long-maturing, high-yielding cereals and legumes. In commenting about the efficiency of *zaï*, the farmer asserted that "I've been experimenting with several techniques, but I've never seen a method that yields as much as *zaï.*"

Figure 3.10 Zaï Planting Pits



Source: Authors' Illustration based on field observations

3.6.4.4 Application of Manure and Composting

Out of the 30 farms we visited, 21 made use of no chemical fertilizers because farmers said it was expensive and destroys soils. Instead, greater attention was given to the collection and spread of animal manure as well as compound sweepings. Agricultural fields that are close to household compounds tend to receive higher manure applications. The amount and frequency of manure application is determined by cropping pattern, livestock density or type, labour availability and rainfall intensity. In some households, manure application is done by corralling livestock overnight on the fields to deposit both faeces and urine. Another strategy is for women and children to collect manure from livestock kralls and hand-spread them on croplands every 3 to 5 days. Farmers noted that whilst corralling livestock on the field saves

labour and provides quick nutrient replenishment, it nevertheless leads to soil compaction, especially in the upper 0-25 cm of the soil profile.

3.7 Discussion and Conclusion

The goals of this research were to investigate farmers' perceptions of and resilience to climate change, and how these perceptions vary by social differences such as gender, age and kinship relations. We also wanted to examine how local knowledge about climate change shapes agricultural practices and on-farm innovations. The research findings show that in semi-arid northern Ghana, farmers are fully aware of increasing climate variability, including shifting rainfall patterns, droughts, dry spells and temperature increases. Generally, many of these farmer perceptions corroborate official climate records for the study area. These findings are also similar to farmer perceptions about climate change and drought in semi-arid Burkina Faso, Mali, Niger, Nigeria and Senegal (e.g. Mertz et al., 2011; Tschakert, 2007).

Our case study further reveals the dynamic nature of the processes that underpin resilience to climate change, particularly at the farm household level. More importantly, our findings suggest that gendered property rights and kinship relations are critical factors shaping resilience and smallholder livelihoods in the context of a changing climate. In addition, the availability of agricultural credit, labour constraints, land appropriation, seed failure, and market outputs, emerged as more prominent issues for farmer resilience to climate change. All these problems are gendered and socially differentiated, with young men highlighting land appropriation, credit facilities and droughts as key constraints; whereas elderly men emphasized labour availability, hybrid seed failure and land appropriation. By contrast, young women identified access to granaries, land appropriation and labour availability, while elderly women mentioned access to granaries, labour availability and market outputs.

Many of these problems are linked to long-term historical processes and current government policies in Ghana. For example, household labour shortages have deep roots in colonial policies. As discussed earlier, colonial policies neglected

the northern parts of Ghana and treated the area as a labour reserve. Northern residents were recruited to work as labourers in cash crop farms in the southern parts of the country. This development resulted in persistent male out-migration, which was further intensified by structural adjustment policies. Today, this pattern of out-migration still persists in the north (Abdul-Korah, 2011), thereby creating labour shortages for household production. Migration has had differential impacts by gender and age, as young men are those who increasingly migrate to seek wage labour. In the absence of young men, household labour shortages are borne disproportionately by women and elderly household members.

Similarly, the problem of costly farm inputs, access to agricultural credits, and market outputs (Figure 3.6) could be explained by the lingering impacts of structural adjustment programs in Ghana. Structural adjustment policies led to a total neglect of smallholder farming, with the government closing down state agencies that serviced smallholder input requirements (Konadu-Agyemang, 2000). Moreover, these policies opened Ghanaian markets to cheap food imports like cereals and canned vegetables, thereby constricting the market outputs where small farmers can sell their surplus products. Many of these problems have persisted to the present era (Laube et al., 2012; Yaro, 2013), therefore constraining smallholder agriculture and farmer resilience to climate change in northern Ghana.

Another key insight from this study is that, in semi arid northern Ghana, many farmers are not only "doubly exposed" to the impacts of climate change and economic globalization (Leichenko and O'Brien, 2008), but also to gendered and intra-household power relations that define access to and control over resources. Indeed, our findings seem indicative of the fact that the impacts of climate change might be socially uneven and highly gendered. While climate change is resulting in decreasing crop yields, women and children are bearing the greatest impacts compared to men. This differential vulnerability emanates from cultural norms, patriarchy, and gendered property rights that restrict women's access to food granaries, with implications for their children. These findings support Ribot's (2010)

argument that vulnerability does not fall from the sky, but is rooted in social, political and economic contexts.

Previous case studies have also pointed out the pervasiveness of women's lack of access to household granaries in semi-arid West Africa. For example, among the Kusasi ethnic group in northeastern Ghana, Whitehead (1984) discovered that "no other member of the household, except the head, may look inside or reach the granary. Each married woman in the compound receives a basket of millet from the granary every ten days or so, from which she is responsible for providing her husband and children with meals" (p.104). Similarly, among Senufo households in the Ivorian Savannas, Bassett (2002) found that husbands "only provide food to their wives on days when they work in household fields. During the dry season when there is little agricultural work, husbands open up household granaries once every 2-3 months and give food to their wives that lasts no longer than 4 or 5 days" (p.361). Given these gendered inequalities in semi-arid West Africa, women's access to food resources could be further marginalized in the face of severe climatic changes (Abdrabo et al., 2014) and decreases in crop yields (Roudier et al., 2011).

These findings suggest that climate change resilience, vulnerability, and adaptation depend on specific household circumstances, cultural factors, and the differential vulnerability of men, women, the young and elderly. Different social groups may be exposed to different stressors due to the complex interplay of factors such as gendered rights of resource use, access and control, as well as economic and historical processes. Understanding these differential exposures is important to helping different social groups to adapt to climate change and variability. Thus, drawing upon a feminist political ecology approach, this study underscores how gendered property rights and existing political-economic structures can coalesce in complex ways to shape climate change resilience. Our findings shed light on *whose* needs are either met or compromised as different social groups seek their own resilience in the face of climate and economic change. Furthermore, our case study illuminates the importance of feminist political ecology in understanding power

inequalities, gender politics, and social dynamics, issues that are largely underemphasized in resilience thinking. In resource-dependent communities, the prevailing socio-cultural context, together with preexisting political economic dynamics, will shape how the impacts of climate change will be felt and responded to. When set within broader debates about global environmental change, these findings have significant implications. They suggest that in the ongoing efforts to reduce vulnerability and strengthen resilience to climate change, a narrow focus on environmental dynamics could be ineffective if social inequalities and political economic dynamics loom as equally important challenges.

Furthermore, our findings highlight the fact that there is a great deal of farmer innovations and experimentation in the context of environmental change, as also observed by Mortimore (2010) and Watts (2013). Within our study villages, ongoing climate adaptation strategies include complex intercropping systems, agrodiversity, and soil and water conservation using *zaï* farming methods. According to oral historical interviews, all the above techniques have emerged from farmers' own experimentation and peer-to-peer learning, without any government agency or project promotion. We argue that farmers' ability to nurture learning, self-innovate, and share knowledge, demonstrates their resilience under dynamic and uncertain conditions (Brown, 2014; Folke, 2006; Nelson, 2011). An example of nurturing learning, a key element of resilience (Folke, 2006), is how farmers have adopted soil and water conservation techniques from neighboring Burkina Faso, and adapted the practice to suite their own place-specific needs.

Too often, these local innovations and adaptive capacities are devalued as incapable of dealing with emerging threats from climate change. Yet, there is much empirical evidence showing that in the face of climate change, these innovations and climate-resilient farming practices are needed (Altieri and Nicholls 2013; Lin, 2011; Mortimore, 2010). Several case studies have shown that farmers who depend on a single crop (monoculture) can cope less with climate variability, droughts and floods, as compared to those adopting diversified farming system (Altieri and Nicholls 2013;

Lin, 2011; Silva et al., 2010). Not only do diversified farming systems improve soil health and higher resistance to pest outbreaks, but they also diversify livelihoods and spread risk across several crops (Lin, 2011; Snapp et al., 2010). Similarly, many case studies suggest that for resource-dependent farmers, these forms of livelihood diversification are the most effective means of building resilience and food security in the face of climate change (Altieri and Nicholls 2013; Lin, 2011; Snapp et al., 2010).

Aside from resilience to climate variability and change, the agro-ecological features of indigenous farming systems also offer opportunities to mitigate climate change (Altieri and Nicholls, 2013). All these benefits suggest that the locally situated knowledge and resourcefulness of farmers could serve as a starting point for building resilience and adaptive capacity to climate change (Boillat and Berkes, 2013). National adaptation policies could better incorporate sources of indigenous knowledge and strengthen farmer innovations already taking place. This strategy will ensure that climate change adaptation programs will meet the primary needs and concerns of rural farmers.

The next chapter provides a detailed account of land-grabbing and gendered agrarian change, one of the major non-climatic challenges that farmers are currently facing in northern Ghana.

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CHAPTER 4

LAND GRABBING AND GENDERED AGRARIAN CHANGE IN NORTHERN GHANA

Hanson Nyantakyi-Frimpong[a,*] and Rachel Bezner Kerr[b]

[a] Department of Geography,
The University of Western Ontario
London ON, N6A 5C2, Canada

[b] Department of Development Sociology
Cornell University
Ithaca NY, 14853, United States

[*] Corresponding author. Email: hnyantak@uwo.ca

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Abstract

This paper argues that large-scale land appropriation is displacing subsistence farmers and reworking agrarian social relations in northern Ghana. The recent wave of farmland enclosures has not only resulted in heightened land scarcity, but fostered a marked social differentiation within farming communities. The dominant form of inequality is land dispossession, with implications for intra-household property rights and labour dynamics. Due to acute land shortages, women's rights to use land as wives, mothers and daughters are becoming insecure, as their vegetable plots are being reclassified as male-controlled household fields. The paper further documents the painful choices that landless farmers have to make in order to meet livelihood needs, including highly disciplined, yet low-waged farm labour work and sharecropping contracts. In these livelihood pathways, there emerge, again, exploitative relations of production, whereby surplus is expropriated from land-dispossessed-migrant labourers and concentrated with farm owners. These dynamics produce a "simple reproduction squeeze" for the land-dispossessed. Overall, this paper seeks to contribute to the broader literature by enriching a critical understanding of geographically specific processes of change, and gendered differentiated impacts occasioned by recent land acquisitions in rural Africa.

Keywords: Land grabbing, Gender relations, Peasant class differentiation, Household agricultural production, Ghana

4.1 Introduction and Theoretical Context

Over the last couple of years, noteworthy transformations have occurred in agricultural land relations in Africa. Driven by the conjuncture of multiple crises: climate, financial, food and energy (McMichael, 2012), foreign governments, transnational corporations and domestic investors are aggressively acquiring African-based farmlands for food, biofuel and mineral extraction (Cotula et al., 2009; Cotula, 2013; Kaag and Zoomers, 2014; White et al., 2012).[8] Some analysts refer to this phenomenon as land grabbing, perhaps to express skepticism about these land acquisition processes and their outcomes (e.g. Cotula, 2013). Although land appropriation is not new, the pace of the current land rush has been overwhelming, generating a contentious debate among scholars, the media, civil society groups, research institutions, Non-Governmental Organizations, and the World Bank (see Borras et al., 2011; Borras and Franco, 2012; Cotula, 2013; Deininger et al., 2011; GRAIN, 2008; Kaag and Zoomers, 2014; Madondi et al., 2011; McMichael, 2012).

Since the new wave of land acquisitions made headlines through the ground-breaking report by GRAIN (2008), a rich and complex literature has emerged addressing the causes, drivers and dynamics unfolding at the global and regional scales (e.g. Alden Wily, 2012; Cotula, 2013; Deininger et al., 2011; Hall, 2011; Li, 2011; McMichael, 2012). For instance, Alden Wily (2012) has placed land grabs within a long-term historical perspective, arguing that the current land rush is nothing new, but a colonial continuity. Philip McMichael has argued that the current land grabs are symptomatic of food regime restructuring, where financial capital is now being invested in cheap land to raise food deficits (McMichael, 2012). Tania Murray Li has examined land grabbing and the agrarian question of labour, especially as land dispossession is creating a surplus population whose 'land is needed, but their labour is not' (Li, 2011, p. 286; see also Li, 2010). Using evidence from Indonesia, Li (2011) has further demonstrated that large-scale farming, which often accompanies many

[8] Farmlands are also being acquired in other regions such as Southeast Asia, and in Latin America and the Caribbean (see Kaag and Zoomers, 2014, p. 3).

corporate land grabs, actually deepens rather than reduces poverty. There is also a fast-growing literature documenting biofuel politics (Hunsberger, 2010), and whether land grabbing will improve food security or aggravate agricultural productivity decline in Africa (Madondi et al., 2011).

In this bourgeoning literature, however, two important discussions remain relatively underexplored. Firstly, less attention has been paid to examining the socioeconomic impacts of land deals in sub-Saharan Africa (for a review of the current literature on this theme, see Oya, 2013a). Secondly, in examining land acquisitions, many studies treat the household as an undifferentiated unit that presumably pools resources together, with members uniformly affected by land loss (e.g. see Boamah, 2011). Indeed, there have been limited attempts at "breaking open the black box of the household" (McCarthy, 2012, p. 615) to examine whether and how emerging land deals (re)produce social differentiation or gendered struggles over resource access and control. Among the few exceptions include local level empirical studies by Julia and White (2012), Mutopo (2011) and Tsikata and Yaro (2013).[9]

Some analysts argue that the new land acquisitions are meant for productive uses, many of which have already created farm and off-farm employment, extended infrastructure, and increased food production and food security in the countryside (e.g. Boamah, 2011; Deininger et al. 2011). However, as Hall et al. (2011, 198) have emphasized, since "all productive land uses require exclusion, the critical issue is who will win, and who will lose, from the ways in which boundaries are drawn." This point has also been echoed by Vermeulen and Cotula (2010, p.899) when they stressed that "rural people are not a homogenous group in terms of claims, uses, and preferences with respect to land and natural resources." Given the myriad differentiation among African smallholder households (Jayne et al., 2010; Oya, 2007) and the shared and

[9] Behrman et al. (2012) and Daley (2011) have also examined the gendered implications of large-scale land-grabbing. However, these papers are reviews of secondary literature, and do not rely on in-depth, field-based evidence. Additionally, Cotula (2013) offered a brief, but useful discussion on gendered impacts of land deals, cautioning against treating women as a homogenous group affected by land loss.

separate interests within domestic units (Jackson, 2007; Thorsen, 2002; Whitehead and Kabeer, 2001), there is a pressing need for a more concrete understanding of *which* specific groups are affected by land deals and in what specific ways.

The main purpose of this paper is to contribute to current debates on land grabbing by investigating dynamics at the household level, where the "micro-politics of negotiations of land control, access and exclusion are played out" (White et al., 2012, p.633). Our first objective is to examine whether and how new agrarian classes are emerging, what processes of accumulation are occurring, and what social relations are being forged, given recent large-scale land acquisitions. A second broad objective is to investigate what this set of relations mean for the political ecology of food production and household food security. Although the household level constitutes our unit of analysis, we endeavour to make critical distinctions within it. We draw the empirical evidence from a case study in Ghana, one of the countries where investors are acquiring supposedly marginal, idle and unproductive lands (Cotula, 2013; Deininger et al., 2011; Kaag and Zoomers, 2014).

A number of studies suggest that from 2004 to 2010, the Ghanaian government allocated between 89,000 and 1,075,000 hectares of land for foreign-based investments in large-scale agriculture, mining and biofuel production (Cotula, 2013, p. 43; Cotula et al., 2009, p.42; Friends of the Earth Europe, 2010, p.6; Schoneveld et al., 2010; Tsikata and Yaro, 2013).[10] A major contradiction is that the

[10] Using in-country case studies, Cotula et al. (2009, p.42) indicate 452,000 hectares of approved projects in Ghana between 2004 and early 2009. However, the authors noted that their data were incomplete as a result of information gaps on specific projects. Drawing upon remote sensing data, key informant interviews, site visits, focus groups and a survey of 31 employees and 64 land-losing households, Schoneveld et al. (2010) found that as of August 2009, foreign-based companies had access to 1,075,000 hectares of land for the cultivation of *Jatropha curcas* (13 companies), cassava (1 company) and oil palm (1 company) in Ghana. The authors noted that just "a fraction of these lands have, however, actually come under cultivation, with no more than 10,000 hectares likely to be under cultivation by these investors" (Schoneveld et al., 2010). Compiling their evidence primarily from media reports, Friis and Reenberg (2010) indicated 89,000 hectares of acquired land between 2008 and 2010. Furthermore, Friends of the Earth Europe (2010, p. 6) indicated a total area of 735,000 hectares, of which 105,000 hectares have been acquired by Italian-based Agroils; 120,000 hectares by Jatropha Africa, United Kindgdom; 10,000 hectares by ScanFuel Norway, with additional contract of 400,000 hectares; and 100,000 hectares acquired by Galten Isreal (see map in Friend of the Earth Europe, 2010; p.6). According to Friend of the Earth Europe (2010), these figures are based on research

majority of these farmlands have been acquired in Ghana's rural north (Boamah, 2011; Nyari, 2008; Tsikata and Yaro, 2013), an area inhabited largely by smallholder farmers who suffer high levels of food insecurity and poverty (Hjelm and Dasori, 2012; Whitehead, 2006). In the present case study, we examine a 316,400 hectares [3,164 km^2] of land given as a concession to Azumah Resources Limited, an Australian-based mining company, to extract gold in north-western Ghana (see Warries et al., 2012, p.20).[11] It is important to highlight that in this particular case, the 'land grabber' is the Ghanaian state and not the foreign company (Alden Wily, 2012). Using the power of eminent domain (Larbi et al., 2004), the Ghanaian state has enclosed farmlands for the purposes of gold mining to ostensibly meet the broader public interest. At the time of research from January to August 2012, and revisit in August 2013, gold prospecting was fully underway. The concessional area had been enclosed and access totally prohibited or considered a trespass onto company territory. This enclosure has dispossessed pre-existing usufruct and derivative rights among local farmers in several villages. We categorize this case as a 'food to non-food' land-grabbing (Hall, 2011, p.20), involving the displacement of land-use from subsistence agriculture to large-scale mining. Following Borras and Franco (2013, p.1725), we define land grabbing as 'the capturing of control of relatively vast tracts of land and other natural resources through a variety of mechanisms and forms, carried out through extra-economic coercion that involves large-scale capital, which often shifts resource use orientation into extraction, whether for international or domestic purposes.'

