Access to Hybrid Seeds in Ghana: A case of Smallholder Farmers in Tamale

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List of Acronyms

AGRA	Alliance for Green Revolution Africa
CSIR	Council Scientific and Industrial Research
CRI	Crop Research Industrial
ESA	Eastern and South Africa
FAO	Food Agriculture Organization
FSG	Food Sovereignty Ghana
GBA	Ghana Biosafety Act
GMO	Genetic Modified Organism
GNAFF	Ghana National Association Farmers and Fishermen
GSID	Ghana Seed Inspection Division
IPR	Intellectual Property Rights
MAG	Modernizing Agriculture in Ghana
MoFA	Ministry of Food and Agriculture
NARI	National Agriculture Research Institutes
NGO	Non-Government Organization
OPV	Open Pollinated Variety
PBB	Plant Breeders Bill
PFAG	Peasant Farmers Association of Ghana
PFJ	Planting for Food and Jobs
SADA	Savanna Accelerated Development Authority
SARI	Savanna Agriculture Research Institute
SEEPAG	Seed Producers Association of Ghana
SSA	Sub-Saharan Africa
TaMA	Tamale Metropolitan Assembly
TNC	Transnational Corporation
WTO	World Trade Organization
USA	United States of Africa

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Abstract

Through the case of two communities in the Tamale Metropolis, this study was set out to examine smallholder farmers, access to hybrid seeds in Ghana. The focus of which was centred on why and how small holder farmers' access hybrid seeds in Ghana. Evidence from data gathered from the field suggest that: non-availability of hybrid seeds, cost implications and gender power relations are some of the bottlenecks that militate against access.

The study further articulates factors that drives smallholder farmers' adoption of hybrid seeds and how it affects seed diversity in Ghana, and subsequently unravels the environmental externalities and how that relationship impacts smallholder farmers.

Interestingly, the study also showed an economic angle to the discourse, it highlighted the politics surrounding hybrid seeds in the countryside and unmasked the relationship between hybrid seeds and indebtedness among smallholder farmers.

These challenges that hybrid seeds present, calls for the promotion of traditional knowledge system of seed saving and farming practices. This will protect and promotes local crop diversity in Ghana.

Keywords

Access, hybrid seeds, Smallholder Farmers, Improved Seeds, Local/Traditional Saved Seeds

Chapter 1 Background

Agriculture remains central in the development of many African economies. The sector absorbs 70 percent of its labour force and contributes about 25 percent to Gross Domestic Product (GDP) (Scoones and Thompson 2011:1). The story is not different in Ghana, in the year 2010, the sector accounted for 29.8 percent of GDP of the national economy (Kwofie 2017:1). And has been touted as a potential of growth. However, there is the need to boost up production in order to achieve or realize its potential.

Central to the question of increased production is the issue of improved seed varieties (hybrids) and other inputs which are key in the agenda of the drivers of the African Green Revolution (Chinsinga 2011:59).For the advocates of the African Green Revolution, Ghana and for that matter sub Saharan African countries, can overcome food security if they can replicate some of the success of the Asian Green Revolution on the 1960s and 1970s which focused on the promotion of new improved seeds varieties and inputs like fertilizers (Scoones and Thompson 2011:1). Yet again, issues of food security are directly linked with undernourishment. Despite a decline in global undernourishment levels, about 33.7 million people (9.6% prevalence) are still undernourished in West Africa (Marx 2015)

These agriculture policies and program can achieve success if there is a critical assessment of the fundamental input which is the seed. As a foundation of crop-based production and the starting point of plant's life, the seed has a dual trait of being an input of production (seed to sow) and an output (grain for consumption) (Kloppenburg 2005: 10), making it an important element of the food system. Like most organisms, seeds have to breed to get more of its kind. Hence the idea behind plant breeding, which is to achieve improved yield of a variety of the same kind, or taste by twerking the characteristics of a seed to achieve a desire trait (Poehlman et al 1995). In recent years, most African countries including Ghana are paying attention to the seed and the seed system and incorporating it into their national policy agenda as the clarion call for an African Green Revolution is gaining momentum (Scoones and Thompson 2011:1). Critical to the success of the Green Revolution in agriculture is the seed systems. By definition "a seed system is the sum of physical, organizational and institutional components, their actions and interactions that determine seed supply and use, in quantitative and qualitative terms, and include formal, informal and seed aid elements (Scoones and Thompson 2011:8).

There exist two seed systems in Ghana and most parts of West Africa, the traditional or informal system which is based on exchange of seed varieties among farmers, and a formal sector which is a creation of the state (Niangado 2010:3). Most of the farmers depend on the informal system, which accounts for about 80 percent of all seed source (Etwire et al 2013:1). That notwithstanding, the formal sector is credited with releasing quality varieties that have helped to sustain the farmers yield. Since independences, the Ghana National Agriculture

Research Institutions (NARIs) with support of the Universities Research Departments (Tripp and Ragasa 2013) have released improved seeds varieties like Obatanpa, Mamaba, dadaba etc.

Ghana like any other African country is being swept by the waves of commercial agriculture. Since seed is the primary input of crop-based agriculture and an important element of the food system, it is also entangled in some of the everyday controversies rising out of the general food system (Wittman et al 2010:11). These controversies or conflicts strongly have to do with the political economy of the seed, i.e. who owns/produce the seed, what kind of seed to produce and who benefits from it (Kloppenburg 2005). In line with the questions of ownership is the larger interest of multinational corporations who in recent year have made their presence felt in the continent and are increasingly producing and promoting commercial seeds to farmers (Kuhlmann and Zhou 2016:4). This study sets out to examine how smallholder farmers access hybrids seeds in the midst of increasing corporate engagement in the seed industry in Ghana, that is been informed by the waves of neoliberal ideas of privatisation and open market policies in sub-Saharan Africa.