The analyses in this paper draw upon a theoretical framework that combines political ecology, theories of resource access and class differentiation. First, we use a political ecology approach to foreground our analysis in the politics of resource access, control and management (Zimmerer and Bassett, 2004). Political ecology is

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carried out by Friends of the Earth Ghana. However, the report provides no information on the time span over which these lands were acquired.

[11] According to field interviews with village elders, this concession was awarded in 2005. Some households reported that they started experiencing dispossession in 2006, whilst others mentioned 2007-2008.

an explanatory framework for analyzing how broad-scale processes at the local, national and global levels affect local-level human environment interactions (Robbins, 2012). Earlier political ecology approaches combined "concerns of ecology and a broadly defined political economy" to understand the interactive effects "between society and land-based resources and also within classes and groups within society itself" (Blaikie and Brookfield, 1987; p.17). Political ecology gives serious consideration to the processes by which resource access is defined, negotiated and contested at multiple geographical scales (Peet and Watts, 2004). It also pays attention to the historical foundations of human-environmental problems and how marginalized groups cope with deteriorating physical environments (Robbins, 2012).

For feminist researchers working in the field of political ecology, a key question has been the ways in which human-environment interactions are gendered. Rocheleau et al. (1996) suggested a feminist political ecology approach that pushed researchers to extend the analysis of *politics* to include how micro-gender politics, especially at the household level, intersect with socio-ecological processes to influence resource struggles. Feminist political ecology frames gender not as a stand-alone social difference affecting resource access and control; instead, it takes seriously the notion that gender, as a social category, gains its purchase through the interplay of other forms of social differentiation such as class, caste, race, ethnicity, age and dynamic ecologies (Elmhirst, 2011; Mollett and Faria, 2013).

In this paper, we draw upon these perspectives to shed light on whether and how relations of power, inequality and rights shape, or are being shaped by, resource management decisions in the context of increasing land dispossession. We adopt a political ecology approach that puts *politics* first (Bryant and Bailey, 1997) in order to better understand emerging dynamics around resource access, given increasing land acquisition by extra-local actors. We use the term *access* to refer to the actual *ability* or 'bundle of powers' that enable institutions, both household and community, to effectively acquire, control, distribute, and transfer land-based resources (Ribot and Peluso, 2003). This definition helps to avoid a narrow focus on formal and informal

property rights, instead highlighting the centrality of customarily usufruct rights, as well as questions of power relations in struggles to control or benefit from natural resources.

We further draw upon the agrarian political economy literature, especially a class-analytic perspective to better analyze and understand existing or emerging differentiation among smallholders (Bernstein, 2010; Cousins, 2011). Henry Bernstein has proposed that to critically understand the differentiated character of contemporary agrarian change, there is the need to ask: who owns available resources, who provides labour and for what returns, and how surplus is appropriated or distributed (Bernstein, 2010). These political economy questions are relevant to fully understand "internal tensions within households (often gender-based) over the use of land, labour and capital" (Cousins, 2011, p.3).

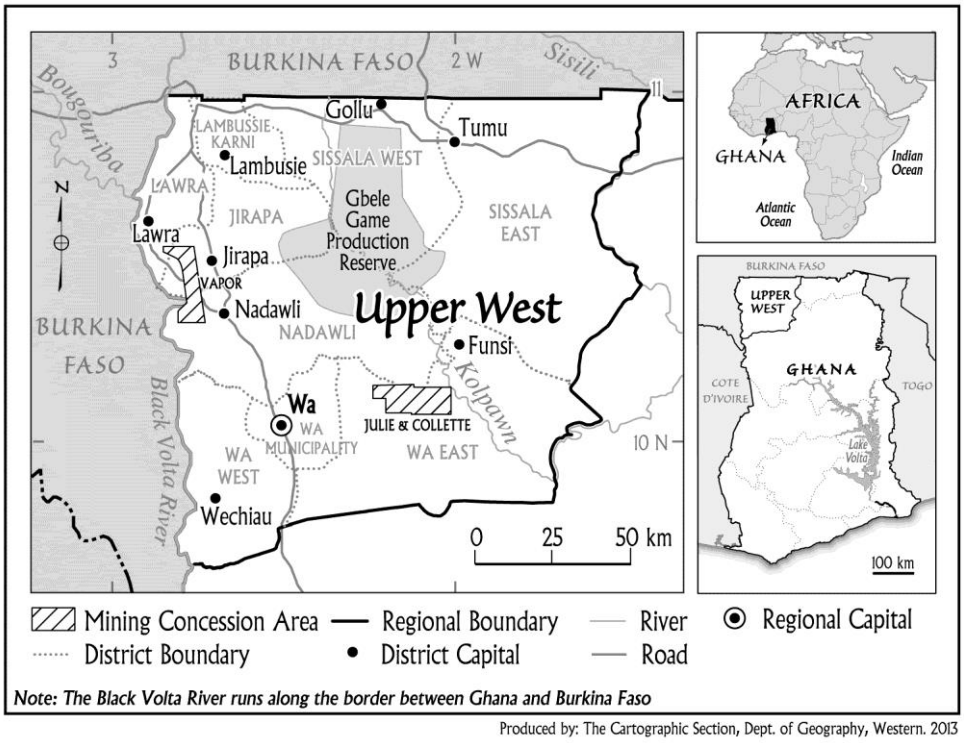
The remainder of the paper is organized into four sections. In the next section, we describe the physical characteristics of the study village, land tenure, farming systems, mode of production, household organization, gender division of labour, crop choices, and the use of common lands. We follow this discussion with an outline of our methodology and methods for data collection and analyses. We then present and discuss our empirical findings. The concluding section spells out the implications of our findings for the ongoing debate about land appropriation, agrarian change and the political ecology of food and agriculture in rural Africa.

4.2 The Research Area in Context

We conducted fieldwork in a small savannah village in Ghana's Upper-West Region, along the Ghana-Burkina Faso international border (Figure 4.1). The village was selected as an exemplifying case of local and broad-scale processes shaping contemporary agriculture and rural development in northern Ghana (Yaro, 2013). It is roughly 650 km north-west of Accra, Ghana's capital, and about 21 km west of Nadowli, the nearest major settlement for banking, marketing, health care, police and postal services. The village is connected to Nadowli through a secondary lateritic

road. Public transportation is limited and unreliable, with bicycles and motorcycles constituting the dominant mode of transportation. In terms of local governance, the village falls under the Nadowli district, one of the poorest districts, ranking 96th out of 110 districts in a recent national-level poverty assessment in Ghana (National Development Planning Commission, 2005).

Figure 4.1 The Study Area Showing the Mining Concessional Zone



Source: Map Prepared by Karen van Kerkole, Western University Cartographer.

In Ghana's 2000 Population and Housing Census, the village had 494 people residing in 72 households (Ghana Statistical Service, 2005a).[12] A recent national census was conducted in 2010, but village-level statistics have not been published at the time of writing this article. In April 2012, we conducted a rough village census which indicated an estimated population of 2,367. Approximately 84 per cent of the population is comprised of the Dagaaba ethnic group, while the remaining

[12] A new national census was conducted in 2010, but as of the time of the fieldwork (January to August, 2012), the census report was not yet published. In April 2012, we estimated from the field survey that there were roughly 272 households in the village.

inhabitants belonged to the Wala (10 percent) and Sisaala (6 percent) ethnic groups. Although the average household size was approximately 7.6 persons, households were generally larger, with complex compositions. For instance, during our survey, it was common to come across larger households comprising a senior head (most often a man), his wife or wives, married sons and their wives, unmarried daughters, unmarried men siblings, and several grandchildren. Within our survey sample, there were 18 people in the largest household, and 1.6 wives per married man. The research village lies within the Guinea savannah ecological zone. It is marked by a seasonal environment, with farming systems similar to that found in much of Sahel-savannah West Africa.

The village economy is primarily agricultural. A vast majority (97 percent) work the land as smallholder farmers, producing for subsistence and relying primarily on family labour. In our sample of 155 farming households, only three households (2 percent) contained members who were full-time salaried employees. Aside from smallholder agriculture, a smaller number of residents engage in artisanal mining and fishing along the Black Volta River. Women derive independent income from growing and selling vegetables, brewing sorghum beer, and selling fuel wood and shea nuts (*Vitellaria paradoxa*). Thus, livelihood strategies are intimately bound up with free access to spatially and temporally dispersed resources.

The average household landholding was 0.6 hectares, with a range between 0 and 3.5 hectares. This average landholding was significantly smaller as compared to the regional average of 2.7 hectares (Chamberlin, 2007, p.7). While individual household members, especially women, own small vegetable gardens, a majority of households had principal fields farm collectively. Labour contribution and the outputs from these collective fields are managed and controlled principally by household heads who might be women or men. The main cultivated crops include maize, finger millet, sorghum, groundnuts, cowpea and bambara beans, often in complex intercropping systems. A number of households raised livestock and poultry. Although not a neat and tidy process, the gendered division of labour is such

that men and women participated in preparing farm fields, women and children undertake planting, women and junior men are mostly responsible for weeding, whilst harvesting was the primary responsibility of women. Women work on their vegetable plots with their own labour or with the help of female relatives.

Village lands are held under customary tenure, with rights vested in an earth priest (*Tengdaana*)[13] who held land in custodianship for the community (see Kasanga and Kotey, 2001). The *Tengdaana* allocates land to individual families and new settlers to the village. New settlers are allocated lands at no monetary cost, except in kind payments involving chickens, sorghum beer and a bowl of millet (Kasanga and Kotey, 2001; Oral history with village chief and elders, April, 2012). When lands are allocated to individual families, the family head serves as the primary right holder. However, since this is a patriarchal society, intra-household transfer of land is only by inheritance through adult men. Women can access land through their husbands, fathers and sons, and this access is limited only to usufruct rights (Tsikata and Golah, 2010).

The research area has a long history of labour out-migration to southern Ghana. This migration tends to be seasonal, with migrants leaving at the beginning of the agricultural slack season (November-December), and returning to engage in farming at the beginning of the rainy season (May-June). The historical root of migration is related to regional underdevelopment shaped by British colonial policies, and further entrenched by post-colonial development strategies (Yaro, 2013). As we will show below, however, in recent years, rural out-migration has intensified markedly as a result of farmland appropriation.

4.3 Methodology

Land appropriation is a difficult topic to study empirically. Information is frequently partial, acquisition processes are shady, and disgruntled village victims are less

[13] *Tengdaanas* are descendants of the first settlers in the village (see Kasanga and Kotey, 2001, p.14).

inclined to share their stories (Vermeulen and Cotula, 2010). There are further complexities in collecting data on the precise extent of total landholdings, land quality, land tenure, and decision-making on land uses (see Oya, 2013b). As a result of these complexities, and in common with a political ecology approach, we adopted a strategy of intensive ethnography and methodological triangulation (St. Martin and Pavlovskaya 2009). Analytically, this approach was more appropriate for contextualizing findings, triangulating results, and enriching our ability to better understand emerging dynamics around land deals. Furthermore, this approach was critical because of the relational and socially embedded nature of land access, ownership and control.

The fieldwork took place from January to August 2012, with a one-week follow-up visit in August 2013. We combined qualitative interviews and participant observations with household-level surveys, and focus group discussions. With the permission of village heads, we first administered a survey to a random sample of 155 households (57 percent of households in the village). Table 4.1 shows the survey sample characteristics compared to regional-level statistics. The household questionnaire consisted of 113 structured items and formed part of a larger study on agriculture and food security in northwestern Ghana. The instrument was pre-tested with a pilot sample of thirty households and subsequently revised based upon cultural and political contexts in the field. Some of the questions included household composition and size, household assets, food security status, migration and remittances, farm output, cropping patterns, land ownership, land uses before the enclosure, and total land lost to the mining project. For the purposes of this paper, the survey was meant to identify socio-economic characteristics before and after the land enclosure. The questionnaire was directed to the entire household; thus, both men and women were invited to provide the most comprehensive answers to questions, especially those regarding incomes and land ownership. Two trained research assistants administered the questionnaire, with coordination and supervision by the first author. During the course of the survey, twelve households

dropped out because the men objected to our plan to include women as respondents. Another group of fifteen households refused to answer the questionnaire altogether. In place of these households, other households were subsequently resampled in order to reach an appropriate sample size.[14]

Table 4.1 Descriptive Statistics of Surveyed Households

Characteristics	*N*=155	*Other Studies (Upper-West Region)*
Mean age of household head (years)	58	55[1]
Household head never attended school (%)	90.3	69.8[1]
Mean household size	7.6	7.2[1]
Men-headed households (%)	67.7	81.7[1]
De facto women-headed households (%)	23	18.3[1]
De jure women-headed households (%)	9.3	82.1[1]
Households that are Dagaabas (%)	83.6	57.5[1]
Mean landholding (in hectares)	0.6	2.7[2]
Households severely food insecure (%)	45	34[3]
Households with a migrant in last 2 years (%)	96.8	76.3[4]

[1] Ghana Statistical Service, 2005b, p.88-105; [2]Chamberlin, 2007, p.7; [3]Biederlack & Rivers, 2009, p.13; [4]Van der Geest, 2002, p.153, Table 6.13

Based upon preliminary analyses of the survey data, we used maximum variation sampling (Patton, 2002) to select fifteen households and revisited them for more in-depth, ethnographic studies. The selected households reflected varying characteristics identified in the survey, including: land-losing and non-land-losing households, landholding size, household structure, gender of the household head, and food security status. We conducted twenty-six in-depth interviews with these fifteen households. This sample size was determined using theoretical saturation, that is, at a point where no new ideas were emerging from interviews (Patton, 2002). The sample included 3 unmarried men, 3 men in monogamous marriages, 4 men in

[14] These households were among the land-losing group who were disgruntled and felt suspicious about the motives of our study. They associated our survey with activities of the mining company and feared that we might share their names and landholding information with the government. Later in the fieldwork, this problem tapered off, as villagers realized that our work was not linked to the activities of any company. Indeed, the early stages of the fieldwork were fraught with several difficulties (e.g. gaining and securing access) which we cannot fully elaborate here due to space limitations.

polygamous marriages, 4 first wives, 3 second wives, 2 third wives, 2 widows, 3 unmarried women, and 2 divorced women. Six additional interviews were conducted with key informants, including 2 agricultural extension officers, 1 mining staff, 2 village heads, and 1 officer from Ghana's Minerals Commission. Thus, a total of thirty-two interviews were completed for this study. Following the request of participants, we did not tape record any of the interviews, instead taking detailed hand-written notes, and carefully differentiating between respondents' narratives and researcher inferences.

Interviews centred on questions such as agricultural practices, patterns of labour use and remuneration, migration and remittances, land ownership and tenure, land title holding, household decision-making, and means of access to land through inheritance, transfer, and intra-household distribution. Additional questions were asked about the amount of land lost to the mining project, what forms of compensation were received and who received the compensation. Interviews were conducted in Dagaare, Twi and English, depending on respondents' education and background. Each interview lasted between 3 and 6 hours , depending upon respondents' interests in the discussion and the richness of the conversation. Interview respondents had an average age of 46 years, with a range of 19 to 72 years. On the average, the respondents had lived in the village for roughly 34 years. There was less ethnic variability: 27 participants (85 percent) were Dagaabas, whereas 3 participants (9 percent) and 2 participants (6 percent) were Walas and Sisaalas respectively. The fieldwork also entailed focus group discussions with 37 participants in four groups: elderly men (n=8), elderly women (n=9), young men (n=10) and young women (n=10). Focus groups lasted between 1.5 and 2 hours, and permitted a critical assessment of primary factors driving agricultural change and food security in this rural landscape. Although we draw upon all these data sets to make our arguments, our greatest insights come from the first author's participant observations working and living with farmers over the course of the fieldwork.

Qualitative data from field notes, focus groups and interviews were compiled and analyzed following the methods outlined by Miles and Huberman (1994). We hand-coded each interview data and the associated field notes for relevant themes. We ensured validity and trustworthiness by using multi-method triangulation, prolonged engagement with study participants (eight months), a field site re-visit, and asking respondents to provide feedback on preliminary findings (Miles and Huberman, 1994; Patton, 2002). The procedure for sampling participants, obtaining consent, analyzing data and all other aspects of the fieldwork were reviewed and approved by the Non-medical Research Ethics Board in our university. In interpreting the research findings, we have maintained some of the actual words of respondents, using direct quotations. These quotes have been selected based upon three characteristics: the ability to represent divergent perspectives; typical views expressed by many respondents; and the depth or clarity with which the idea was conveyed. The fragments of interviews are taken from our field notes, in those instances when we were able to capture the actual language and sentences of interviewees.

4.4 Research Findings and Discussion

4.4.1 Land Dispossession, Agrarian Class Formation and Gendered Property Rights

The household-level data suggested that farmland dispossession has led to a process of marked social differentiation within the community. Two forms of social inequalities were identified. The first was an emerging class of landless and near-landless households (Table 4.2), while the second related to gender differentiation in land access (Figure 4.2). On average, households had access to 0.6 hectares of land, whether cultivated or uncultivated. However, this average landholding masked significant variations within and across households. Table 4.2 illustrates comparative statistics on landholdings before and after the farmland enclosure. Approximately 60 percent of households (n=155) reported no land ownership, as they have lost all their agricultural fields to the mining project. Another group of households (39 percent)

were partially dispossessed of their landholdings, controlling less than the regional average landholding of 2.7 hectares (Chamberlin, 2007, p.7). Their marginal holdings were of uneven quality, mostly non-contiguous, and barely sufficient for subsistence (re)production. Only two households (1 percent) reported land ownership of more than 2.7 hectares. The household with the largest landholding owned 3.5 hectares. Out of the 93 households who were landless at the time of the study, 64 households (69 percent) were previously land 'rich,' while the remaining 29 households (31 percent) were near-landless before the enclosure.

Table 4.2 A Comparison of Landholdings Before and After Enclosure for Mining

Household Landholdings	*Before Enclosure N = 155*	*After Enclosure N = 155*
Landless (0 ha)	None	60%
Near-landless (0.1 to < 2.7 ha)	39%	39%*
Land 'rich' (>2.7 ha)	61%	1%

Source: Household Survey, 2012. NB: Landholding includes the entire area of land (whether cultivated or uncultivated) from which a household derives its food and income.

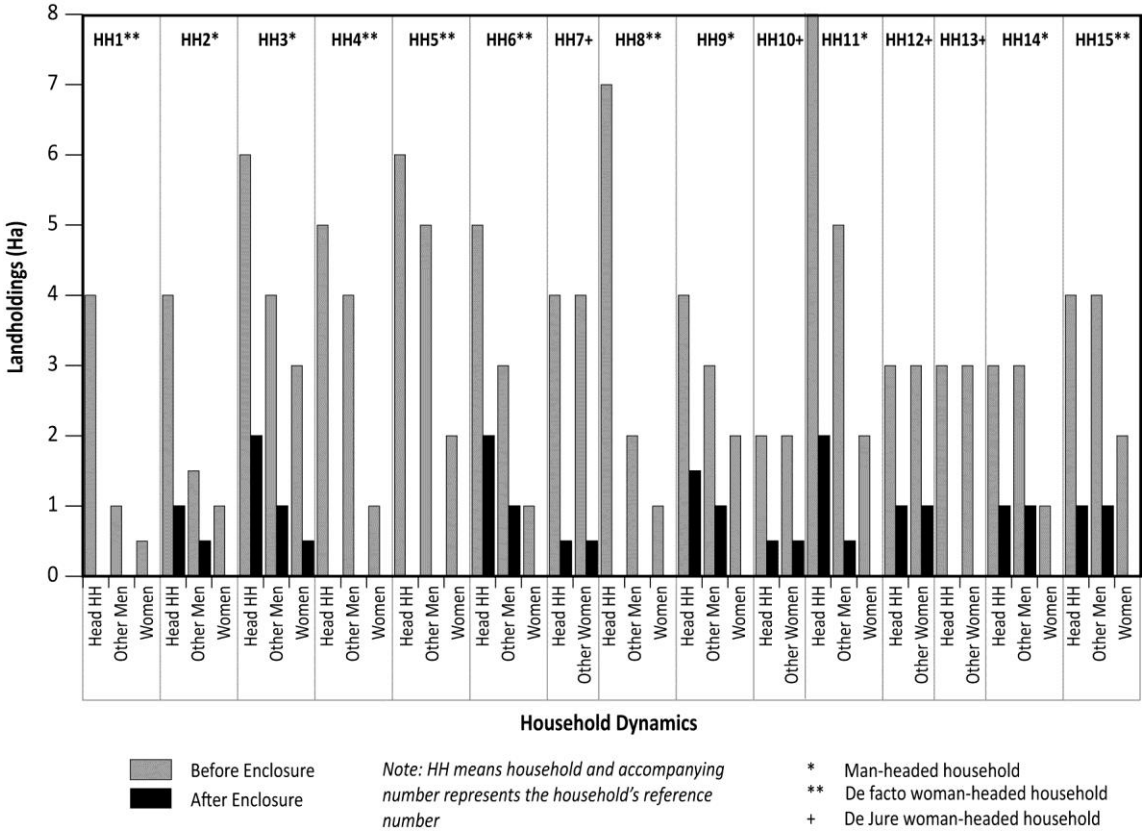
* Within this class, interviews and focus groups revealed that farmlands were severely fragmented in the period after enclosure, compared to the period before enclosure. For example, a household may own a total 0.5 hectares, but this land could be non-contiguous and found in highly dispersed locations.

This differentiation in landholding can broadly be associated with agrarian classes that Bernstein (2010) [following Lenin, 1964] has termed rich peasants, proletariats and semi-proletariats (see also Akram-Lodhi, 2005). For those farmers dispossessed of *all* their primary means of (re)production (land), we classify them as proletariats. For the group of near-landless farmers who are neither dispossessed of all means of self-reproduction, nor in possession of sufficient means of production, we classify them as semi-proletariats. The farming households with relatively large landholdings are classified as 'rich' smallholders. As we will show below, these 'rich' smallholders are able to engage in expanded reproduction, in most cases using the labour power of the proletariats and semi-proletariats.

Indeed, one can argue that agrarian class structure is not simply about resource differentiation or degree of control over land. For example, Gillian Hart has raised some objections to using land as a measure of class, arguing that "a unidimensional measure like landownership is narrow and might produce a distorted picture of patterns of control over resources" (Hart, 1986, p.102). Although this caution is clearly valid, in our particular case study, which was located in an agricultural-based economy, access to land was tightly linked to access to other resources central to agriculture, most notably, labour, seeds, credit and technology (see also Akram-Lodhi, 2005). Moreover, in a situation of increasing land scarcity, even marginal differentials in landholdings are significant.

However, a more fundamental shortcoming of a Leninist approach to class analysis is that it does not uncover in greater detail the differential situation (e.g. access to land) of different members within the same class position. For example, Figure 4.2 illustrates deepening intra-household inequalities in landholdings. This dynamic will be obscured if household landholdings are read through the lens of class. In the following section of the paper, we fully discuss this dynamic, focusing particularly on the gendered impacts of dispossession within and across different classes of households. We use four case study vignettes based upon data from observations, interviews and the survey.

Figure 4.2 Intra-household Landholdings Before and After Enclosure for Mining [15]



Source: Household Survey, 2012.

4.4.1.1 Case Study 1: Land 'Rich' Households

In total, only two households (1 percent; *n*=155) are classified under this class of land 'rich' group. Baba Musa's[16] household had the largest land holding in the village (3.5 hectares). The household was composed of fourteen people: Baba Musa's first wife, second wife, four unmarried sons, three unmarried daughters, three grandchildren, and Baba Musa's step mother.

[15] Landholding was a difficult and complicated variable to measure. It is possible that some households might have over- or under-estimated their landholdings. Oya (2013b) discusses similar difficulties of reliably collecting this type of data in rural Africa. Out of the total 155 sample households, we report here only on 15 households where we did ethnographic studies and were able to verify reported landholdings.

[16] To protect participants' confidentiality, we have given pseudonyms to all informants featured in this article.

The household had lost 9.5 hectares to the mining project, but it owned 3 hectares outside the mining concessional perimeter. The household also had access to 0.5 hectares immediately outside their compound. This backyard plot was previously labelled as the 'women's field' and was used for vegetable gardening by the two wives. However, faced with land scarcity, the 'women's field' had been incorporated as part of the larger household field, leaving women with no opportunity for either vegetable gardening or independent income accumulation. According to the second wife, this dynamic has had a negative implication for women because when household granaries run out, women must utilize their own food reserves to feed themselves and their children. Indeed, this problem was a recurring concern among women. Many women reported that as a result of land appropriation for mining, and the resultant land scarcity among households, men were claiming women's vegetable plots for household cultivation. In a focus group discussion, one woman summed up this concern by exclaiming that "our husbands are no better than Azumah [the mining company]!! Azumah is stealing big family lands and men are also stealing women's tiny lands!!!"

On average, this household produced larger harvests of cereals and legumes as compared to the landless and near-landless households. The household also grew a wide diversity of crops and had larger household income per capita (GHS100 = US$50). The household had access to food almost throughout the year, with their granary running out only two months before the next harvest season. Baba Musa reported that in years of good harvest, the household has supplied grains to their landless and land poor neighbours, in exchange for weeding. Baba Musa also supplies seeds to families who are forced to consume their seed stock as a result of inadequate harvests.

4.4.1.2 Case Study 2: Near-landless Households (with de facto women-head)

This class of households (39 percent; *n*=155) had marginal landholdings barely sufficient for subsistence production (0.1 to < 2.7 hectares). The case of Yoofi and her household typified this category of near-landless class. Dakora was the former head of this household that comprised twelve people. He had two wives. The senior wife (Yoofi) had five children between the ages of 4 and 12. The junior wife had four children between the ages of 6 months and 4 years. Previously, the household owned 10 hectares of non-contiguous land. However, they had lost 8 hectares, and were farming on the remaining 2 hectares.

When the household lost a greatest portion of its farmland, Dakora migrated permanently to work as a migrant labourer in southern Ghana, leaving behind the two wives and nine children. While the wives wanted to migrate, Dakora refused, insisting that they should stay behind and look after the young children. The senior wife (Yoofi) served as a *de facto* woman-head of the household at the time of this study. In a later interview with Dakora, he revealed that land scarcity was the push factor for long-term migration. Asked why he did not migrate with the whole family, he confided that it was not because of childcare, as he had explained to the wives, but he feared that upon migrating, the women might gain greater economic autonomy.

Although Dakora was not staying in the village, he played a significant role in household decision-making. According to the wives, their husband dictated what crops were to be grown and how livestock sales were to be managed. Before he migrated, he divided the remaining household field equally between the two wives. The wives farmed the plots for two consecutive years. During the third year, however, their in-laws (husband's brothers) started establishing claims over the 2 hectares. As Yoofi recounted: "one day, I was coming from the market. I saw some men standing inside our thriving garden. I looked closer and it was my in-

laws. I asked why they were standing on our plot and they said they have come to check on 'their' land." The in-laws argued that Dakora's rights to the land were less than absolute and could be mediated by claims by his own family. Further, the in-laws insisted that the women's land rights were guaranteed only under marriage, but since Dakora appeared to have totally left the village, it seemed the marriage was broken. Thus the land should be reverted to his patrilineal kin who have also lost all their farmlands to the mining project. The wives resisted, claiming that they have invested labour in weeding and soil improvement. The women quickly sent a message to Dakora, but before they could get a response, the in-laws had already cleared and cultivated about 1.5 hectares of the "women's field".

As a result of the marginal landholding (approximately 0.5 hectare), the women said they cultivated a smaller diversity of crops, with about 90 percent of the field planted to hybrid maize. Not only was their harvest marginal, but diets constituted mostly of carbohydrates. Yoofi reported that their harvest was able to last for approximately two months in a year. Consequently, they decided to cut household meals from two to one. Before they lost their farmlands, they were able to produce food that lasted for nine months. The husband occasionally sent food remittances. However, the women complained that these remittances rarely met their food requirements. Both wives could not tell whether compensation has been paid for the land lost to the mining project. They indicated that the husband would be in a better position to provide this information.

4.4.1.3 Case Study 3: Near-landless Households (men-headed)

This category of households had the same landholding as those in case study two, but was distinguished by having an adult male head.

Kuutaala's household was typical of this class of households. He had one wife and three children, and was staying with one unmarried brother. The household previously owned 9 hectares of non-contiguous land of which 6.5 hectares had been lost to the mining project. Kuutaala said he had received monetary compensation of GH¢500 (US$250)[17] for the enclosed land. As Kuutaala emphasized, however, the compensation was not for the "…price of the land, but the price of crops destroyed during the digging of trenches to see if there was gold." One mining officer confirmed this information by saying "compensation has been paid for the value of crops destroyed during reconnaissance surveys…" (Interview, August 6, 2012).

At the time of the study, this household was farming on a 2.5 hectare backyard plot previously used for vegetable gardening by Kuutaala's wife. Similar to case study one, Kuutaala has now incorporated the wife's vegetable plot as a collective household field. The wife complained that she was not informed before the plot was annexed as a 'collective field.' She recounted that: "...without anybody telling me, my okra was removed by my husband and he said we should plant maize and groundnuts for all of us to eat." Kuutaala explained that he was compelled to take the wife's land because the household had lost a greater portion of their farmlands to the mining project.

4.4.1.4 Case Study 4: Landless Households

This class of landless households constituted the vast majority (60 percent) of households in the village, who were significantly poorer and with higher food insecurity. Pifaa's household typified the growing dynamics within this class of landless households. The household was

[17] During the course of the research (January to August 2012), the prevailing exchange rate was approximately: GH¢2= US$1

composed of 15 people, with Pifaa (27-year old and a third wife), serving as a *de facto* woman head. According to Pifaa, her husband, Nmbananoba (age 54), used to be the primary household head. Other members included Nmbananoba's first wife (with 5 adult-unmarried children), second wife (with 4 adult-unmarried children), and Pifaa's two children (5 and 7 year old). The household's total farmlands (10 hectares) fell under the mining concession and had been completely enclosed. Out of the 10 hectares, 1 hectare was the women's vegetable plot that was farmed in smaller fragments by the three wives.

Faced with land scarcity, migration served as the primary means of livelihood for this household. With the exception of Pifaa and her two children, the remaining twelve members have migrated almost permanently. When asked how long it had been since her husband returned, Pifaa responded by saying: "Never since 2010". At the time of the study, the migrant members were engaged in sharecropping in a small community located in Ghana's Brong Ahafo Region. They were traced and interviewed in their sharecropping field. In the interview, Nmbananoba reported that he had received compensation for crops damaged by the mining firm. As he recalled the "household head received something small… like GH¢300 [US$150], which took a long time to come." However, the senior wife suspected that the compensation was more than GH¢300. As the woman confidentially disclosed, "I think Nmbananoba isn't saying the truth. He keeps saying we got GH¢300. I think it's more than that because when it's about money, men will not say the truth. You mean that whole big farm for GH¢300? The problem is also how Azumah pays the money… it's always to the husband."

Although this household was landless, the husband and other adult male children were much enthused about the mining project. For instance, Nmbananoba commented that "we know when the mining

starts operating big, there will be work for everybody." In contrast, however, all the three wives held negative views about the project. The women complained bitterly that during the mining reconnaissance survey, their vegetables were destroyed, but the compensation was paid to the husband who was presumed to be the 'owner' of everything on the plot. The second wife expressed her frustration by saying: "they [mining company] dig holes in my farm but gave the money to Nmbananoba and we did not see the money."

The migrant household occasionally sends food remittances to Pifaa. At the time of interview in 2012, the last time Pifaa had received food remittance was during Christmas in 2011. Pifaa obtains independent income by gathering and processing shea nuts for sale. While shea nut has been integral to women's income generation in northern Ghana (Chalfin, 2004), Pifaa complained that the raw material was now harder to find because of the enclosure of family and common lands. A similar development has been reported for other villages in Ghana's Northern Region (Nyari, 2008). During the month in which Pifaa was interviewed, the household had a highly grain-based diet most of which came from purchased maize.

4.4.2 Commentary on the Four Case Studies

These case studies are specific and particular and it is impossible to generalize with any precision across all households in northern Ghana. Despite the local and specific details of these cases, however, they point to broader dynamics that are emerging beyond agrarian class structure. One of the key dynamics concerns how large-scale land dispossession reworks the rules governing gendered property rights and intra-household access to land. As suggested by the case studies, there have been claims and counter claims over land, with different householders seeking their share of much smaller parcels. The case studies further illuminate how women are

marginalized in benefits that accrue from land transactions. In particular, benefits in the form of monetary compensations privilege titled or principal landholders, who are always men, thus ignoring the importance of rights to usufruct held by women. For example, in case study four, women's crops were destroyed, but since their customary usufruct rights were unrecognized as property (Ribot and Peluso, 2003; Tsikata and Golah, 2010), these women were not deemed as legitimate owners to be consulted and compensated.