1.1: Problem Statement

Farmers own seed systems which are at the heart of food security in Ghana, as it is a significant source of seeds for small scale farmers (Etwire et al 2013). However, the commercialization of seed has become a global phenomenon. As a result, farmers and civil society groups in Ghana are worried about the trend of liberalizations in the sector which is putting them at a disadvantage in their own space for local plant breeding (Moore-Adingo 2018). However, the woes of farmers are being exacerbated by the coming in place of the Plant Breeders Bill (PBB) and the passing into law the Ghana Biosafety Act 2011(GBA). Proponents of the PBB are of the opinion that it will protect the property rights of breeders, and attract investment into the country as well as provide revenue for government. On the other hand, the Ghana National Association of Farmers and Fishermen (GNAFF) responded by arguing among other things that it will only bring investment that will limit farmers into growing export crops, and will lead to massive job losses as rural farmers will be choked by debts (Amuah 2013).

The Peasant Farmers Association of Ghana (PFAG) during a meeting in Techiman lamented that the PBB is a clarion call for multinational seed corporation to monopolize the seed sector in Ghana in the name of intellectual property rights (IPR) (Moore-Adingo 2018). However, the Ministry of Food and Agriculture (MOFA) together with its satellite bodies are unperturbed about this concern as they are of the opinion that these laws are the panacea to a robust agricultural sector. With regards to the Ghana Biosafety Act (an act that regulates the handling, transfer and use of Genetic Modified organism). Food Sovereignty Ghana (FSG) a local NGO and PFAG are in court challenging the legality of MOFA of using the act to allow the commercialization of genetically modified cowpea and rice in the country

(Wayo 2015).These laws in the seed sectors have led to mass protests and demonstrations by small scale farmer groups, NGOs, movement groups and political parties in Accra, Goaso and other parts of the country (Baffour 2015). These agitations beg the questions of who is/are in the heart of the control of the seed as well as the beneficiaries and losers.

At the heart of the commercialization of seed is the "hybrid seed". Which is being promoted to have higher yield of about 70 percent more than other varieties and is endowed with early maturation traits, and ability to compete with striga (Tripp and Ragasa 2015). Hybrid seeds and other modern seeds varieties are at the core of African Green Revolution agenda which is strongly pushed by the Alliance for a Green Revolution Africa (AGRA) with the objective of helping small scale farmers attain food sufficiency and security (AFSA and GRAIN 2015). However, these initiatives have achieved little success as farmers resist adoption. Reasons being, small scale farmers, as articulated by FSG are much comfortable with their local varieties which they understand better (Tagoe 2015).

There is also growing scepticism from various farmer groups/associations about the cost involved in the acquisitions inputs and chemicals needed for hybrid crops which further drains the pockets of farmers, The situation is even harder especially for farmers leaving in the Northern Region of Ghana, which is ranked as the third poorest (44.2%) in the country (GSS, 2015). Nonetheless, commodification of food and other agriculture resources through industrial and capitalist modes of production is often argued as the best way out, feeding into the larger narrative of neoliberal economics/principles that touts market base solutions as the panacea in resolving food insecurity and world hunger (Amir 2013). Therefore, this study argues that the access to hybrid seeds and other improved seeds is a big challenge for most of the smallholder farmers in Ghana, and especially those in Northern Ghana (Tamale).

1.2: Research Objectives

This research aims to explore the factors affecting smallholder farmer's access to hybrids seeds and other improved seeds in Tamale Metropolis. It also examines the seed systems in Ghana and how it is structured. Additionally, it analyses the policy directions of the seed industry and how it affects farmers' access to hybrid seeds in Ghana in general and in particular in Tamale articular.

1.3: General Research Question

The main research question is: Why and how do smallholder farmers access hybrid seeds in Ghana?

This is further explored through the following specific research questions:

- What are the drivers of hybrid seeds in Ghana?

- To what extent and in what ways has a private sector-driven seed industry been affecting local food systems in Ghana?

- To what extent has the promotion and expansion of hybrid seeds affected local seed diversity?

- Why and to what extent do smallholder farmers use hybrid seeds?

- What challenges do smallholder farmers face regarding access to and use of hybrid seeds?

1.4: Relevance and Justification of the Study

This study is relevant to both Government and Non-Governmental Organizations (NGO) in many ways. It will help policy makers in Ghana to identify the challenges of farmers in accessing hybrid seeds. It will contribute as a source of information for identifying the obstacles limiting farmer's access to improved seed varieties. The study will also equip Local agro NGOs in the Northern Region of Ghana with information regarding actions of global actor in the seed industry and its ripple effect in the Ghanaian context.

1.5: Structure of the Study

This research is structured in six chapters. The first chapter provide the background of the research topic and presents the research problem and objectives. The chapter also explains the relevance of the study and how the research is structured. Chapter 2 presents the research methodology, research challenges and limitations as well as the ethical considerations applied in the field. Chapter 3 engaged with the theoretical concept that provides the analytical structure of the study and literature on some concepts related to the topic. Chapter 4 examines the seeds systems in Ghana and its institutional structure and framework. The fifth Chapter present research findings and analysis while the Final, Chapter gives the conclusion of the study.

Chapter 2 Research Methodology

2.1: Introduction

This chapter examines how data for this research was generated. It is a qualitative study that employed both primary and secondary methods of data collection. The chapter gives a description of the study location, methods of data collection, choice of sampling, processes of data collection, secondary data sources, data analysis, challenges, and ethical considerations. Tools that were used in the primary data collection include focus group discussions (FGD) with selected respondents in two farming communities in the Tamale metropolis and in-depth interviews of key informants such as officials of the Ministry of Food and Agriculture and the Tamale Metropolitan Department of Agriculture, owners of Agri business firms, some local farmers and Non-Governmental Organizations (NGOs).