The case studies further demonstrate how intra-household struggles over land become entwined in communal struggles to cope with foreign acquisition of farmlands. Interviews conducted with women indicated that as a result of land dispossession, and the resulting protracted male out-migration, land control was becoming increasingly insecure. Husbands' kin were able to use their patriarchal power to exploit the remaining fragmented lands, the majority of which were plots being used for vegetable gardening by women. Indeed, this dynamic constitutes one of the less recognized aspects of the growing literature on recent large-scale land acquisitions. An offshoot of these land transactions is that it can transform the domestic arena into a site of struggles over properties. In particular, it opens up new sources of power for claims and counter claims over land, or what might be termed "domestic land grabbing." The sources of power for these claims include, for women, marriage-based rights as a conditional part of the conjugal contract, and for men, inherited male rights (Tsikata and Golah, 2010). These rights are social relations subjected to discretionary interpretations, which often work to the particular disadvantage of women. As Jackson (2003, p.466) reminds us, "inherited male rights are possibly firmer and less open to discretionary interpretation than marital 'rights.'" Interviews with women confirmed that although male kin have the right to take land, this was not a right that they frequently exercised. As many women respondents explained, the new contestations over land have been engendered by farmland enclosures and the resultant land scarcity.

Another implication of the findings is decreased dietary diversity as a result of land-grabbing. Since the majority of production is now based on cereals rather than vegetables, household diets are significantly less diverse, which could have long term implications for the growth and development of children. As shown in several nationally representative data, the diversification of diets is associated with improved food security, better child nutrition, and rapid physical as well as mental development (e.g., Arimond and Ruel 2004). Moreover, when household granaries run out, women must utilize their own food reserves to sustain themselves and their children. To a greater degree, this gendered responsibility compels women to engage in independent farming. In a context of increasing land scarcity, annexing women's vegetable plots into a household collective field might serve the overall collective need of the household, but this might not always be the case. In many parts of rural Africa, evidence of men preventing wives' access to household granaries (Bassett, 2002); and of women separating their incomes from that of men (Schroeder, 1999), all point to the existence of competition and conflict within the household (see also Thorsen, 2002). These studies show how farm outputs and incomes may not be shared equitably, and help to explain why women struggle to maintain "a field of their own" (Agarwal, 1994), "but not necessarily to opt out of the household in order to make it on their own in isolation" (Razavi 2009, p. 209).

Finally, the vignettes suggest increasing labour mobility as a result of partial or complete land losses. Whether these migrants are men, women or include both genders, depend on household composition and the degree of decision-making power held by householders (e.g. see Case Study 3). However, the survey data indicated that compared to women, men were more likely to migrate and stay for prolonged periods when households are faced with acute land scarcities. Long-term out-migration and the spatial fracturing of households were both having significant implications for gendered agricultural relations. In the next section of the paper, we examine these relations and the resultant implications for local agrarian change.

4.4.3 Farmers Working Afield without Land

The field survey, interviews and observations indicated that most farmers have left the countryside completely, after losing their productive agrarian capital (farmlands), or being reduced to the cultivation of marginal lands. This trend was evident in all classes of households, but was most pronounced among the landless class. Indeed, landless households reported a higher average number of migratory members (6 persons) as compared to near-landless (3 persons) or land "rich" households (1 person). Lacking access to the means of production, these households were unable to survive without relying almost exclusively on hiring out their labour power. About 70 percent of interview respondents revealed that household members were working in insecure, exploitative and typically low-wage employments in the urban frontiers in southern Ghana. In explaining the daily struggle for a livelihood, a landless farmer summarized several respondents' sentiments, by saying: "we're farmers but aren't farming," echoing Henry Bernstein's point that many "rural people may not qualify as "farmers" in any strong sense…because they lack land" (Bernstein, 2010, p.3).

As noted earlier, northern Ghana has a long history of circular labour migration, primarily to the agricultural hinterlands in the south. Oftentimes, the causes of this migration have been linked to environmental change and the lingering impacts of colonial and post-colonial development strategies (Abdul-Korah, 2006). While our study participants did indicate the challenges posed by droughts and decreasing state support for smallholders, the majority clearly identified land appropriation as the factor that propels farmers to leave the countryside. Older respondents in particular made this point more forcefully. In an oral historical interview, a 75-year-old woman revealed how many of the agricultural workforce have gradually left the village. She explained the phenomenon by saying: "Take the case of my house - the elderly son first left. One year later, the middle son left. Seven months later, the young one left. I've not seen them in four years. Land is the big reason for that form of movement. Previously, young men will travel to do by-day

[casual labour work] and come home and work in the rainy season, but now they don't come because there is no land and there is no farming." Another 60-year elderly man showed how land was an important driver in migration decisions: '…at first, migration was seasonal. Now, it's long-term. People will migrate and will not return for so long because there is no land. Even some young women are traveling out to work.' An account by an older woman (62 years) indicated a similar story: "It's really difficult. Have you ever seen a farmer without land? That's the life here and you can't support 8 people on that type of life…You've to travel to look for land somewhere to feed your family."

Interview respondents revealed that throughout the course of migration, these landless and near-landless farmers are further marginalized and their livelihood insecurity deepened. They are only able to afford accommodation in underserved urban hovels with inadequate sanitation, often facing uphill challenges over cultural and linguistic identities. Some reside in bus terminals under conditions far worse than life in their own homeland. The survey data revealed that a few of these landless and near-landless migrant men operated small businesses such as butcheries (5 percent) or work as mini-bus conductors (8 percent). The overwhelming majority (87 percent), however seek employment in the agricultural sector. Some of them work as casual day labourers (locally called by-day labour), while others work as tenant and sharecrop farmers on piece-rate or fixed contract basis (see also Kuuire et al., 2013). With the latter, land is often obtained through rent-in-kind sharecropping, with rents fixed at one-third of the harvest, if the tenant advances the production cost, and two-thirds otherwise. Women typically worked as domestic servants (43 percent) or as porters in bus terminals (57 percent).

In the course of the fieldwork, migrant households and their families routinely stressed that working as casual labourers, or as sharecrop farmers, were all highly exploitative in terms of wages and contracting arrangements. A majority emphasized that these exploitations were being fostered by migrants' fragile social networks, financial insecurity, and what Tania Murray Li has described as the endless supply of

"surplus labour" (Li, 2010). Whether one was working as a day labourer or sharecropper, wages were either substantially lower or the same as what they could potentially earn for doing similar work in their home village. For example, by-day labour was recruited on a daily wage basis at a rate of GHS5 or US$2.5, remuneration remarkably below the daily expenses for accommodation and food in the city. According to land-poor migrant women and men, this wage is often cut by one-half during off-peak demand for agricultural labour. Many sharecrop farmers reported that they have had their contracts terminated for inhumane reasons, including extended illness, getting injured, or poor harvests. According to farmers, the most difficult part of a sharecrop contract was when a tenant is obligated to pay rent even if crops are lost to natural disasters.

Other landless labourers reported that they were being provided with on-farm accommodation and food as part of their labour and sharecrop contracts. Whereas landlords and farm owners characterize these provisions as "incentives", a number of migrant labourers revealed otherwise. They showed that these "incentives" were rather disciplinary and exploitative. A middle-aged landless farmer, who was working as a by-day labourer, explained the subtle politics of labour contracting and how the process was riddled with exploitation. With greater clarity, he stressed a recurring concern among land-poor migrant labourers, that is, how on-farm accommodation indirectly restrains farmer mobility and makes labour readily available for over-time, yet unpaid work:

> The land owner has put a mud hut on the plot. He provides working tools and gives food twice a day. We're twenty people living there - all from northern Ghana: Dagaaba, Gonja, Mamprusi… He says if there is shelter and food, workers need not leave the farm plot. So, we spend all our time here. Normally, by-day work should be 8:30am to 1:00pm, but when you stay inside the farm shelter, the owner over-works you. When he comes and you aren't working after 1:00pm, he says you are lazy. He says you are trying to cheat him. Because they see that you're staying in the farm all the time, you've to work from 7:00am to 6:00pm, but the money is the same. He doesn't pay for the time worked after 1:00pm to the night. That's an abuse. He thinks we don't know the rules. When you complain, he says you're making trouble, so he'll sack you. But you don't

> want to be sacked. With no land back home, you don't want to be sacked. You can't go home. That's why we take all this abuse.

In the foregoing contracting relationship, we see how landlords subtly appropriate, yet fail to pay surplus labour from the migrant work force. We further see how asymmetrical class and power differences are accentuated and reproduced. The class position of these landless migrants labourers, effectively removes their bargaining power to negotiate for fair wages. Their social vulnerability further precludes them from complaining about working conditions. These migrants' willingness to endure exploitative labour regime underscores the ways in which migration, sharecropping and casual labour are hardly issues of choice, but a necessity. Findings such as these aptly reveal contradictions in large-scale land acquisitions, particularly their implications for the agrarian question of labour (Li, 2011; Oya, 2013a). Farmers are being dispossessed of their farmlands and consequently expelled from agriculture; yet, their labour power is not absorbed elsewhere in the economy, thus rendering the rural workforce highly superfluous. Increasing labour redundancy or "surplus population" (Li, 2010) compels land-dispossessed farmers to leave their communities, seeking out (non-)farm income. Leaving these spaces also means leaving social networks that result from being in place, thereby making these farmers easily exploitable.

During interviews with migrant workers, all of them revealed that southern Ghanaian landowners were most interested in sharecropping involving perennial crops. For landless and near-landless migrants who were compelled to engage in such contracts, they explained that it was a major threat to food production and food security. According to farmers, sharecrop contracts involving cocoa, oil palm , coffee and citrus fruits have a long maturation period (oftentimes between 3 and 5 years) in which there are no harvest to share. In order to meet immediate food remittance needs (Kuuire et al., 2013), many landless tenants were farming the area directly beneath cocoa, oil palm and coffee plantations. They planted these fields to maize, yam, plantain and cassava until a point where these annual crops were shaded out by

the perennial crops. As many tenant farmers explained, however, landowners were discouraging this intercropping practice. They do so by rationalizing that, first, it is not part of tenants' cultivation rights, and second, tenants tend to severely prune stands of perennial crops (the primary products in the share contract), so that these perennials never shaded out annual food crops. A farmer from a land-losing household elaborated in detail the difficulties in making a living as a sharecropper:

> Sharecropping is not good for a family man. My two boys work with me, my wife and my daughter. At harvest, the farm owner will take more than half of the produce. When you work on your own land, you can harvest and eat anytime. But when you work for someone as a sharecropper, he will say wait until harvest season. Don't plant this crop. Don't plant that crop. If you are hungry and you harvest small, they think you're trying to steal from them.

For all the migrant workers who were interviewed, they were not only confined to unproductive sharecropping arrangements, but life had become an endless cycle of landlessness. They earned incomes barely enough to maintain themselves, let alone send remittances back home. In effect, they were caught in a "simple reproduction squeeze" (Bernstein, 2010), that is, they did not have the primary means for own-account (re)production, yet their labouring work did not generate a large enough income to increase their food stores. These findings add further credence to evidence from Indonesia, where land dispossession has not only constricted resource rights, but put households into exploitative commodity relations (Julia and White, 2012).

It is important to acknowledge that diversifying livelihoods away from rural farming, and into wage labour or urban farm and non-farm activities, is not in itself a problem, and can be part of the portfolio of strategies used to meet multiple livelihood objectives. As Tania Murray Li has persuasively argued, "subsistence agriculture pursued in isolated villages is a form of life many rural people are eager to escape" (Li, 2009, p. 634). Even in the 2008 World Development Report, the World Bank encouraged rural smallholders to exit agriculture if they cannot compete with the increasing commodification of land and labour (World Bank, 2007). Yet, exiting

agriculture, and making a livelihood through wage employment or proletarianization, becomes a problem if these livelihood pathways worsen and perpetuate pre-existing livelihood conditions.

4.4.4 Gender, Migration and Changing Organization of Peasant Farming

Among our interviewees, many shared the sentiment that the organization of household production was being reworked because of landlessness and the ensuing protracted migration. As described above, men were migrating for waged labour in cities, whilst leaving women to farm, to maintain households, and to defend family rights to resources. For the semi-proletarian class in particular, this masculinized pattern of migration establishes an opportunity cost for social relations of household production. The most significant cost was the feminization of farm management. Whilst migrants' food remittances were benefiting left-behind families (Kuuire et al., 2013), their labour power was being lost for a considerable time period. In fact, this finding was not in itself surprising. As Carmen Deere has noted, "male participation in temporary wage labour, particularly when it requires seasonal migration, has everywhere been associated with higher female participation in agriculture" (Deere, 2009, p. 116). What was rather revealing in our study was that women were managing household production from a much disadvantaged position, more so in a patriarchal setting where women have tenuous land rights, and where state agricultural programs continue to target men (Apusigah, 2009).

As compared to women, adult men reportedly have far-reaching influence in public arenas within and outside the village, especially in mobilizing co-operative labour, in dealing with government institutions, and in everyday village politics. Their long-term absence therefore affects households' intra-community property relations. This issue emerged rather strongly as a concern for women who were missing migrant husbands, as compared to those in single, divorced, and widow-headed households. For the greatest majority of women, they faced labour problems not only because they cannot afford to hire one (i.e. labour), but also because they were

less able to mobilize political links for co-operative working groups. In the following comments, a woman highlights the manipulation of cooperative or reciprocal labour parties: "The labour group exists, but now there's a new tactic: The way it works is that, once the members see your husband is not here, or doesn't visit home often, your field will be prepared last. And that delay can be very bad - when rains are coming and you want to plant quickly." In another typical example, a 43-year old woman revealed how resident men were defaulting reciprocal work-parties: "When it's your turn and you're a woman head, the men won't turn up. They simply ask their wives to go and weed - that reduces the number of people supposed to provide shared labour." The following fieldwork excerpt shows what happened in another woman's household: When Rukaya invited the labour group to help prepare ridges in her field, only nine women showed up. When the work was completed, however, the women, accompanied by their husbands, proceeded to Rukaya's house to eat and drink.

Equally important, women respondents stressed that they now retain a substantial responsibility for farm management. Yet, the delivery of agricultural programs has not changed to reflect this new role. Oftentimes, information about access to major inputs and programs (e.g. food aid, new agricultural inputs, flood relief items) are still mediated through village heads and their elders, all of whom are men, before in turn reaching down to individual households. It is here that village-level politics become very animated. As one middle-aged woman frustratingly described, successful access to these programs and information hinge upon "…having a man who is *present* to lobby to get the household's name on top of the beneficiary list. Not having your husband here, means not getting anything. If lucky, your name could be written, but maybe at the bottom."

With increasing number of men migrating out, one might be tempted to think that their long-term absence will be empowering for women, but it is not. Indeed, the absence of men reportedly opened up new spaces of autonomy for women, including ultimate control over household budgets, and unrestricted access to

granaries. However, this autonomy was reported by less than a quarter of those households missing migrant husbands. For the remaining majority, male control remained unbroken. Mobile phone technologies have meant that absentee husbands have a virtual presence in households, making decisions from hundreds of miles away (see Case Study 2). The following fieldwork excerpt provides a vivid illustration of this point: During interviewing in one damp day in May 2012, Zaami got a cell phone call. It was a call from her migrant husband who has heard that the planting rains have arrived. Zaami asked to be excused. She excitedly left the interview scene, but a few minutes later, she returned quite upset. She wanted to plant local maize, but the husband demanded that the field should be planted to hybrids. And to top it all off, there was no money for the seeds. The husband further instructed Zaami not to sell anymore chickens. At this point, Zaami was no longer ready to continue our interview. With her arms crossed over her chest, she looked rueful and asked that the interview be put off till the next day (Reproduced from field notes, 9th May 2012).

Repeatedly, many women were quick to express how food remittances are irregular and inadequate, and how migrant husbands were not willing to share income earnings. Most of the women were in agreement with the following statement by a 45-year-old woman: "My husband will never send money. He instead sends food. He would tell me the job is not good – or he'd say something like the landlord is cheating him. But I don't know a lot of the details." Her husband, on the other hand, painted a more complicated picture: "I still care about my wife and children. The difficult thing is when they call on Sunday, and all the kids will be put on the line, and they will demand more food and even money. After so many years apart, you want them to know that you're still in their lives. But it's hard to find words to tell the kids there is no money. I wish they knew how I get the food items that arrive on their door step every month." Indeed, part of what made intra-household relationship so bitter was that migrant members were living on the edge, and so too were left-behind householders.

The greatest majority of households were worried about food insecurity, with 82 percent eating fewer kinds of food, 78 percent eating smaller meals than they consider normal, and 88 percent going to sleep hungry (Table 4.3). These findings ran in stark contrast to Boamah's (2011) analysis of land-grabbing and food security in northern Ghana. Based upon research in two agrarian villages, the author argues that in Ghana's rural north, not only have land acquisitions diversified income sources, but the "existence of 'food sharing' in the households meant that the diversified income sources improved household food security" (Boamah, 2011, p. 173; emphasis in original). Although an intriguing finding, the analysis is based on a theory of the household that renders gender dynamics as insignificant. The author's portrait of the household over-simplifies the frictions, bargaining and often contested rights that women and men exercise over the exchange of domestic resources. Implicit in the arguments are assumptions of altruism and the pooling of household resources into a single conjugal fund (see Boamah, 2011, p. 173-5). However, the analysis presented here, together with detailed case study material by Tsikata and Yaro (2013), do not endorse this image of the northern Ghanaian household. Examining non-pooling households in northern Ghana and Africa more generally, Ann Whitehead has also noted that "an important characteristic of the system of household allocation and distribution is that rarely, if ever, is it based on a simple notion of the sharing between household members of what are held as joint resources and fund" (Whitehead, 1994, p.39). It is thus hard to concur with Boamah's (2011) argument that in areas where land is being acquired in northern Ghana, incomes are diversifying, food is being shared, and consequently, food security has improved. Once land acquisitions are examined more closely, and all the complexities, including micro-level gender politics are revealed, the picture is not as clear-cut as Boamah (2011) suggests.