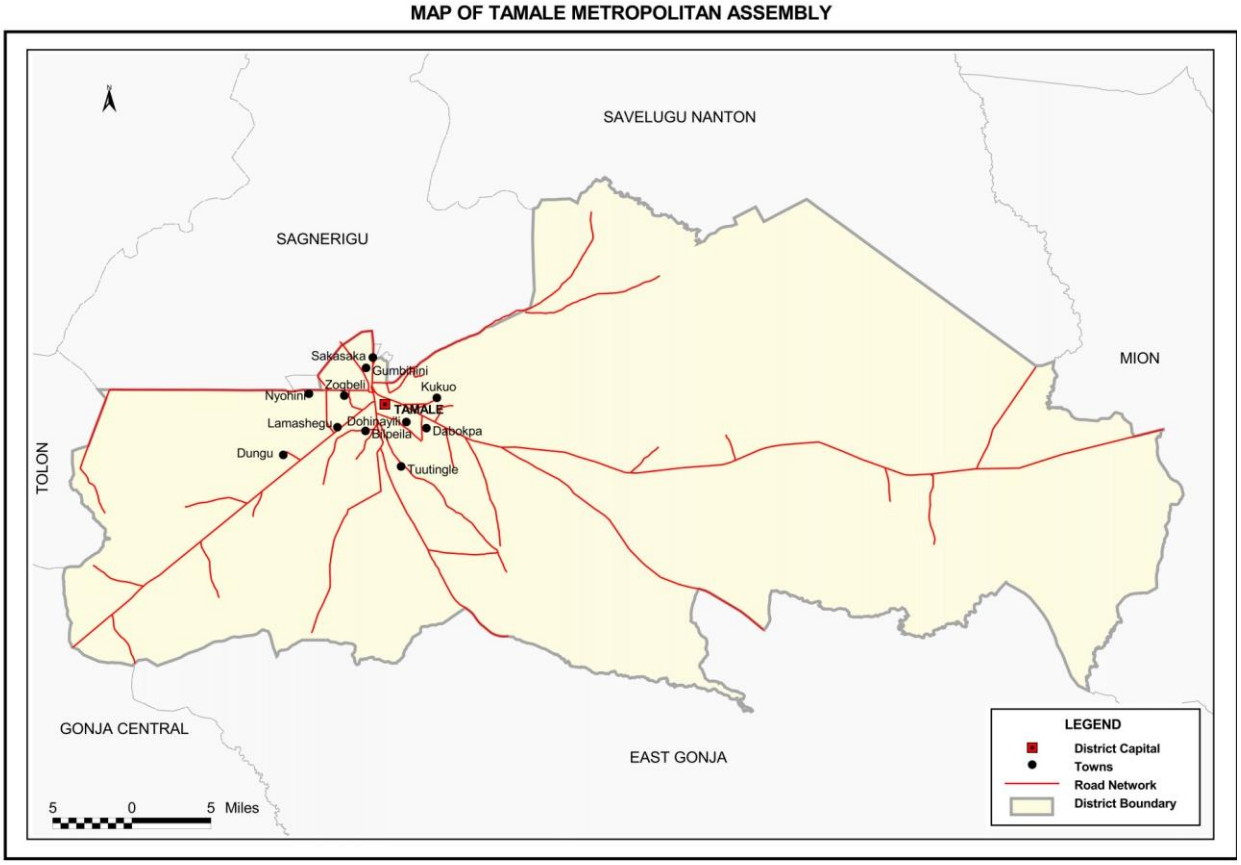
2.2: Choice of Study Location

The Tamale Metropolitan Assembly (TaMA) is the administrative capital of the Northern Region of Ghana. It attained Metropolitan status in 2004 (GSS 2014). The Metropolis has a land area of 646.90180 km^2 which accommodates 223,252 people (GSS 2014:20). It shares boundaries with Mion District in the east, Sagnerigu District to the west and north, and Central Gonja to the south west (GSS 2014:1). TaMA is made up of 115 communities with most of them being rural. It experiences a rainy season that stretches from May to the end of October (Kuwornu and Owusu 2012:79) which is followed by a dry season which is characterized by dry harmattan winds from November to February and a high sunshine from March to May (GSS 2014:3) Majority of the rural communities in TaMA have large expanse of land suited for agricultural purpose (GSS 2014:1).These communities are engaged in crop farming (about 85%), but fish farming accounts for less than (0.1%), which is as a result of fewer streams and rivers in the metropolis (GSS 2014). Maize, rice, sorghum and guinea corn constitute most of the crops cultivated in the area, as they formed the significant ingredients to the staple foods of the people called Tuo Zaafi and Kooko. Regarding livestock, poultry is a domestic activity found within most household in the rural communities.

Dagombas form the largest ethnic group in the Metropolis; however, other ethnic groups like Gonjas, Manprusis, and other groups from neighbouring regions like Dagaabas are residing in the area (GSS 2014). Muslims constitute the majority (90.5%) of the population in Tamale Metropolis, Christians account for 8.8 percent, and the proportion of traditionalist stands at 3.0 percent, which is followed by 0.2 percent of the people who are not affiliated to any religion (GSS 2014).

The selection of Tamale for this study is driven by the fact that it is the agricultural hub of the northern part of Ghana and a point of distribution of most agricultural inputs to

neighbouring countries like Burkina Faso the northern parts of Ivory Coast, Togo and other Sahel countries. It houses most of the big input distribution companies like Wienco, Masara Na Arziki, Wunpini Agro Chemical and Jubaili Agrotech. A majority of the Agro NGOs have pitched their headquarters in the Central Business District of the Tamale metropolis. The study communities (Chieseh and Adubiliyili) were chosen because they are easily accessible. In addition, they are among the few rural farming communities within the Metropolis with better road network linking to Tamale central business district.



Source: Ghana Statistical Services (2014)

2.3: Methods of Data Collection

The methods used to collect Primary data for this study were Focus Group Discussion (FGD), Interviews and Observation. The first method that was engaged in eliciting data for the study was Focus Group Discussion (FGD).Focus Groups mostly comprises of about 4-12 participant, with the objective of drawing out depth opinions of an issue that may not arise from direct questions (O'Leary 2017: x) .It is a method that allows the researcher to engage with respondents of diverse background on issues or matters of mutual interest. Participants are afforded the opportunity to express their concern/frustration or even challenge others' opinions or ideas in a pointed fashion (Kidd and Parshall 2000:294). However, this can only be successful with the facilitation of a very skilful and experience moderator. This notwithstanding, the technique offers the researcher a window of

opportunity to gather valuable information about people views on an issue, and why they hold the views the do (Bell 2014: 166). Just like all methods, it has its weaknesses. Poor facilitation of can lead to participant speaking out of research topic or question. Nevertheless, with a better facilitation, discussion among participants can consolidate or even provide new ideas (O'Leary 2017: x). The choice of FGD for this study was is because the topic for this study requires divergent views, and since issues of seeds involves almost every farmer, how it impacts them, their farms, families and fortunes differs. Also, the ability of the researcher to speak the local language (Dagbani) suits perfectly, as it offers the chance to probe further on issues that are not clear and also to understand some of the local jargons used in their daily conversation. From interactions with the contact person (an Agriculture Extension Agent) for the two selected communities, it was clear that farmers in the area of study are prepared to have discussion with everybody who is interested in the issue of seed.