Table 4.3 Households' Affirmative Response to Nine Food Insecurity Questions [18]

Household Food Insecurity Access Scale Questions - During the past 4 weeks did you or anyone in your household:	Food Insecurity Survey in the Hungry Season-April, 2012 (*N*=155)	Food Insecurity Survey in the Agricultural Season -August 2012 (*N*=155)	Total
	N (%)	*N* (%)	%
Q1:Worry about how to access food	115(74)	97(63)	69
Q2: Unable to eat preferred food	101(65)	99(63)	64
Q3:Eat just a few kinds of food	134(86)	121(78)	82
Q4:Eat foods they really don't want to eat	120(77)	95(61)	69
Q5:Eat a smaller meal	140(90)	100(65)	78
Q6:Eat fewer meals in a day	138(89)	88(57)	73
Q7:No food of any kind in the household	100(65)	60(39)	52
Q8:Go to sleep hungry	98(63)	78(50)	88
Q9:Go a whole day and night without food	109(70)	86(55)	63

Source: Household Survey, 2012; NB: these rates are significantly higher than regional levels of household food insecurity (34%) in the Upper-West (Biederlack and Rivers, 2009; Hjelm and Dasori, 2012).

4.5 Conclusion

In the mainstream discourse on foreign farmland acquisitions, much of the academic literature centres upon drivers and impacts at the macro-level. Rarely addressed are the emerging dynamic and impacts within households, between genders, and among generational-based groups. In this paper, our aim was to use northern Ghana as a case study to shed light on some of the emerging gender dynamic around land grabbing and gendered agrarian change. Admittedly, the study sample is not representative of the entire population of northern Ghana, which is a vast, heterogeneous region. The case study material should therefore be taken as examples of important processes of change that are geographically specific, rather than a generalized pattern for the region.

Notwithstanding the village-level nature of our study, however, it offers a much-needed "view from below," and provides innovative contributions to the still-maturing literature on land-grabbing (Borras and Franco, 2012; Kaag and Zoomers,

[18] These survey questions were drawn from the Household Food Insecurity Access Scale (HFIAS) developed by Coates et al., (2007).

2014; Kenney-Lazar, 2012). The study adds new empirical insights by illuminating not only the gendered and class differentiation occasioned by land grabbing, but the scaled spaces (individual, household and village levels) in which these impacts are played out. In particular, the study shows how macro- or village-level shifts in landholdings ultimately trickle down into households, and often to the women within them. While men are able to solidify their command over remaining fragmented lands, women's land access and tenure rights have come under increasing threat. These findings are similar to those reported by Schoneveld et al. (2011), and Tsikata and Yaro (2013), who have all demonstrated that in large-scale land grabbing in northern Ghana, women's resource rights are constricted more easily than men. Our findings further extend, both geographically and analytically, the work of Julia and White (2012), and Mutopo (2011), who have documented gendered experiences of land dispossession in Indonesia and Zimbabwe respectively. Moreover, in the emerging literature on land grabbing, scholars often stress severe land inequality among farming households. Perhaps less well acknowledged is the fact that such deals also leave severe inequalities in landholdings within the farming household itself.

This study also adds theoretical rigour to research on land grabbing, where there exists a paucity of gender analysis and feminist perspectives. Theoretically, the findings suggest that focusing on class or gender alone may fail to characterize correctly which social groups are hard hit by land dispossession. An agrarian political economy or a class-analytic perspective (Bernstein, 2010) may be a useful first step in highlighting the differentiation occasioned by land grabbing. Yet, these perspectives need to be infused with micro-level politics of gender inscribed within households and villages to better understand "who will win, and who will lose, from the ways in which boundaries are drawn" (Hall et al., 2011, p.198). As our case study vignettes suggest, for most women, their insecure land tenure was not merely based upon the class position of their household, but gender relations within it. Thus while class is useful in analyzing social differentiation, it can present a static and homogenous

picture of access to resources, making it difficult to identify peculiar challenges facing marginalized groups.

Although not intended to test household models, this study also contributes to academic literature that challenges the unitary view of the household. Our findings demonstrate that when land appropriation is examined at a household level, it is neither a homogenous experience nor a fully unproblematic one. Indeed, despite the conceptual limitations of the unitary household model (Razavi, 2009), this framework persists in analyses of the impacts of large-scale land acquisitions. The case studies presented here, together with that of Julia and White (2012), suggest that the household should be seen as a locally constituted political arena. Without "breaking open the black box of the household" (McCarthy, 2012, p.615), it is difficult to grasp the behaviour and interests of its members, or the gendered impacts of land grabbing. Additionally, this paper answers recent calls to centre labour in the land grabbing debate (Li, 2011), and complements Kenney-Lazar's (2012) challenge that "land is not the only focal point of social justice struggles in rural areas; labour issues and control over other forms of property are just as important" (p. 1035). Our findings suggest that in addition to the ongoing land dispossession, household labour regimes are being restructured in complex ways. As a result of growing farmland commercialization, many of the agricultural work force have been made redundant and pushed into distress migration. They migrate to locations where they are further exploited and their class inequalities entrenched.

These findings have potential policy implications for the future of agriculture in northern Ghana and beyond. Land is the most basic productive resource for people who depend on agriculture for their livelihoods. If land appropriation continues to increase at current rates, it could have contradictory effects on the long-term trajectory of agricultural development. Opening national agricultural lands to foreign-based investors can offer economic benefits, but can also reproduce the conditions that generate food insecurity and poverty. There is therefore a need to secure small farmer land rights, including that of women. In order to grow more food, farmers

need secure rights to their land and critical natural resources. Secure land rights provide more incentives for long-term productive investments. Tenure security has also been shown to increase food security, income opportunities and respect for smallholder farmers. Most importantly, increasing women's tenure security has positive implications for agricultural productivity, better food access, improved food security and child nutrition (Doss, 2006; Hawkes and Ruel, 2008; Van den Bold et al., 2013).

A major conclusion of this paper is that large-scale land acquisitions are questionable as a strategy for reducing poverty and ensuring food security in northern Ghana. The state's commitment to improving agrarian development centers upon opening up rural lands to foreigners. Indeed, these developments may further undermine government policies towards self-sufficiency in food production and food security. At a moment when there are significantly higher levels of food insecurity in northern Ghana, it is paradoxical that farmers should be separated from the principal means of agrarian production, and land diverted towards non-food production. If contemporary threats to land tenure security continue, it could make agriculture less attractive, with consequences for the long-term trajectory of agrarian development in the region. As noted earlier, land grabbing is not new. Indeed, the precolonial and colonial periods witnessed the grabbing of large swaths of arable lands. What is new in today's mega-land acquisitions is that they are occurring in an era when rural agrarian systems are already threatened by climate change, ever-decreasing state support for peasants, and global restructuring of agriculture. Increasingly, the current debate about land grabbing is a debate about the fate of peasants, who constitute about half of the world's population, and derive a significant portion of their livelihoods from agriculture. In order to help these peasants, there is a need to invest in their small-scale, agroecological farming, and not solely in the land on which they depend.

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CHAPTER 5

META-ANALYSIS AND CONCLUSION

5.1 Introduction

This concluding chapter serves a three-fold purpose. Firstly, through a meta-analysis, I put the thematic case studies into direct conversation with one another, drawing connections and comparisons among cross-cutting issues. I also bring the two study settings into a side-by-side comparison. Secondly, I explain what the key findings might mean for scholars, policy makers, development professionals, agricultural scientists, and concerned citizens seeking a better understanding of agriculture and food security in northern Ghana. I provide practical suggestions for addressing each of the major challenges identified in the thematic case studies. Finally, I specify the contributions of the dissertation to research in human geography more broadly, and political ecology most specifically. To begin the meta-analysis, I first turn to the entry-point of the dissertation by revisiting the research questions.

5.2 Back to the Problem: Mapping the Coordinates of the Hungry Farmer Paradox

In the introductory chapter, I raised a broad set of analytical questions to frame the dissertation. Employing a political ecology framework, and building upon the context established in the first chapter, I then pursued the research questions through three case studies. Thematically, the case studies included: government responses to food insecurity, and the unrelenting drive towards high-input agriculture in northern Ghana (Chapter 2); climate variability, local knowledge and resilience (Chapter 3); and land-grabbing and gendered agrarian change (Chapter 4). Despite the wide-ranging themes, the manuscripts coalesce to improve our understanding of the hungry farmer paradox in northern Ghana. Below, I outline the major constellation of arguments in the three case studies. I then draw on these arguments to answer each of the research questions. A schematic mapping of the connections and cross-cutting issues among these case studies are shown in Table 5.1.

Table 5.1 Meta-Analysis

THEMATIC CASE STUDIES			GEOGRAPHICAL SETTINGS	
MANUSCRIPT #1: Paths to Agrarian Development > **Methods:** Archives, survey, oral history, interviews, observations, focus group discussions (FGDs). >**Key Issues**: Colonial legacy, environmental change, farmer agency, gender politics, neoliberal policies, political economy of resource access. > **Key Arguments** (1),(2),(3),(4),(5),(7)	**MANUSCRIPT #2: Climate Change, Local Knowledge and Resilience** > **Methods:** Survey, meteorological data, oral history, interviews, observations, FGDs. >**Key Issues**: Environmental change, farmer agency, colonial legacy, neoliberal policies, gender politics and property rights. > **Key Arguments** (2),(3),(4),(5),(7)	**MANUSCRIPT #3: Land-grabbing and gendered agrarian Change** > **Methods:** Survey, in-depth interviews, observations, FGDs. > **Key Issues**: Appropriation of surplus labor, class dynamics, gender politics and property rights, wage labour, political economy of resource access and control. > **Key Arguments** (2),(3),(4),(5),(6)	**VILLAGE 'A'** **Micro-Geography** > Population: 494 > Physically isolated village. > Droughts and flooding. > Less developed. > Average landholding: 0.6 ha. > Livelihood options: farming, herding, fishing and mining. > **Key Arguments** (1), (2), (3), (4), (5), (6), (7)	**VILLAGE 'B'** **Micro-Geography** > Population: 4,041 > Near a major town. > Droughts. > Relatively developed. > Average landholding: 2.4 ha. > Livelihood options: farming and herding. **Key Arguments** (1),(2),(3),(4), (5), (7)

KEY OR CROSS-CUTTING THEMES OF FINDINGS AND ARGUMENTS

1. High-input agriculture is not the appropriate panacea for agrarian development in northern Ghana. This approach is vigorously being pushed to improve small farmer productivity, but adoption is still low. The low adoption is best explained by the intersection between the prevailing political economy and the human ecology of agriculture in the savannah **(Reference: Manuscript 1)**.
2. The micro-politics of gender and power hierarchies shape the social relations in which food is produced and distributed within households in northern Ghana. In many cases, women have less power to access and make decisions about land, food reserves, labour and financial resources than male household members **(Reference: Manuscripts 1, 2 & 3)**.
3. Agricultural development strategies need to be sensitive to the importance of place, politics and history in northern Ghana. In particular, policies and programs should take into account the micro-politics of households, as well as the particularities of ecological, cultural and social relations across scales **(Reference: Manuscripts 1, 2 & 3)**.
4. In northern Ghana, farmer problems are not solely about climatic variability, which in many ways local farming systems are well adapted, but rather about broader scale political and economic processes, including land tenure rights **(Reference: Manuscripts 1,2 &3)**.
5. The uneven outcomes of structural adjustment reforms in the 1980s are still impeding the viability of smallholder farming in northern Ghana **(Reference: Manuscripts 1 & 2)**.
6. The surge in land-grabbing is not only undermining small farmer agriculture, but creating an emerging class of landless farmers whose labour is made redundant, and forced to reproduce themselves through exploitative sharecrop contracts. Current land-grabbing also makes women's entitlement to land more vulnerable than men. In addition, households are experiencing less nutritional diversity, as production currently consists mainly of cereals instead of vegetables. Any agrarian development strategy should accord a major priority to inequalities in landholdings and other productive assets **(Reference: Manuscript 3)**.
7. Small farmers in northern Ghana are responsible environmental managers, but their local knowledge, innovations and resilience are often misconceived as inefficient. If future agrarian development strategies intend to have any chances of success, such strategies should not change but rather build upon what farmers already know **(Reference: Manuscripts 1 & 2)**.

Several issues and themes recur throughout the empirical chapters. Seven of these issues stand out as particularly critical and they form the fulcrum of my arguments. The first issue relates to agricultural technologies. High-input agriculture is being pursued vigorously to improve small-farmer productivity in northern Ghana. However, adoption is significantly low. I have argued that the intersection of the prevailing political economy and human ecology of agriculture in the savannah (political ecology) explains the low adoption of these high-input technologies. Secondly, the micro-politics of gender and power hierarchies shape the social relations in which food is produced and distributed within northern Ghanaian households. Thirdly, agrarian development strategies often assume that households are socially homogenous and can function equally under generic development models. Almost all the thematic case studies reveal that these assumptions are erroneous. The findings point to many instances of cooperation, conflicts and struggles over resources such as land and labour.

A fourth key finding is that farmer problems are not so much about climatic variability, to which in many ways local farming systems are well adapted, but rather about broader scale political and economic processes of access to markets, agricultural credits, and other key inputs. Fifth, the uneven outcomes of structural adjustment reforms in the 1980s are still impeding the viability of smallholder farming. The majority of farmers still struggle to access affordable agricultural inputs, including the high-input technologies being promoted to increase food production. Sixth, the surge in land-grabbing is not only undermining small-farmer agriculture, but is creating a dispossessed class of landless farmers whose labour has been made redundant. These farmers are currently forced to reproduce themselves through sharecrop contracts with paltry wages and exploitative working conditions. The appropriation of village farmlands also makes women's entitlement to land more vulnerable than men. My findings highlight the reality that in northern Ghana, any effective agrarian development strategy should accord a priority to these land inequalities. Finally, northern Ghanaian farmers are responsible environmental

managers, but their local knowledge, innovations and resilience are often misconceived as inefficient. If future agrarian development strategies intend to have any chances of success, such strategies should not change, but rather build upon what farmers already know. Based on these cross-cutting themes, I now attempt to answer each of the research questions and relate the findings to relevant literature and key theoretical debates.

In Chapter 1, the first research question sought to understand why food insecurity is particularly prevalent in northern as compared to southern Ghana. The answer to this question depends, in part, on how it is framed theoretically. This dissertation brings to the fore explanations that remain silent. In northern Ghana, a common narrative posits that food insecurity is the consequences of recurrent droughts, capricious climates, and the technical limitations of peasant farming methods (e.g. Armah et al., 2011). While not disputing the role of environmental change, I argue that this explanation is a partial reading of the problem, as it does not capture the full scope of hardships facing small farmers. These views also cast the problem as utterly unavoidable and diminish the significant role in which politics shape the problems confronting farmers. Moreover, such representations also set up the northern Ghanaian landscape as a target for developmental interventions, many of which end up exacerbating precisely the problems they intend to solve.

Based upon the findings presented in the thematic case studies, I argue that in northern Ghana, food insecurity and agriculture are shaped by a web of mutually constitutive social, ecological, cultural, and political-economic relations. It is important to shift explanations beyond "natural disasters" if we are to understand the structural and regulatory forces underpinning food insecurity in the region. More specifically, I have shown that in addition to droughts or climatic extremes, farmer problems are shaped by the social relations of production and their attendant struggles. This argument comes out most clearly in Chapters 2 and 3, where I provide strong evidence to reveal that cultural practices, power hierarchies, gender and class dynamics are all part and parcel of the problems confronting farmers. The

penultimate chapter adds nuanced depth to this argument, revealing how the state is grabbing smallholder farmlands and displacing many poor farmers.

In this sense, small-farmer problems could hardly be understood as a natural scourge, but in real terms, as politically and socially produced. Such theorization is helpful if well-meaning solutions are to be developed for hunger and food insecurity. Similar arguments have been advanced by geographers such as Moseley (2012), Nally (2011), and Watts (2013) who maintain that food shortages ought to be theorized and understood as socially and politically produced. Unfortunately, these authors' arguments have neither been heeded nor absorbed into food policy issues. Many contemporary African food shortages - in the Horn of Africa in particular (Moseley, 2012) - are still explained in neo-Malthusian terms, blaming the victims, seeking technical solutions, and conveniently ignoring external factors over which small farmers have little control.

The second research question investigated governments' responses over time to address food insecurity in northern Ghana. Another quest was to understand the successes, shortcomings and failures of such responses. In Chapter 2, I mapped out the historical trajectory of food policy initiatives in northern Ghana (Figure 2.1). I argued that historically, agricultural and food security initiatives have focused narrowly upon the use of intensive technologies to increase food production, neglecting a wide range of other alternatives. A number of assumptions have shaped the notion that intensive agriculture will lead to major improvements in food security in rural northern Ghana. Prominent among these presumptions are ideas that the problem is Malthusian in nature and indigenous farming methods are inefficient.

Chapter 2 showed the inherent contradictions in these presumptions, and how intensive technologies end up exacerbating the exact problems they are intended to solve. The chapter revealed low adoption of high-input agriculture in northern Ghana, a finding consistent with other similar case studies in the region (e.g. Amanor, 2011). I argued that farmers' failure to adopt agricultural intensification emerges from the fact that food insecurity and hunger are typically framed, analyzed,

and addressed as a technical fix, with little sensitivity to the politics and history that configure these processes. As revealed in Chapter 2 and parts of Chapter 3, the intersection of the prevailing political economy, together with the human ecology of agriculture in the savannah, explains the low adoption of high-input technologies.

The high-input agrarian development strategy also assumes, quite wrongly, that households are socially homogenous and can function equally under a generic farming model. Under such assumptions, inter-household differences, intra-household politics and social inequalities are all ignored. Yet, these differences form an important part of farmer decision-making processes. All the three thematic case studies uncovered different forms of tensions within households, suggesting that a wholesale transfer of technology is ill-suited to the problems confronting farmers. Chapter 2 takes this theme a step further by showing how agricultural intensification is cost prohibitive, and how these farming practices are dramatically contested within the domestic sphere.

These findings raise the question rather sharply of what kind of intensification is needed to address hunger and food insecurity in a sustainable manner. I have argued that peasant agriculture is peculiarly situated to address food production challenges in northern Ghana. The main problem is government's neglect of the small farming sector, and the ongoing efforts to change traditional farming practices. In order to produce its desired benefits, any planned agricultural strategy must not seek to change, but be adapted locally to the situated knowledge and experimental skills of farmers. Examples of these skills are documented in Chapter 3, which shows soil and water conservation techniques, intercropping and the maintenance of agrobiodiversity, and biological pest control.

Undoubtedly, some critics will take this argument as backward-looking, or a repeat of the worn-out argument of Chambers (1983) and Richards (1985). Howver, as many recent international meta-reviews have shown, however (e.g. McIntyre et al., 2009), agro-industrial technology cannot solve problems of hunger and food insecurity (see also Pretty et al., 2011; Snapp et al., 2010). Instead, what is needed is a

stronger emphasis on peasant agriculture, as well as scientist-farmer collaboration to build low-cost, agroecological and locally adapted solutions to problems of hunger, nutrition and food security (Van der Ploeg, 2013). Jules Pretty and colleagues have provided countless examples of where sustainable agricultural practices are actually taking place in Africa, and are making a difference (Pretty et al., 2011). Chapter 3 of this dissertation cuts its cloth from this same argument. The chapter reveals existing farmer innovations and the adaptability of local farming systems, which can serve as building blocks for small farmer development in northern Ghana.

The third research question sought to understand whether climate change and variability are major constraints to food production in northern Ghana. This question was analyzed extensively in Chapter 3. The findings suggested that small farmers are aware of recurring environmental changes in the region. However, many farmers are resorting to climate-resilient farming practices to offset the impacts of dry spells and other environmental constraints. According to farmers themselves, their farming systems are more resilient to climatic stresses, but less so to the vulnerabilities imposed by the prevailing agrarian political economy (see also Chapter 2). For instance, many small farmers are more constrained by broader scale political and economic processes including access to markets and agricultural credits.

Historically, these constraints have their roots in the uneven outcomes of structural adjustment policies implemented in Ghana beginning in the early 1980s (Konadu-Agyemang, 2000). Structural adjustment programs (SAP) compelled the Ghanaian state to abandon its support for small farmers. Today, Ghanaian agriculture has not retreated from SAP and related neoliberal policies. Small-scale farmer support is virtually non-existent to help peasants to farm sustainably, or in some cases, farming at all. Cheap food imports also continue to flood Ghanaian markets, thereby constricting market outputs and prices for locally grown produce. The majority of farmers see these constraints as more pressing than the impacts imposed by climate change and variability.

Closely related to the foregoing findings, the fourth research question investigated how northern Ghanaian farmers view the underlying causes of food insecurity, and how these perspectives differ by gender, age and other axes of social differentiation. This question was examined in Chapter 3, which presented results from participatory research with socially differentiated groups. From the analyses, two key findings stood out. The first finding relates to local customs and power hierarchies preventing women's access to granaries. The second is related to ongoing land grabbing. On the one hand, young and elderly men identified land grabbing as the greatest constraint to food production. On the other hand, all groups of women worried about their lack of access to household granaries. Relatively little research has uncovered these dynamics. Whilst food insecurity is acute in the Upper-West region, Chapter 3 revealed that women and children might be more vulnerable than men. The differential vulnerability stems from patriarchal rules defining access to and control over household harvests, as well as household organization and women's marital positions. These gendered-based findings not only reveal social inequalities in access to food, but they once again point out that food insecurity is not only about climatic variability or population growth as in dominant narratives.

The fifth research question investigated whether there are broad-scale forces interacting with local dynamics to influence food security in northern Ghana. Chapter 4 examined this question, engaging particularly with current debates over global land-grabbing. Driven by contemporary food, energy, climate and global financial crisis, many foreign companies are acquiring African-based farmlands for different purposes (Cotula, 2013). The Ghanaian state has welcomed these so-called "investments," by appropriating farmlands in northern Ghana for biofuel and mineral extraction. This development strategy echoes past neoliberal assumptions that (1) small farmer agriculture should be abandoned in northern Ghana; (2) that there are large tracts of vacant farmlands in the north; (3) and that there should be foreign or private sector-led growth in development.

Chapter 4 reveals what is happening to farmers who have lost their farmlands to these recent enclosures for foreign-based mineral extraction. The findings reveal the impacts of enclosures on local livelihoods, increasing landlessness, and the movement of surplus labour into urban frontiers and in sharecropping relationships. Many farmers are no longer connected to their own farmlands. Their labour is not only being made surplus to the requirements of capital, but they are further exploited and locked up in sharecrop contracts further afield. Many households are now spatially fractured. The majority of men in this study increasingly seek wage labour in cities, while leaving their wives behind to look after children, and protect family rights over remaining land resources. Meanwhile , the left-behind women themselves have tenuous property rights. They also have weak access to extension support, agricultural credits, and intra-community property relations. For the majority of households, land-grabbing has resulted in reproduction squeeze and gendered agrarian change.

Despite their different entry points, there are many concerns that bind the three empirical chapters together. Three similarities are particularly evident. Repeatedly, all the case studies revealed gender politics and their contingencies to shape particular outcomes, whether it is around household labour (Chapter 2), access to farmlands (Chapter 4), or access to household granaries (Chapter 3). Moreover, virtually all the empirical chapters show that whether it is farmland, agricultural technology, or building resilience to climatic variability, the smallholder farmer is increasingly squeezed. As with any thematic approach, however, the case studies are uneven in their treatment of political ecology. Some elements of the political ecology approach are brought more clearly into focus, while others are necessarily pushed out of view in the case studies. For instance, Chapters 2 and 3 focus more fully on politics and ecology, whereas Chapter 4 adopts a political ecology approach that puts politics first, thus downplaying an account of ecological concerns. Nevertheless, this opens up space for other scholars to pursue ecological themes within similar

research. For example, it would be valuable to analyze the impacts of mining on land use systems in northern Ghana, and the implications for rural livelihoods.

The case study villages also provide another valuable point of comparison. As noted earlier in Chapter 1, the two villages were selected to ensure a greater geographical breadth. The aim was to capture some of the variability in the region and reduce the risk that peculiarity in just one village might overly sway the findings. All the two study villages shared a common regional history and culture, but also differed remarkably in a number of ways (Table 5.1). One village was relatively small, physically isolated, and faced acute problems with land-grabbing. Conversely, the other village was close to an urban center, had a larger population, and was unaffected by recent waves of farmland acquisitions. Yet, with the exception of land-grabbing and landlessness, the emerging findings are similar across both settings, whether it is about resistance over hybrid seeds (Chapter 2); household politics over granaries (Chapter 3); the social relations of production in which peasants are enmeshed (Chapters 2, 3 and 4); and perceptions of climate change, as well as innovations with *Zaï* farming techniques (Chapter 3). This is not to suggest that the research findings are representative of the Upper-West Region. However, with two sites that are 42 km apart and showing strong contrasts, it is striking to see a similar pattern of emerging findings.

5.3 Theoretical Contributions and Future Research Directions

Although focused on the frontiers of northern Ghana, this study has theoretical and methodological resonance reaching far beyond the field sites. There are at least four areas of literature, and accompanying debates, to which the contributions of this dissertation can be appreciated. Some of the key conceptual and theoretical issues are summarized in Table 5.2 below.

Firstly, this research contributes to the wider theorization of food insecurity and hunger. Despite decades of evidence, many contemporary food shortages are cast as neo-Malthusian problems. Such representations perpetuate long-standing

and ahistorical understandings of the causes of hunger. Alongside work by Moseley (2012) and Watts (2013), among others, this study provides human geographers with an indispensable set of tools for thinking about how power and politics operate in relation to food security. Taken together, the three manuscripts demonstrate the necessity of grounding agricultural and food policies within a broader historical and political economic context.

Table 5.2 Summary of Emerging Conceptual Issues

Chapter #	Focus	Key Conceptual Issues
1	Background and problem context.	▪ Political ecology and the epistemological value of ethnographic research with mixed and participatory methods.
2	The trajectory of food security initiatives.	▪ The role of place, politics and history in human-environment relations.
3	Climate change, local knowledge and resilience.	▪ Long-term patterns of landscape change. ▪ Local knowledge and land use practices. ▪ How political ecology can facilitate the integration of power relations and gender politics into resilience thinking. ▪ The value of participatory methodologies in eliciting farmers' views on climate change and its impacts.
4	Land-grabbing and gendered agrarian change.	▪ Scaled spaces of the impacts of land-grabbing (i.e. individual, household, and community). ▪ Horizontal conflicts in agrarian settings. ▪ The value of a class-analytic perspective and gender dynamics in the analysis of social differentiation.
5	Meta-analysis and conclusion.	▪ The social and political production of food insecurity.

Source: Derived from the emerging findings and meta-analysis in Table 5.1

Secondly, this research broadens knowledge about development processes and how they impact at the local scale and on different social actors. The study sheds light on the nonlinear paths of development, and demonstrates the unpredictability

of the politics of development interventions. All the manuscripts reveal how political-economic processes are simultaneously implicated in farmer problems, and yet elided, in policy responses designed to address these problems. The research findings suggest that when state officials define food and hunger as problems in need of a technical fix, such framing screens out the political-economic processes that created these challenges in the first place. This dissertation thus contributes to the development studies literature that tries to understand and contest state-centered, top-down approaches to improving human conditions (e.g., Ferguson, 1994; Li, 2007; Scott, 1998).

Thirdly, this study has implications for research in political ecology and human-environment geography. The findings reveal the manner in which environmental change and power relations intersect to shape food security and agrarian change. In exploring these dynamics, this dissertation advances existing understandings of power in political ecology. As a theoretical framework, political ecology has been effective in examining how social relations shape access to environmental resources in different settings. While this approach has thrived for more than three decades, there is still a debate over the scaled spaces within which 'politics' occur. Peet and Watts (2004) have called for a need for political ecologist to focus analyses more on the micro-politics at the household or local scale, while not abandoning the political influences wielded by the state, processes of globalization, capitalist development, and World Bank neoliberal policies. This dissertation makes important contributions in this regard.

My analyses put the mutual constitution of local and broader-scale politics front and center, further deepening the work of earlier scholars who have examined micro-politics of resource access and control (e.g., Carney, 2008; Schroeder and Suryanata, 2004). As revealed in the three thematic case studies, broader scale politics are clearly at work in structuring what sorts of agricultural policies are privileged, and how the problem of food insecurity is defined. However, these broader-scale politics are not the only powerful forces affecting farmers, who are

differentiated by age, gender and class. Indeed beneath these broader-scale politics are compelling micro-level politics of gender, property rights, tenurial regime, and division of labour. As Hecht (2004, p. 65) reminds us, 'resource use reflects not just globalization "from above" but also its modification and manipulation "from below."' Moreover, this study contributes to human-environment research seeking to understand how climate or environmental change affects gendered groups, class structures, and other forms of social differentiation. As demonstrated in Chapter 3, women perceived climate change differently than men. Women's perceptions were influenced by their material and socio-political contexts, especially gendered inequalities within the household. This study therefore contributes to emerging research using feminist political ecology to reject reductionist explanations of women and other marginalized groups as helpless victims of climate change (e.g., Bee, 2014).

My methodology and fieldwork experience would also be valuable for novice scholars beginning their own research careers. The study has shown the benefits of ethnographic fieldwork in critical human geography and political ecology research. The long-term field immersion was helpful in uncovering many of the findings not evident in previous studies. For example, if the research had relied solely on a snap-shot food security questionnaire, it would have been impossible to uncover some of the gender politics and shady practices around women's access to granaries (see also Schroeder, 1999). Finally, my personal account on gender identity and fieldwork experiences would be invaluable for "male gender researchers" (Schroeder, 1999, p.xxi) interested in cross-cultural and cross-gender studies. Gender identity is important and could shape research outcomes in very complicated ways. In ethnographic research in patriarchal settings, it is not always easy to cross into men's or women's spaces. This challenge is at once practical, ethical and epistemological, raising larger questions about what sort of data could be reasonably gathered, and how the entire research milieu shapes what could be known. The experiences

reported in this study could serve as pointers for what new researchers could expect during fieldwork in similar contexts.

The findings from this research offer several possibilities for future work. Although valuable, a village-level ethnographic lens raises several questions. Would the analysis be richer still if such a theoretical and methodological framework is applied more broadly? Would the same gender dynamics, micro-politics and power relations be found among ethnic groups other than the Dagaabas in northern Ghana? To what extent are the dynamics highlighted in this study exemplary of wider trends in northern Ghanaian agriculture? Might a different methodology, say, a regional quantitative survey, open scope for another contribution? It would be interesting and valuable to see an extension of case studies into other villages in the Upper-West, and the northern regions more broadly.

As well, virtually all the thematic case studies revealed that a far larger proportion of men than women migrate to southern Ghana, thus leading to the formation of *de-facto* women-headed households. Chapter 4 revealed how household social relations help to explain who migrates and with what consequences. In the long-term absence of men, however, there is a need to understand whether women aid each other in access to key agricultural resources. It is my hope to examine some of these issues in the near future. Future research will also involve a return village study to assess how things have evolved since the completion of the core fieldwork in August 2012.

In the realm of critical agrarian studies, land grab research could be significantly enriched through a broader understanding of the following questions: Among the population experiencing landlessness and exploitation, what form of resistance is emerging? How are communities communicating and negotiating their needs with mining and biofuel companies? Are women or women's organizations active in these communications? What organizational forms, tactics and moral vocabulary define community resistance to land grabbing? How does identity, both collective and individual, shape various forms of community resistance? In cases

where communities vociferously resist land appropriation, what constraints do they face, especially given already overlapping conditions of social, economic, and political marginality? What resources can communities draw upon not only to challenge unjust land appropriation, but also to transform the relations of power undergirding it? What are the gendered dynamic in forms of resistance? Because of space limitations, all these are questions that I sidestepped in manuscript 3. In the slightly shorter term, I hope to complete a separate manuscript addressing these questions, drawing upon my field notes with additional field research.

5.4 Conclusion

What immediate changes need to occur to reduce food insecurity and reverse the hungry farmer paradox in northern Ghana? In order to improve food security in Ghana's rural north, there is a need for a deep shift in the manner in which agriculture is organized. Based upon findings from the three thematic case studies, the following is a summary of changes that are urgently required.

The aspect of agriculture that farmers most frequently mentioned as problematic is government support for peasants. Thus, there is a need to improve smallholder farmers' access to key resources, including agricultural credits and secure access to farmlands. Since small farmers are the locus of food production in the north, it is important to invest in these farmers, but not to appropriate or invest in the farmlands on which they depend. There is also a need to take a hard look at agricultural development policies, and encourage farming with, rather than against nature. As an alternative to the unrelenting drive towards high-input agriculture, attention could focus more on strengthening and building upon existing farmer knowledge. Such an approach could result in more locally adapted, low-cost strategies for sustainable food production now and into the future (Pretty et al., 2011; Van der Ploeg, 2013).

Finally, it is important to strengthen and protect customary rights over land ownership. In particular, there is a need to establish and reinforce women's land and

property rights. When smallholder women farmers have secure land rights, it leads to long-term productive investments and a larger say in household decisions. There is further evidence suggesting that as compared to men, secure land rights for women could lead to better child nutrition and improved food security for all household members (Van den Bold et al., 2013). Unless these changes are effected, Ghana's food security "success" story will continue to be marred by the paradox of hungry farmers. Throughout the dissertation, I have tried to capture small farmers' views, their experiences, and their agroecological practices. Policy makers will do well to hear the voices of these farmers and heed their examples. These policy shifts are needed not only in Ghana, or even across Africa (Pretty et al., 2011), but the whole world is hungry for these changes (Akram-Lodhi, 2013). The challenge is a big one. Our food system is already failing too many of those who wake up every morning to cultivate food. If we fail to effect radical changes, we will risk obscuring and replicating the very mechanisms through which the current food system has become established, and is firmly being entrenched.