Another method that was engaged in gathering information for the study was In-depth interviews. According to Boyce and Neale (2006), in-depth interview is a "qualitative research technique that involves conducting intensive individual interviews with a small number of respondents to explore their perspective on a particular idea, program, or situation" (Boyce and Neale 2006:3). As a method of data collection, interviews are used by researchers to elicit open ended answers and opinions related to various topics or events (O'Leary 2017: x). Interviews can be formal or informal, structured , semi-structured or unstructured depending on who the researcher is talking to, where he is conducting the interview and what he wants to get from the interviewee (ibid 2017). The choice of in-depth interview for this study was based on the fact it helped the researcher to solicit valuable information from key actors in seeds industry in the area of study. This is in line with the argument of Payne and Payne (2004) when he pointed out that it is a method that aims to obtain "an in-depth account of particular topics, but that account has to be the informant's" (Payne and Payne 2004: 131).

2.4: Sampling

Adopting a good sampling frame is a preliminary step to obtain a creditable data for a quality research work. For this reason, the purposive or non-random sampling technique was adopted to select respondents for this research work. The goal was getting responses from whom are directly involve in seed issues like farmers, Agro dealers and Ministries. Therefore, it makes sense that, target respondent were selected based on their professional competence, office titles (as in the case of Ministries, NGOs and Seed Producer) and experiences (as in the case of farmers. Besides, using this technique helps to manage the research processes very well. In addition, snowballing was incorporated to the process as it helped the researcher to identify key informant that contributed valuable information to the study.

In selecting respondents, diversity was key when it came to farmers, the goal was to have a respondent list that meet gender balance (a composition of both male and female), incorporation of age groups (youth and elderly persons) and dependents size of respondents.

Two Focus Group Meetings were held each at Chieseh Community and Adubiliyili Community composing of 12 and 10 participants respectively. In addition, 25 in-depth interviews with farmers across the two communities were conducted. With respect to the other respondent, an Official of the of the Ministry of Food and Agriculture was interviewed, since it is the department responsible for seed registration, inspection, monitory and the general responsibility of the facilitation and promotion of activities in the seed sector in Ghana. Four extension agents were interviewed from the Department of Agriculture of the Tamale Metropolitan Assembly, they are responsible for the diffusion of technology and information to farmers and are always in touch with farmers. Also 2 seed producers were interviewed to find out the process as well as the adoption rate of seeds and the pros and cons of seed producers. Jubaili Agrotech and Wunpini Agro Dealers who are private agro dealers in Tamale Metropolis responded to some of our questions ranging from the performances of hybrid and farmers general attitude towards improve seeds and inputs. The president of the Peasant Farmers Association of Ghana (PFAG) and the General Secretary of Food Sovereignty Ghana (FSG), who are both in the forefront of the fight against the introduction of improved seeds variety and hybrid seeds as well as inputs were interviewed to ascertain their side of the story.

2.5: Data Collection Processes

The entire data collection processes lasted 5 weeks, from 5th of August to 11th of September 2018. Three weeks were spent with farmers, with the remaining two weeks on the other respondents. Chieseh Community was the first point of call where a Focus Group Discussions took place on the 5th of August 2018. It was organized with the help of our contact person who also happened to be an extension agent responsible for the community as well as the Adubiliyili community. The composition of the focus group consisted of 3 women, 5 youth (20- 35yrs) and 4 elderly men (45-60 plus years). The discussion was co-facilitated by the researcher with the extension officer while the assistant did the recording. The discussion lasted for 1hr 20 mins (From 10:00am to 11:20 am). In Adubiliyili, the FGD was held on Friday the 7th of August at the Adubiliyili primary school teacher's common room. The composition of participant in this community was slightly different where we had a woman, 5 youth and 4 elderly men. Most of the women turned down our invitation because they were engaged with household chores. Nevertheless, we had ample time to discuss as it was a Friday, which is a resting day for Muslims in the community. The meeting started at 10: 15am and ended at 11:45am. With the in-depth interviews, most of the participants who participated in the FGD were not willing to take part. However, those who willingly granted us the interviews referred us to other farmers who have used hybrid seed in the communities. Out of the 25 in-depth interviews conducted, only 7 were females. Reasons being that majority of women were scared to talk to us without the permission of their husbands. Which is in line with the traditional practices of the communities. However, the entire data collection in the two communities went on well.

With institutions like the Ministry of Agriculture and the NGOs, letters were sent to them asking for an interview with them. At the Tamale Metro- Agriculture Department the extension officer arranged interviews with 3 of his colleagues (2 ladies and a gentleman) and the researcher. For the Agro Dealers and seed producers, we had to rely on our contact who provided their contact numbers. Some of them immediately agreed to meet (for example Heritage Seed officer), and for others an introduction in person was needed in order to give a reason for the interviews before an appointment was scheduled. .

2.6: Secondary Sources

Secondary data constitute a critical and essential part of this study. Academic journals, agriculture policy documents, government reports, newspaper articles, online news portal and academic books on various field contributed immensely to this research.

2.7: Data Analysis

Evidences from the field were categories into themes and then analysed. In analysing the finding certain terminologies featured prominently. These terms are defined as used in the context of the study. Hybrid Seeds in this study refers to the cross breeding of sexual combination of two varieties (Kloppenburg 2005). Modern Seed Varieties also refers to the products of the formal plant breeding systems in Ghana. In the context of this study Modern seed Varieties is used interchangeable with hybrid seeds. Local/Traditional seeds refers to the products of farmers farming breeding and selection (Tripp 1996). While smallholder farmers refers to the local farming population of the study areas of Adubiliyili and Chieseh in the Tamale south constituency.

2.8: Challenges and Limitations

Since time and resources will not allow for a study of the entire 115 communities in the Metropolis, Adubiliyili and Chieseh, some communities were selected for this study. One of the biggest challenges encountered was the bureaucracies at the Ministry of Agriculture. As it took the researcher two days before an officer from the Plant protection and Regulatory service of the Ministry could grant an interview. The two communities where data was collected are about 6km away from the capital, where the researcher lives. Travelling to these communities was a challenge. 3 litres of petrol were required for the motorbike every day of the visit. Besides, at the end of every FGD, the groups were provided with snacks.

2.9: Ethical Considerations

Ethical considerations were followed during the data collection process. Permission was sought on behalf of the researcher by the extension officer of the area before starting the

data collection. Before we began with the FGD, permission was granted for recording of the proceedings. Also, all customary norms regarding meetings in those communities were adhered too.

Chapter 3 : Theoretical Framework / Literature Review

3.1: Introduction

This chapter examines the theoretical and conceptual framework for understanding and analysing the processes of commodification of seeds. The frame is built around the concept of Agrarian Political Economy (through the lens of the processes of commodification and global corporate concentration). Theory of access is also discussed to help unmasked what and how to access resources and in the context of seeds, it will examine factors that influences the access of hybrid seeds. The chapter will also review certain concept and their link with the seed system.

3.2: The concept of Political Economy

In the field of agrarian studies, many writers have applied the concept of political economy to analyse and understand the relations and processes of the modes of agricultural production. Henry Bernstein defined political economy as "the social relations and dynamics of production and reproduction, property and power in agrarian formations and their processes of change, both historical and contemporary" (Bernstein 2010: 1). In this definition, one can easily identify striking concepts of social relations (relations to economic production), property (ownership of resources), and power (authority). These are deeply associated with where local farmers access their seeds from, how the get those seeds, what they do with them and what benefits they get from these seeds. The concept of political economy is going to be discussed in this context through the lens the processes of commodification and Global corporate control of the seeds.

3.2.1: Processes of Commodification

To fully understand how social relations to production, power and property have an influence on the seed, one will have to unpack how capital hold grip of it through the processes of commodification and primitive accumulation. As Bernstein puts it, "commodification is the process through which the elements of production and social reproduction are produced for, and obtained from, market exchange and subjected to its disciplines and compulsions" (Bernstein 2010:102). A clear phenomenon that every aspect of the agriculture production chain including the seed is subjected to market principles. Commodification is extricable linked with primitive accumulation, a situation where farmers are separated from their means or tools of production (i.e. seeds and other inputs) (Kloppenburg 2005:9). However, this is not a feature of non-capitalist regimes, where all input of production was at the bosom of the farmer. Yet with a distortion of the farmer relations to his farm, he must resort to the market for the provision of farm inputs and services.

Commodification of the seed has been possible in two ways. The technical approach and the legal route. The technical approach has been achieved through the application of science and technology or what is known in food politics as Biotechnology. This has led to the released of improved seed varieties like hybrids which defies the natural traits of self-reproducing (which has always been the obstacle for capital engagement). Thus, opening up the doors for private investment in seed. And since varieties like hybrids, whose subsequent generations can't exhibit the same traits as parents, farmers will have to rely on the markets to access them. Whiles those who invested in them rake in more profits (Howard 2009; Kloppenburg 2005).

3.2.2: Global Corporate Control of Seeds

Commodification of the seed can also be contextualized in the general global food politics, in what Philip McMichael described as the corporate food regime. Where the interplay between Biotechnology and World Trade Organization (WTO) legal framework has intensified corporate grip of the agriculture. Biotechnology which is "any technique that uses living organisms (or part of organisms to make or modify products, to improve plants or animals, or to develop microorganisms for specific uses" (Kloppenburg 2005:1). Is being protected by laws and conventions that protect companies (mainly from global north) ownership of improved biomaterial to the disadvantage of government and local farmers right to those materials (McMichael 2000: 24). Besides, the neo-liberal world order, which is driven on the wheels of WTO legal framework, has led to the intensification of corporate integration in agriculture. Various intellectual property rights protocols have opened up doors for Transnational Corporations (TNCs) claims on patent genetic materials like seed germplasm. Forcing farmers to abandon the saving of certain seed varieties of their choice for fear of patent infringements (McMichael 2000). These measures have led to farmers not only to lose control of the economic benefits of agriculture, but also to a large extend loss of knowledge of seed.

The legal framework of the WTO has also sparked up an emergent intensification of global corporate consolidations in certain sector of the agro- industry (Howard 2009). This is achieved through mergers, joint ventures and so on (McMichael 2000). Fine examples can be drawn from the joint venture between Cargill and Monsanto in a bid to control the "Terminator gene", which will save Monsanto the pain of regular sample test on farmers' fields to detect whether farmers are saving seeds, and will also set the treadmill of farmers buying seeds from them every season (McMichael 2000: 25). Also, when it comes to the share of companies in the global market, only 10 agrochemical companies control 81% of the world's 29 billion dollars global agrochemical market, while another 10 life science companies are controlling 37 percent of the 15 billion dollars per year global seed market share (ibid 2000). The centralization of corporation in agriculture is shaping processes leading to (especially in the seed sector) the production, breeding and circulation of seeds, being controlled by few but powerful agribusiness firms. Indeed, the global influence of these

corporation has seen them claim stakes in the development of the seed systems in most sub Saharan African Countries.

3.3: Theory of Access

With the emergence of new forms and mechanisms of control of the seed in the agriculture sector, issues related to access become critical to the farmer. The theory of Access is therefore one of the lenses of analysing the mechanism of control, power and access of the seed. This theory is useful in unravelling the various industry actors and also unpack the means, and processes engaged by individuals and institutions who control the seed industry. According to Ribot and Peluso (2003) access is "the ability to derive benefits from things" (Ribot and Peluso 2003:153). This definition points to one's power or authority that equips him/her to derive benefit from a resources or services. Theory of Access tends to differentiate access from property by arguing that while property is define as the "right to benefit from things", access has to do with the "ability to derive benefits from things" (ibid 2003). Nevertheless, both are pointing to how one 'benefits' from a resource, product or service. However, proponents of theory of access contends that property relations are one of the various means to access a resource, therefore focus should be on the "bundle of powers" embedded in access rather than the "bundle of rights" one has over the thing or resource (Ribot and Peluso 2003). Indeed, these differences are clear when it comes to farmer's access to seed. Farmers might gain the benefit from planting a certain variety of seed, but may not have the right of producing and saving it for future use.