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APPENDICES

APPENDIX A: RESEARCH ETHICS APPROVAL

Research Western

Use of Human Participants - Ethics Approval Notice

Principal Investigator: Dr. Rachel Bezner Kerr
Review Number: 18429S
Review Level: Full Board
Approved Local Adult Participants: 0
Approved Local Minor Participants: 0
Protocol Title: A Political Ecology of Food Security and Smallholder Farmer Adaptation to Climate Change in Upper-West Region, Ghana
Department & Institution: Geography,University of Western Ontario
Sponsor: International Development Research Centre

Ethics Approval Date: October 27, 2011 **Expiry Date:** August 31, 2014

Documents Reviewed & Approved & Documents Received for Information:

Document Name	Comments	Version Date
UWO Protocol		
Letter of Information & Consent	Appendix 4	
Other	Confidentiality Agreement	
Other	Oral Script	

This is to notify you that The University of Western Ontario Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the applicable laws and regulations of Ontario has granted approval to the above named research study on the approval date noted above.

This approval shall remain valid until the expiry date noted above assuming timely and acceptable responses to the NMREB's periodic requests for surveillance and monitoring information. If you require an updated approval notice prior to that time you must request it using the UWO Updated Approval Request Form.

Members of the NMREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussions related to, nor vote on, such studies when they are presented to the NMREB.

The Chair of the NMREB is Dr. Riley Hinson. The UWO NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

This is an official document. Please retain the original in your files.

The **University** *of* **Western Ontario**
Office of Research Ethics
Support Services Building Room 5150 • London, Ontario • CANADA - N6G 1G9
PH: 519-661-3036 • F: 519-850-2466 • ethics@uwo.ca • www.uwo.ca/research/ethics

APPENDIX B: HOUSEHOLD SURVEY QUESTIONNAIRE

HOUSEHOLD SURVEY

A Political Ecology of Agriculture and Food Security in Northern Ghana

A Study by Hanson Nyantakyi-Frimpong & Prof. Rachel Bezner Kerr
The University of Western Ontario, CANADA

GENERAL INFORMATION:

Name of Community ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Physical Address of Household ☐☐☐ *(as it appears on the map provided)*

Code of Respondent ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name of Enumerator ☐☐☐☐☐☐☐☐☐☐☐☐Code # ☐☐☐

Survey Date *Month Day* ☐☐/☐☐/2012

Survey Time ☐☐:☐☐ *am* ☐ *pm* ☐

Survey Results ☐ (* If 'Refused', write REFUSED in large print on top of this page)

1. Completed
2. Postponed
3. Not at Home
4. Refused

Interview Entered into SPSS ☐

Introduction and Study Information:

1. My name is:_____
2. PLEASE USE INFORMED CONSENT FORMS TO EXPLAIN THE PURPOSE OF THE STUDY AND REQUEST EITHER WRITTEN OR ORAL CONSENT.
3. Thank you for agreeing to participate in this survey.
4. Before we get started, I want to let you know that we will be doing a village forum and public presentation in July 2012. We'll be sure to let you know about it in case you want to attend.

SECTION 1: HOUSEHOLD COMPOSITION, DEMOGRAPHICS AND SOCIAL DYNAMICS

Names of Usual Household Members	***Relationship to Head of Household***	***Gender***	***Age***	***Main Economic Activity***	***Highest Level of Education***
1	2	3	4	5	6
Make a complete list of all persons who are usual members of this household, starting with head of household. *(Exclude visitors)* (**Be sure the respondent understands that 'usual members' are those who eat and sleep in the household. As each individual name is mentioned, PROBE by asking "over the past 12 months, how long has this person been away from home?". If more than 4 months, do not include the individual in this list.)*	What is the relationship of (NAME) to the head of household? Head … … 1 Spouse … … 2 Son/Daughter … 3 Brother/Sister … 4 Parent/Parent-in-Law 5 Son/Daughter-in-Law … 6 Grandchild… 7 Niece/Nephew … 8 Other Relation … 9 Non-Relative … 10	Is (NAME) male or female? Male 1 Female 2	How old is (NAME) in completed years? *(*Round down to the nearest whole number.*	Farmer …1 Rear Livestock/Poultry…2 Fishing …3 Forest Activities …4 Trade/Small Business 5 Government Officer 6 Student/Pupil …7 Others…….. 8	University …1 Polytechnic …2 Senior High School …3 Junior High School …4 Primary …5 Non-formal Education 6 None …7 Others…….. 8
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Q 7. Total Household Members ☐ **Q 8. How many household members are away for at least 4 months in a year? Males** ☐ **Females** ☐

Q. 9. What is the children *(0 to 17 years)* **to adults** *(18+ years)* **ratio?** ☐ :

Q. No. 10	How many of the household members are present in the household during each of the following months? **NOTE ESPECIALLY THAT OF THE FARMING SEASON (MAY TO SEPTEMBER)**	Jan:	**May:**	**Sep:**
		Feb:	**Jun:**	Oct:
		Mar:	**Jul:**	Nov:
		Apr:	**Aug:**	Dec:

Q. No.	**Questions/Instructions**	**Possible Responses**	**Code**
11	Which of the following best describes the household structure? **DO NOT READ ALOUD- ASK ABOUT HOUSEHOLD TYPE AND CIRLCE ONLY ONE ANSWER**	*Household Structure*	
		Female Centered *(No husband, may include relatives, children, friends)*	1
		Male Centered *(No wife, may include relatives, children, friends)*	2
		Nuclear *(Husband/ wife/ female partner with or without children)*	3
		Extended *(Husband, wife/ and children and relatives)*	4
		Child-headed	5
		Polygamous household	6
		Elderly-headed	7

12	Which one of the following housing type best describes the type of dwelling this household occupies? **DO NOT READ ALOUD CIRCLE ONLY ONE ANSWER FOR THE COLUMN LABELLED CODE**	**Housing Type**	**Code**
		House	1
		Town house	2
		Traditional dwelling/ homestead	3
		Room in backyard	4
		Squatter hut/ shack	5
		Other (specify):	

SECTION 2: SMALLHOLDER FARMERS PERCEPTIONS AND IDEAS ABOUT CLIMATE CHANGE

No.	**Questions/Instructions**	**Possible Responses**	**Code**
13	Have you noticed any **temperature** changes over the past years?	Yes	1
		No	2
		Don't know	98
		Refused	99
14	**IF YES ASK** What changes have you observed?	Getting hotter	1
		Getting colder	2
		Rapid changes	3
		Other (Specify)	97
		Don't Know	98
		Refused	99
15	Have you noticed any changes in **total amount** of	Yes	1

	rainfall over the years?	No			2
		Don't Know			98
		Refused			99
16	What changes have you noticed in **total amount** of rainfall over the years?	Increase			1
		Decrease			2
		Don't know			99
		Refused			99
17	How long ago do you remember these changes happening?	**0**	**1-3x**	**>3<5x**	**>5x**
	Within past 10 years	1	2	3	4
	More than 10 years ago	5	6	7	8
	Don't know				98
	Refused				99
18	Have you noticed changes in the starting time of **first rains** over the years?	Yes			1
		No			2
		Don't Know			98
		Refused			99
19	Which month did the **first rains** use to start?	September			1
		October			2
		November			3
		December			4
		Other (specify)			97
		Don't know			98
		Refused			99
20	Which months do the **first rains** start now?	November			1
		December			2
		Jan			3
		Feb			4
		Other			97
		Don't Know			98
		Refused			99
21	How long ago did you start noticing changes in the starting time of the **first rains**?	**0**	**1-3x**	**>3<5x**	**>5x**
	Within past 10 years	1	2	3	4
	More than 10 years ago	5	6	7	8
	Don't know				98
	Refused				99
22	Have you noticed any long term changes in **ending time** of rainfall over the years	Yes			1
		No			2
		Don't know			98
		Refused			99
23	What changes have you noticed in the **ending time** of rainfall?	Ends early			1
		Ends late			2
		Abrupt end			3
		Ends early and abruptly			4
		Ends late and abruptly			5
		Other (Specify)			97
		Don't know			98
		Refused			99
24	Which months did the rains use to end?	April			1

		May			2
		June			3
		July			4
		Other			97
		Don't Know			98
		Refused			99
25	Which months do the rains end now?	Jan			1
		Feb			2
		March			3
		April			4
		May			5
		June			6
		July			7
		Aug			8
		Other			97
		Don't Know			98
		Refused			99
26	How have you adapted to these changes (ending time of rains)? (check all that apply) **CIRCLE AS MENTIONED**	Plant as soon as rains start			1
		Plant fewer crops			**2**
		Plant legumes			3
		Plant different crops (list): _____ _____			4
		Exchange Food for work			5
		Stored up more food			6
		Food aid			7
		Stored food in grain bank			9
		Other (specify):			97
		Don't Know			98
		Refused			99
27	Which crops did you drop? ENTER AS MENTIONED	_____ _____			
28	Has there been any **drought** in this area over the years?	Yes			1
		No			2
		Don't know			98
		Refused			99
29	Time Period and Frequency **droughts** noticed	**None**	**1-2x**	**>3<5x**	**>5x**
	Within past 10 years	1	2	3	4
	More than 10 years ago	5	6	7	8
	Don't know				98
	Refused				99
30	How have you adapted to **drought?** (check all that apply)	Plant as soon as rains start			1
		Plant fewer crops			2
		Plant legumes			3

		Plant different crops (list): _____ _____	4
		Food for work	5
		Stored up more food	6
		Received food aid	7
		Did *ganyu*	8
		Prayed to Gods	9
		Stored food in grain bank	10
		Other (Specify)	97
		Don't Know	98
		Refused	99
31	Which crops did you drop? ENTER AS MENTIONED	_____ _____	

32	Has there been any **cyclone** in this area in the last years?	Yes			1
		No			2
		Don't know			98
		Refused			99
33	How long ago did the **cyclone occur in this area**?	**None**	**1 or 2x**	**3-5x**	**>5x**
	Within past 10 years	1	2	3	4
	More than 10 years	5	6	7	8
	Don't know				98
	Refused				99

34	Have there been any **floods in this area** over the years?	Yes		1
		No		2
		Don't know		98
35	Time Period and Severity and of **floods**	**Severe**	**Mild**	**Low**
	Within the past 10 years	1	2	3
	More than 10 years ago	4	5	6
	Don't know			98
	Refused			99
36	What did you do to adapt to the effects of the **floods**? **RECORD ALL MENTIONED**	Relocate house		1
		Relocate farm		2
		Construct drains		3
		Reinforce the house		4
		Planted different crops (list)		5
		Pray to God		6
		Nothing		7
		Other (Specify)		97
		Don't know		98
		Refused		99
37	Would you say the climate in this area is changing	Very rapidly		1

	VERY RAPIDLY, RAPIDLY, SLOWLY or NOT CHANGING AT ALL?		Rapidly	2
			Slowly	3
			No change at all	4
			Don't Know	98
			Refused	99
38	Have you observed any key local signs that indicate that the climate is changing? **IF NO GO TO Q40**		Yes	1
			No	2
			Don't Know	98
			Refused	99
39	If **YES,** what are they? **ENTER AS MENTIONED**		_____ _____	
40	Do you think anything can be done to prevent further climate change? **IF NO GO TO Q42**		Yes	1
			No	2
			Don't know	98
41	What do you think should be done? **ENTER AS MENTIONED**		_____ _____	
42	What do you think is the role of [ ] in efforts to combat climate change?	Government		
		Private companies		
		Communities		
		Individuals		

SECTION 3: ON-GOING CLIMATE CHANGE ADAPTATION STRATEGIES

43	What are the **THREE** major constraints/difficulties in your farming?	First	
		Second	
		Third	
44	Over the past years have you ever done intercropping?	Yes	1
		No	2
		Don't Know	98
		Refused	99
45	Over the past years have you ever rotated your crops?	Yes	1
		No	2
		Don't Know	98
		Refused	99
46	Over the past years have you ever pulled out crops that grew poorly? **IF NO GO TO Q48**	Yes	1
		No	2
		Don't Know	98
		Refused	99
47	Which crops did you pull out? **ENTER AS MENTIONED**	_____ _____	
48	Over the past years have you ever not weeded crops because they were growing poorly? **IF NO GO TO Q50**	Yes	1
		No	2
		Don't Know	98
		Refused	99
49	Which crops did you not weed? **ASK FOR EXAMPLES OF CROP TYPES OR VARIETIES**	_____ _____	
50	Over the past years have you ever staggered planting	Yes	1

	dates of your crops?	No	2
		Don't Know	98
		Refused	99
51	Over the past years have you ever relayed the planting of your crops?	Yes	1
		No	2
		Don't Know	98
		Refused	99
52	Have you ever built a water harvesting facility?	Yes	1
		No	2
		Don't know	98
		Refused	99
53	Have you ever implemented soil conservation techniques? **IF NO GO TO Q55**	Yes	1
		No	2
		Don't know	98
		Refused	99
54	What soil conservation techniques did you do? Improve soil fertility (check all that apply)	Crop residue incorporation	1
		Manure	2
		Agro-forestry	3
		Contour bands	4
		Zero tillage	5
		Other (Specify)	97
		Don't know	98
		Refused	99
55	Have you ever planted trees? **IF NO GO TO Q57**	Yes	1
		No	2
		Don't know	98
		Refused	99
56	What types of trees did you plant? CIRCLE ALL MENTIONED	Fruit trees	1
		Indigenous trees	2
		Exotic tress	3
		Other (Specify)	97
		Don't know	98
		Refused	99
57	Have you ever irrigated your crops? **IF NO GO TO Q 59**	Yes If yes, **LIST** which crops? _____ _____	1
		No	2
		Refused	99
58	How did you irrigate your crops?	Canals	1
		Bucket/Watering can	3
		Other (Specify)	97
		Don't know	98
		Refused	99
59	Do you have any livestock? **IF NO GO TO Q61**	Yes	1
		No	2
		Refused	99
60	Would you say the total number of livestock has INCREASED, DECREASED or REMAINED CONSTANT	Increased	1
		Decreased	2

	over time?	Constant	3
		Don't Know	98
		Refused	99
61	Did you (or someone else in your household) migrate to another village or town in or outside the country? **IF NO GO TO Q63**	Yes	1
		No	2
		Refused	99
62	What did [NAME] do where they migrated?	Employment	1
		Education	2
		Trading	3
		Farm	4
		Other	97
		Don't Know	98
		Refused	99
63	Have you (or someone else in your household) ever rented out the land that you farm? **IF NO GO TO Q65**	Yes	1
		No	2
		Refused	99
64	What is the main reason that your household decided to rent out your land?	Didn't have farm inputs	1
		Raise school fees	2
		Pay hospital bills	3
		Lying idle/excess	4
		Shortage of h/h labour	5
		Raise money for food	6
		Raise money for business	7
		Other	97
		Don't Know	98
		Refused	99
65	What was the land used for during the rental period?	Pasture	1
		Livestock farm	2
		Growing food-crops	3
		Off-farm business activity	4
		Other	5
		Don't Know	97
		Refused	98

SECTION 4: CLIMATE CHANGE INSTITUTIONAL CONTEXT

	OVER THE PAST 5 YEARS, HAVE YOU EVER		
66	Obtained formal credit for agriculture?	Yes	1
		No	2
		Refused	99
67	Obtained informal credit for agriculture?	Yes	1
		No	2
		Refused	99
68	Had access to farm input markets when you wanted to use them?	Yes	1
		No	2
		Refused	99
69	Had access to farm output markets when you wanted to sell you produce?	Yes	1
		No	2
		Refused	99
70	Changed [increased/decrease – **PLEASE CIRCLE WHICH ONE**] the size of farm land?	Yes	1
		No	2

		Refused	99
71	Received free food?	Yes	1
		No	2
		Refused	99
72	Received subsidized fertilizer?	Yes	1
		No	2
		Refused	99
73	Accessed agriculture extension services when you needed them?	Yes	1
		No	2
		Refused	99
74	Been a member of any organization? Name(s): _____	Yes	1
		No	2
		Refused	99
75	How would you rate your vulnerability to the effects of climate change?	High	3
		Moderate	2
		Low	1
		Don't Know	98
		Refused	99
76	Would you say you are SATISFIED, SOMEWHAT SATISFIED or NOT SATISFIED AT ALL about the government's response to climate change?	Satisfied	3
		Somewhat Satisfied	2
		Not Satisfied	1
		Don't Know	98
		Refused	99

SECTION 5: HOUSEHOLD ASSET OWNERSHIP

77	**Does your household have the following?**	**Yes**	**No**	**Don't Know**	**Refused**
77a	Radio	1	2	98	99
77b	Television	1	2	98	99
77c	Cellular phone	1	2	98	99
77d	Sofa set	1	2	98	99
77e	Refrigerator	1	2	98	99
77f	Plough	1	2	98	99
77g	Oxen	1	2	98	99
77h	Ridger	1	2	98	99
77i	Ox-cart	1	2	98	99
77j	Wheel barrow	1	2	98	99
77k	Iron-roofed house	1	2	98	99
77l	Bicycle	1	2	98	99
77m	Motor-cycle	1	2	98	99
77n	**Household ownership of the following**				
77o	Cattle [enter #]	1	2	98	99
77p	Pigs [enter #]	1	2	98	99
77q	Chickens [enter #]	1	2	98	99
77r	Sheep [enter #]	1	2	98	99
77s	Guinea-fowls [enter #]	1	2	98	99
77t	Goats [enter#]	1	2	98	99

SECTION 6: HOUSEHOLD PRODUCTION, INCOME & EXPENDITURE

78	Household Production 5 Years Ago (2006)	Maize	Sorghum	Millet	Beans	Rice	Vegetables	Others
	*Are seeds Local (L) or Improved Varieties (Im V)? *Circle One*	L/Im V	L/Im V	L/Im V	L/Im V	L/Im V	L/Im V	L/Im V
	Surface in hectares							
	Production (bags or baskets)							
	Income							
	Expenses							
	Net Profit							