The theory of Access identifies power as a crucial element of access to a resource. As Steven Lukes pointed out, power has the ability to influence the making of decision, shape a political agenda and control people thoughts through manipulating their perceptions and preferences (Lukes 2005).Foucault puts it right when he stated his view on power as " productive as well as controlling" (Lukes 2005:491). Therefore, in differentiating between access and property, 'Ability' is equated to power, which can influence or affect others way of doing things or perception of things (Ribot and Peluso 2003:155). To that effect, it is not surprising that Multinational companies like Monsanto and Syngenta have the power to sue anybody who is found using their seed without buying it from them. Because they derive their power from the patent granted them by the state, which gives them exclusive right to be the producers of certain seed varieties (Howard 2009). Such institutions by law, control access to the resource (seed) while farmers maintain their access of the seed for farming through them. One can therefore fully understand the "bundle of powers" embedded in 'Access', by identifying and unpacking these "powers" within the social, economic and political context that shape people's ability to benefit from resources, services or things (Ribot and Peluso 2003:173).

Elements like capital, knowledge, market and technology have a tendency of shaping or influencing access to resources or services (Ribot and Peluso 2003: 165). Capital for

instances, is used to gain, control and maintain access to a resource, while those who have adopted advanced technology have the ability to derive maximum benefit from a service (ibid 2003). In addition, an entity's ability to commercially benefit from a resource will largely depends on its access to markets (Ribot and Peluso 2003:166). Same can be attributed to the seed. Multinational Companies who have access to capital, can use it to access control, by buying patent rights, or lobby law makers to pass laws that will protects their interest. Moreover, these companies have the financial muscle to easily access the market through the power of advertisement.

Institutions and organizations are also crucial in understanding how one is included or excluded in accessing a resources or services. As pointed out by Leach et al (1999), "institutions mediate access to resources" (Scoones 2015: 51). The interplay of formal and informal processes that governed institutions have highly differential effect, influenced by power relation (i.e. age, wealth, gender and class), that determines who gains access to a resource (ibid 2015). Therefore, the availability of a resources is not enough to benefit from it. Rather the access determines who is included or excluded in the benefits of that resources.

3.4: Gender Power Relations

Gender relations also shape and influence how one accesses a resource or service. It describes the social meaning of male and female as well as prescribing the code of behaviour of both men and women in a society. As a relation, it is just not how women and men relate to each other, but covers a wide range of social and economic activities like access to resources of agriculture production, income and work. However, gender relations vary from society to society (Thomas and Allen 2000:385). This speaks to why in most agrarian society's women faces obstacles and discrimination in access to land, extension services, market and financial services. Also, power dimensions on the unequal gender relations give rise to a situation whereby men have an economic advantage over women thereby limiting their access to economic activities. Inheritance of property and ownership of assets are core to gender relations. In sub-Saharan Africa for instance, married women can only access lands that are allocated to their husbands, who administer them on their behalf (Jacob 2013:44). The situation is not different in Ghana where the majority of the ethnic groups practices the patrilineal system of inheritance, where only male children of the family inherits the deceased property. Also, the structure of household and the communities in Northern Ghana is largely gender bias. The hierarchy of authority right from the household to the community is occupied by men i.e. chiefs, traditional priest and head of the family are all men (Apusigah 2009). Therefore, decision making regarding the welfare of the family, the political situation of the community and the religion needs of the villages are the preserve of men. The world of work also exposes the gender inequality in many spheres. The productive and well rewarding jobs are being occupied by men, while women engaged in less rewarding ones. In the context of northern Ghana, the production of non-staple products like vegetables and

beans which does not reward much financially is being left for women to cultivate (ibid 2009). Thereby limiting their capabilities and access to productive and rewarding economic activities.

3.5: Land Access

Land is an in important resource in agricultural production, hence access to it is significant in influencing who benefits and who loses. Issues like land tenure systems, gender and customary laws are crucial in access to land for agricultural purposes especially for women (Tripp 2004). In most African countries, women access to land is impeded, because their link to land is mediated by their male relation. Any attempt to challenge the statuesque will mean a disruption of the social relations of that society (Tripp 2004:2). Customary land tenure relations is also a factor that shapes access to land. The situation is even more complex with the wave of changes in land tenure relations in Africa. In Northern Ghana for instance, commoditization is taken hold of the land tenure relations, where customary norms are being replaced by market logics in land transfers. Moreover, residential need for land is in competition with agricultural interest in most areas of the region (Yaro 2010:200).This has led to a rise of new mechanisms of access and control of land. And in most cases small holder farmers are always at the losing end in this whole enterprise.

3.6: Food Security

The political economy of the seed is also linked with food security issues. It is not surprising that international organizations like Food and Agricultural Organization (FAO) and others try to link food security with seed security (McGuire &Sperling 2011). Food security is always defined to include terms like sufficiency, availability and accessibility of food by a population (Patel and McMichael 2009; McGuire and Sperling 2011). Missing in the debate on food security is the question of who has the power and control over food, whether people have the purchasing power to buy what is available and more important, do countries have the leverage to produce what they can for their people (Patel and McMichael 2009).These are some of the evading questions that need to be addressed. The root of the problem of food security issues especially from countries of the global south can be attributed to the impact of the structural adjustment policies which minimize local farmers channel of support through rural credit and marketing boards (Lawrence and McMichael 2012:135). This opens the doors of developing economies to the influx of imports from western economies whose farmers are protected by subsidies which are non-existences for farmers of the global south. Rendering local farmers unable to compete with foreign food and creating new markets for their surplus grains. Apart from subsidies, the inculcation of science and technology into agriculture contributed immensely for grain surplus especially in the United States of America (Kloppenburg 2005). Indeed, the emergence of hybrid technology through biotechnology saw the hybrid corn fill American granaries in the 1930s (ibid 2005). This led to them

advocating for developing countries to depend on their cheap agricultural products instead of producing to feed themselves (Patel and McMichael 2009). It led to the transformations of developing countries' economies as new market for USA grains. Thereby killing local potential of grain production and resulting in food crisis in those countries. Jennifer Clapp puts it well when she describes it as the "age of agriculture biotechnology" which is being motivated by factors which include economic interest (Clapp 2005:6).

Food security issues are also interlinked with trade related deals like the Uruguay and the Doha round of trade agreements which have created uneven rules to the disadvantages of developing countries (Clapp 2015). As the interpretation and operationalization of some of these trade regimes are being influenced by the power and interest within the table (Clapp 2015:115). It is therefore in light of all this political and economic tone framing food security, that activist groups like La Via Campesina advocated for an alternative paradigm known as Food sovereignty which "is the right of people to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems" (Patel 2009: 666). This is a paradigm that advocates for the farmers agency in deciding what they feel appropriate to undertake in their farms.

Chapter 4 Exploring Ghana's Seed System

4.1: Introduction

This chapter discusses the Seed system and it institutional structure and framework in Ghana. It also highlights some of the policies that have guided the operations of the seed systems over the years. Also of importance in the chapter is the role of private actors and how they are transforming the seed system in Ghana. The chapter also briefly examine the emergences of hybrids and how is performing in Ghana and other parts of the world.

4.2: Seed System

Seed is one of the most important agricultural inputs. Therefore, the availability of quality seeds will boost sustainable food production (McGuire and Sperling 2010). The availability of quality seed will largely depend on a robust and well-functioning seed system. A seed system is "the sum of physical, organizational and institutional components, their action and interactions that determine seed supply and use, in quantitative and qualitative terms and include formal, informal and seed aid elements" (Scoones and Thompson 2011:8). It includes a network of individuals and institutions associated with the development, production, multiplication, distribution and marketing of seeds in a geographical space. Like most African countries, Ghana has a two seed system; a formal seed system which is the creation of the state, and an informal system which is based on traditional techniques of seed exchange among farmers (Niangado 2010).

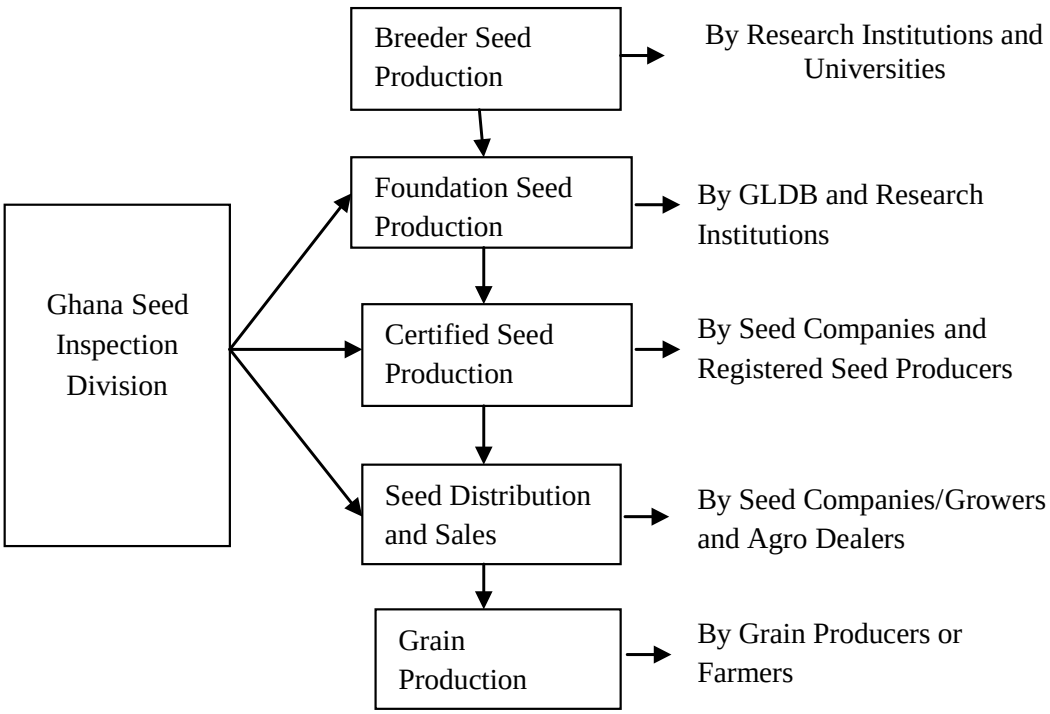
The informal seed system accounts for majority of small-scale farmer's source of seeds in Ghana (Etwire et al 2013). It comprises farmers saved seeds, informal seed markets, informal seed storage mechanisms and the preservation of traditional knowledge of seed (Gill et al 2013). Seed breeding under this system is much faster as compared to the formal system where they go through a series of regulatory checks and inspections (Etwire et al 2013)

The formal seed system is based on a well organised structure, that regulates the activities of key stakeholders and operates through specific mechanisms involving the breeding, production, multiplication, certification, distribution, marketing and storage of seeds in a geographical location (Gill et al 2013; Niangado 2010; Etwire et al 2013). The system over the years has provided certified improved seed variety of different crops like maize, sorghum, rice and groundnuts. The system ensures quality control of seeds. However, low publicity and awareness of new varieties by smallholder farmers is the major challenge facing the formal seed system (Etwire et al 2013).

4.3: The Institutional Structure of the Formal Seed System

The formal seed system is organised under the supervision of the Ministry of Food and Agriculture (MoFA). The system is organised with a specific structure that caters from the production level right away to the farmer's field. Breeder seeds are developed by the National Agriculture Research Institutes (NARIs) which is made up of the Crop Research Institute (CRI) and the Savanna Agriculture Research Institute (SARI) under the Council for Scientific and Industrial Research (CSIR) (Tripp & Mensah- Bonsu 2013: 2). This breeder seeds are then acquired by the Grains and Legumes Development Board (GLDB) to be developed into foundational seeds. However, with the increasing demands for foundational seeds, research institutions are also mandated to engage in their production (Etwire et al 2013). Foundational seeds are further developed into certified seeds by Private seed growers, Non-Governmental Organizations (NGOs), and even farmers through the monitoring and regulation and certification by the Ghana Seed Inspection Division (GSID) of MoFA (ibid 2013). The final responsibility of marketing and sale of certified seeds lies in the hands of private Agro –input dealers who ensure that farmers get it. However, breeding activities are being challenged by low funding of public breeding institutes like the CRIs, opening for competitions from imported seeds (especially hybrid seeds) from agro-distribution companies. Below is a flow chart of the formal seed system in Ghana.