79	Household Production in 2011	Maize	Sorghum	Millet	Beans	Rice	Vegetables	Others
	*Are seeds Local (L) or Improved Varieties (Im V)? *Circle One*	L/Im V	L/Im V	L/Im V	L/Im V	L/Im V	L/Im V	L/Im V
	Surface in hectares							
	Production (bags or baskets)							
	Income							
	Expenses							
	Net Profit							

80a	How many <u>hours</u> do household members work on the farm? NB. Take note of the # of people in the household who work on the farm regularly……..	< 3 hours	1
		3-5 hours	2
		6-9 hours	3
		10-12 hours	4
		Other	97
		Don't Know	98

80b* This data is to be collected periodically in selected households	**Date:**			**Remarks:**			
		Tasks					
	Labour Category	*Clearing/ weeding*	*Hoe-ridging*	*Planting*	*Harvesting*	*Post-harvest processing*	*Caring for children*
	Males	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*
	6-9						
	10-17						
	18-60						
	>60						
	Females	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*
	6-9						
	10-17						
	18-60						
	>60						

81	Other sources of income or money-generating activities	List Source	Amount in GH¢

82	Household's average expenses	Expenses per week	Expenses per month	Expenses per year
	Food			
	Health			
	Education			
	Clothing			
	Transportation			
	Others (Specify)……			
	Total			

SECTION 7: ASSESSMENT OF FOOD SECURITY

These next questions are about food eaten in your household in the past four weeks and whether you were able to afford the food you need.
READ THE LIST AND CIRCLE ONLY ONE ANSWER FOR EACH QUESTION

9-Item 4-week Food Security Access Scale	Never	Rarely (Once or Twice)	Sometimes (3-10 times)	Often (More than 10 times)
83. In the past four weeks, did you or any household member **worry** that there would not be enough food?				
84. In the past four weeks, did you or any household member **not able to eat the kinds of foods you preferred** because of a lack of resources?				
85. In the past four weeks, did you or any household member have to **eat a limited variety of foods** due to a lack of resources?				
86. In the past four weeks, did you or any household member have to **eat some foods that you really did not want to eat** because of a lack of resources to obtain other types of food?				
87. In the past four weeks, did you or any household member have to **eat a smaller meal than you felt you needed** because there was not enough food?				
88. In the past four weeks, did you or any household member have to **eat fewer meals in a day** because there was not enough food?				
89. In the past four weeks, was there **ever no food to eat of any kind in your household** because of lack of resources to get food?				
90. In the past four weeks, did you or any household member **go to sleep at night hungry** because there was not enough food?				
91. In the past four weeks, did you or any household member **go a whole day and night without eating anything** because there was not enough food?				

SCALE SCORE (DRY/HUNGRY SEASON):
92. This household's Food Security Status is: (1) Food Secure; (2) Mildly Food Insecure; (3) Moderately Food Insecure; (4) Severely Food Insecure.

SCALE SCORE (RAINY/AGRICULTURAL SEASON:
93. This household's Food Security Status is: (1) Food Secure; (2) Mildly Food Insecure; (3) Moderately Food Insecure; (4) Severely Food Insecure.

SECTION 8: HOUSEHOLD LANDHOLDING

	Land Held by Household Head (in Hectares)	*Land Held by other Men within the Household (in Hectares)*	*Land Held by other women within the Household (in Hectares)*	Total Household Landholding *(in Hectares)*
94. Current Landholding				
95. Previous Landholding **Fill this section ONLY if the household has lost farmlands within the past five years**				
96. REMARKS: If Household has lost land, provide brief details here				

SECTION 9: FARMERS' PREFERENCE FOR LOCAL AND HYBRID MAIZE VARIETIES

For each of the following production characteristics, do you prefer Traditional Varieties [TV] or Improved Varieties [IV]?

Characteristics	[1] *Traditional Varieties*	[2] *Improved Varieties*
97. Yield		
98. Early maturity		
99. Drought resistance		
100. Insect pest resistance		
101. Lodging resistance		
102. Grain weight		
103. Labour requirement		
104. Non-labour input requirement		
105. Guarantee minimum yield		
106. Low cost of seed		
107. Planting seed availability		
108. Fertilizer requirement		

For each of the following consumption characteristics, do you prefer Traditional Varieties [TV] or Improved/Hybrid Varieties [IHV]?

Characteristics	[1] *Traditional Varieties*	[2] *Improved/Hybrid Varieties*
109. Taste		
110. Storability		
111. Ease of dehusking/ shelling		
112. Flour-to-grain-ratio		

113. Remarks:

APPENDIX C: GUIDE FOR ORAL HISTORY AND FOCUS GROUP DISCUSSIONS

Oral History - Discussion Topics

1. The purpose of the oral history is to gain more precision about changes in climatic and social events, and what these mean for local livelihoods. Oral histories produce an interview that is focused on the individual's life experience. Hence, the interview will be highly unstructured. At the minimum, discussion topics will include but not limited to:

2. A set of short direct questions:

    - Example, where and in what year were you born?

3. These would be followed by open-ended questions:

    - Example, how the native town used to be.

4. From this point, open-ended questions will be used to direct the discussion towards the interviewee's personal history in relation to his or her ecological knowledge, agriculture, food production, food availability, food accessibility, and so on. Broader topics of particular relevance in this study include:

    - Discussions on the constraints and vulnerabilities imposed by specific agricultural development policies. Attention should particularly be focused on constraints regarding access to and control over productive resources such as land, labour and credit for farming.

    - Discussions on land cover changes and land use decisions. Transect walks to be conducted where appropriate as this could prompt memories in the interviewee's life.

    - Discussions on changes in rainfall, temperature, and wind, as well as incidences of drought and flooding, with a particular focus on impacts on local farming practices.

    - Ask if respondents have relevant photographs they wish to share.

Focus Group Discussions 1- Perceptions on climate change and its impact on agriculture and food security

The aim of this focus group discussion is to use participatory group exercises that can be readily applied in the context of a mostly illiterate population to assess collective major perceptions of male, female and youth on climate change and its impact on agriculture and food security.

Participants: Four Groups of 8 to 10 farmers (divided by elderly men and women, and young men and women).

Materials: Flip chart sheets, markers, sticks, stones and other local materials.

Instructions: Explain participatory risk mapping, conceptual mapping, and historical matrices to the group before the start of each activity. Make sure people understand what is required of them.

Participatory Risk Mapping Activity (40 minutes)
1. Ask participants to free list various risks they have experienced in the past 10 years in terms of agriculture and household access to food,
2. Ask participants to rank the various risks they have experienced in order of severity.
3. The rest of the discussion should then center upon environmental changes and variability that may or may not have been explicitly listed in the risk mapping exercise.
4. Summarize results using a tally sheet.
5. Present results to the group

Conceptual Mapping Exercise (40 minutes)
Guide participants to map out a cause and effect relationship between
2. Rainfall variability and local farming practices and outputs.
3. Drought and local farming practices and outputs.
4. Summarize results using a tally sheet.
5. Present results to the group.

Historical Matrices (40 minutes)
1. Use historical matrices to elicit information on past food shortages, and the causes and consequences of these shortages.
2. Summarize results using a tally sheet.
3. Present results to the group.

Focus Group Discussions 2 - Agroecological Practices, Indigenous Knowledge and Climate Change Adaptation

This set of focus group discussions will be conducted after all farm visits have been completed. The aim is to discuss different agroecological practices and adaptation options identified during farm visits, problems associated with their implementation, and how the capacity of farmers could be enhanced to either encourage or scale-up the implementation of the most feasible options

Participants: Four Groups of 8 to 10 farmers (divided by elderly men and women, and young men and women).

Materials: Flip chart sheets and markers.

Instructions: Explain pair-wise ranking and scoring to the group before the start of the activity. Make sure people understand what is required of them.

Pair-wise Ranking and Scoring Activities

1. With the help of smallholder farmers and the agricultural extension agent, list different adaptation strategies and agroecological practices identified during farm visits.
2. Ask each participant to choose two of the named adaptation strategies/agroecological practices.
3. After the two choices have been made, ask the following question: “If you could have only one of these strategies/practices, which would you choose?"
4. After selecting the preferred option, the participant should be asked: "Could you tell me why you have made that choice?"
5. Repeat activities 2 to 4 for different FGD participants and for different adaptation strategies.
6. Summarize all the results using a tally sheet.
7. Present results to the group.
8. Discuss results with particular attention to adaptation strategies that seem to be recurring.

APPENDIX D: CURRICULUM VITAE

Hanson Nyantakyi-Frimpong

EDUCATION

2010-2014 **Ph.D. Geography**
The University of Western Ontario, Canada
Dissertation Title: Hungry Farmers: A Political Ecology of Agriculture and Food Security in Northern Ghana.

2008-2010 **M.S. Geography**
The University of Montana-Missoula, USA

2003-2007 **B.Sc. Development Planning (1st Class Honors)**
Kwame Nkrumah University of Science and Technology, Ghana

PUBLICATIONS

Peer-Review Publications in Progress

Nyantakyi-Frimpong, H. and Bezner Kerr, R. "A Political Ecology of High-input Agriculture in Northern Ghana." (In Press). *African Geographical Review.*

Nyantakyi-Frimpong, H. and Bezner Kerr, R. "A Feminist Political Ecology of Climate Change Resilience in Northern Ghana." Under Review at *Global Environmental Change.*

Nyantakyi-Frimpong, H. and Bezner Kerr, R. "Land-grabbing and Gendered Agrarian Change in Northern Ghana." Under Review at *Journal of Peasant Studies.*

Book Reviews

2014 Nyantakyi-Frimpong, H. Review of "Successes in African Agriculture: Lessons for the Future" Edited by Steven Haggblade and Peter B.R. Hazell, (2010), Baltimore: Johns Hopkins University Press. In *Agriculture and Human Values* 31, pp.157-158.

2013 Nyantakyi-Frimpong, H. Review of "Biofuels, Land Grabbing and Food Security in Africa" Edited by Prosper B. Matondi, Kjell Havnevik and Atakilte Beyene, (2011), London: Zed Books. In *African Geographical Review* 32(2), pp. 190-192.

Policy Briefs and Backgrounders

2014 Bezner Kerr, R. Shumba, L., Dakishoni, L., Lupafya, E., Snapp, S.S., Berti, P.R., Nyantakyi-Frimpong, H., Luginaah, I. et al. "Farmer-Led Climate Change Adaptation Strategies To Improve Food Security, Nutrition And Soil Health in Northern Malawi." Policy Brief presented at the Climate Change and Food Security Policy Workshop, March 4, 2014, Crossroads Hotel, Lilongwe, Malawi.

2014 Mkandawire, P., Nyantakyi-Frimpong, H., Armah, F. and Arku, G. "Regionalism, Food Security and Economic Development in Africa." Background Paper prepared for the African Capacity Building Foundation, Harare, Zimbabwe.

2013 Nyantakyi-Frimpong, H. "Food Insecurity in Northern Ghana: Policy Issues in Historical and Contemporary Contexts" *Africa Portal Backgrounder Series, No. 62, August 2013.*

2013 Nyantakyi-Frimpong, H. "Indigenous Knowledge and Climate Adaptation Policy in Northern Ghana" *Africa Portal Backgrounder Series, No. 48, January 2013.*

RESEARCH EXPERIENCE

2013-2014 **Research Assistant**
Soils, Food and Healthy Communities Project, Ekwendeni, Malawi/The University of Western Ontario. Participatory Research on Climate Change Adaptation in Northern Malawi.

2008 **Research Assistant**
Government of Ghana, Land Administration Project Management Unit: Land Rights and Vulnerability Studies in Dormaa Ahenkro Pilot Customary Land Secretariat.

2008 **Research Assistant**
Government of Ghana, Ministry of Local Government and Rural Development, Preliminary Impact Assessment of Community Environmental Sanitation Projects (Aboabo Storm Drain, Kumasi, Ghana)

TEACHING EXPERIENCE

2013- **Instructor, Geography Department, Western University, Canada**
Intersession (2013): Geography of Sub-Saharan Africa
(Enrolment: 33 Students)

2010-2014 **Teaching Assistant, Geography Department, Western University**
Winter (2014): Geography of Tourism
Fall (2013): Geography of Tourism
Winter (2013): Fundamentals of Geography
Fall (2012): Fundamentals of Geography
Winter (2011): Geography of Sub-Saharan Africa
Fall (2010): Introduction to Resource and Environmental Management

2008-2010 **Teaching Assistant, Geography Department, University of Montana**
Spring (2010): Introduction to Physical Geography
Spring (2010): Introduction to Human Geography
Fall (2009): World Regional Geography
Fall (2009): Introduction to Human Geography
Spring (2009): World Regional Geography
Spring (2009): Introduction to Human Geography
Fall (2008): World Regional Geography
Fall (2008): Introduction to Human Geography

2007-2008 **Teaching Assistant, Faculty of Planning/Land Economy, KNUST, Ghana**
Spring (2008): Development Planning Workshop II
Fall (2007): Development Planning Workshop I

PRESENTATIONS AT PROFESSIONAL MEETINGS & PUBLIC SEMINARS (SELECTED)

2014 Nyantakyi-Frimpong, H. "Climate-resilient Agriculture: A Critical Examination of Zai Farming in Dryland West Africa." Annual Meeting, Association of American Geographers, Tampa FL, USA. April 8-12.

2014 Arku, G., Mkandawire, P., Nyantakyi-Frimpong, H., Armah, F. and Luginaah, I. "African Regional Integration: Assessing the Implications for Food Security and Economic Development." Annual Meeting, Association of American Geographers, Tampa FL, USA. April 8-12.

2014 Nyantakyi-Frimpong, H. "Farmland Enclosure, Gender and the Political Ecology of Rural Livelihoods in Northern Ghana." The United Nations Food and Agricultural Organization, Multi-Stakeholder Conference on Agricultural Investment, Gender and Land in Africa. Cape Town, South Africa. March 5-7.

2013 Nyantakyi-Frimpong, H. "Hungry Farmers: A Political Ecology of Agriculture and Food Security in Northern Ghana." Food Studies Collective Speaker Series. Cornell University, Ithaca NY, USA. November 1.

2013 Nyantakyi-Frimpong, H. and Bezner Kerr, R. "Planting Hybrids, Eating Landraces: Smallholder Farmer Perspectives on Agricultural Technologies in Northwestern Ghana." Annual Meeting, Association of American Geographers, Los Angeles CA, USA. April 9-13.

2013 Nyantakyi-Frimpong, H. "Gender Politics and Food Security Implications of Transnational Farmland Acquisitions in Ghana." Gender and Land Governance Conference, Utrecht University, The Netherlands. January 14-15.

2011 Nyantakyi-Frimpong, H. "Land Grabbing in Northern Ghana: A Review of Impacts on Smallholder Agriculture and Household Food Security." Annual Conference, Canadian Association of African Studies, York University, Toronto, Ontario, Canada. May 5-7.

2010 Nyantakyi-Frimpong, H. "The Difficulty of Integrating Climate Change Concerns into Spatial Planning" Graduate Students and Faculty Research Conference, The University of Montana, Missoula MT, USA. April 24.

2010 Nyantakyi-Frimpong, H. "A Causal-Chain Analysis of Environmental Problems in the Lake Bosomtwe Basin, Ghana." Annual Meeting, Association of American Geographers, Washington DC, USA. April 14-18.

2009 Nyantakyi-Frimpong, H. "The Human Geography of Ghana." Evening Lectures on Thinking Globally. Missoula Public Library, Missoula MT, USA. November 7.

2009 Nyantakyi-Frimpong, H. "Sustainable Management of the Lake Bosomtwe Basin in Ghana: Examining Constraining Issues and Required Action." Geography Graduate Colloquium, Department of Geography, The University of Montana, Missoula MT, USA. September 27.

FELLOWSHIPS, RESEARCH GRANTS & AWARDS

2012 Centre for International Governance Innovation, Canada - Africa Initiative Graduate Research Grant.
Research Project: Food Security and Smallholder Farmer Adaptation to Climate Change in Ghana's Upper-West Region (May 2012 to May 2013)

2012 Land Deals Politics Initiative, Institute of Social Studies, The Hague, Netherlands.
Research Project: Land Grabbing, Gender and Food Security in Northern Ghana (April 2012 to December 2012)

2011 International Development Research Centre, Canada, Doctoral Research Fellowship.
Research Project: Food Security and Climate Change Adaptation in Ghana's Upper-West Region (November 2011 to November 2012)

2011 Western University, Graduate Travel Fund (May 2011)

2010-2014 Western University, Graduate Research Scholarship. (September 1, 2010 to August 31, 2014)

2008-2010 The University of Montana-Missoula, Graduate Scholarship. (August 1, 2008 to May 7, 2010)

2004-2006 Asante Akim South District, Ghana Undergraduates Fellowship Award

PROFESSIONAL AFFILIATIONS

- Association of American Geographers (2008 to Date)
- Agriculture, Food and Human Values Society (2013 to Date)
- Canadian Association of Geographers (2010 to Date)
- Canadian Association for the Study of International Development (2010-Date)
- Canadian Association of African Studies (2010 to Date)
- Land Deals Politics Initiative (LDPI) Global Research Network (2010 to Date)