Figure1: The structure of the Formal Seed System in Ghana



Source: Analysis of the Seed System in Ghana by Etwire et al (2013).

4.4: Seed Related Policies in Ghana

Over the years, government has come out with policies and legal framework that guide the operations of the formal seed system in Ghana. The Plant and Fertilizers Act which came to force in 2010, was designed to provide plants protection as well as seed and fertiliser control in Ghana. The Biosafety Act of 2011 (Act 831) was also developed to ensure the protection, development, safe handling and transfer of genetically modified organisms (GMOs) in the country. An act that has received a lot of backlash from civil society groups in the country (Wayo 2015). Nevertheless, the Act among other things called for the establishment of the Biosafety Authority that will be responsible for developing an administrative mechanism to ensure that the objective of the Act is achieved. The Plant Breeders Bill is another legal instrument that was also drafted to protect the intellectual property of breeders and also catered for the general regulations of actors in the research, development and production of seeds. In 2013, MoFA in collaboration with all stakeholders in the seed sector ranging from expert agribusiness firms, civil society groups and local farmers, contributed in drafting the National Seed Policy, which aimed to address the general needs of the sector. Its main objective as cited from the policy document itself stated this;

> The main objective of the National Seed Policy is to support the development and establishment of a well-coordinated, comprehensive and sustainable private sector-driven seed industry through systematic and strategic approaches which would continuously create and supply new improved varieties for use by farmers and, further, support successful seed production, certification, marketing and seed security systems which will form the basis for food security and support the overall development of the agricultural sector.(GSP 2013:33)

The policies over the years have contributed little to the development of the seed industry due to poor implementations of these regulations (Tripp and Mensah-Bonsu 2013). Which is a result of inadequate funding of public institutions that has been there since the colonial era (Amanor 2011).

4.5: Hybridization in the Ghanaian context

The emergence of hybrid corn in the 1930s in the United State of American (USA) was heralded as a breakthrough in plant breeding (Kloppenburg 2005). Since then, there has been an impressive adoption of hybrid seeds by farmers in most part of the world, with the USA and China leading the pack (Tripp and Ragasa 2015). Countries from the global south are not left out of the new technology, as Asian and Latin American countries have shown promising adoption rates. Even though there is variation in adoption from Country to country (ibid 2015).

In Sub-Saharan Africa (SSA) the adoption of hybrids is gaining prominences especially from Eastern and Southern African (ESA) like Zimbabwe, South Africa, Malawi, Zambia and Kenya. Ever since the introduction of hybrid seeds to Africa by the colonialist, it adoption

has been encouraging, especially among Eastern and Southern Africa countries (Tripp and Ragasa 2015). However, in most of these countries the seed sector is dominated by multinational seed firms who are responsible for the production and distribution of hybrids (Chinsinga 2011: 59). Yet again the diffusion of hybrids in ESA countries can also be attributed to proponents of the New Green Revolution of Sub-Sahara Africa whose objective is to replicate the success story of the Asian Green Revolution of the 1970s which hinges on the promotion of new seeds (i.e. hybrids) and fertilizers (Scoones and Thompson:1). However, the story is different in Ghana and other West Africa countries. Where farmers have adopted modern improved maize varieties in their farms, and yet little of this is hybrid, in fact 60 percent of maize area cultivated in the country is modern improved varieties with very little as hybrid (Tripp and Ragasa 2015:2).

The adoption of hybrid maize by Ghanaian farmers hasn't been that encouraging. Until the mid-1990s, the crop research institutes who were responsible for plant breeding (especially maize) (Amanor 2011: 50) were focused on the breeding of Open Pollinated Varieties, which has culminated to Obatanpa (an OPV maize variety), accounting for more than 40 percent of Ghana maize area (Ragasa et al 2013). The first hybrid maize seed variety Mamaba was released by CRI into the country in 1996. Subsequent varieties failed to replicate the success of Mamaba and were withdrawn until the mid-2000s were viable hybrids varieties like Etubi were introduced to Ghanaian farmers (Tripp and Ragasa 2015). From this point, a number of hybrid maize were released to the Ghanaian farmer. The general low investment in research institutions for cereal crop development since pre-independences era has been used to explain why public breeding bodies have not been able to come out with many adaptable modern improved variety seed(such as hybrids)(Amanor 2011).To complement the effort of public research institutions in production and spread of hybrids (especially maize), several agribusiness firms like Wienco, Dizengoff and AgriServ have imported varieties like Pioneer 30Y87, Pan53 and Pan12 from South Africa (Tripp and Ragasa 2015). Also, parastatal bodies like the Savanna Accelerated Development Authority (SADA) has also engaged in the importation of hybrids maize seeds to support local farmers in Northern Ghana. However, pressure from groups like SEEDPAG made them adopt OPVs (ibid 2015). The absence of a clear-cut government policy on hybrid seed development in Ghana has open door for donor bodies and foreign agribusiness firms to dominate the sector leaving the potential of developing a local hybrid seed industry in limbo.

5.6: The Interest of Private Actors in the Ghanaian Seed System in Ghana

The centrality of the question of food security and modern agriculture is in line with the neoliberal policy adopted by most Sub Saharan African Countries including Ghana. It has deepen, and to some extent redefined the interest of Donor partners, NGOs and Agri-firms/corporation. In the case of Ghana, it is transforming the formal seed system to a largely

foreign dominated one (Tripp & Ragasa 2015). Interest of donors, seeds companies and NGOs sometimes determine the area of investment in the seed sector. Whether it is in the interest of government or not (Tripp & Ragasa 2015). These undermines government objectives of developing a robust domestic hybrid seed industry in Ghana. A case in question is the partnership between USAID and Pioneer on their decision to import foreign hybrid seeds from Multinational Corporations into the country (ibid 2015). A situation that can hamper the development of a domestic hybrid seed system. Furthermore, policies like the Plant Breeders bill, the Biosafety Act and the National Seeds Policy protects the intellectual property rights of multinational seed companies. These companies owns and controls a greater part of the global seeds industry (McMichael 2000).

The increased private sector engagement of the formal seed system is being informed by inadequate regulations to guide the operation of the NARIs, resulting in challenges related to varietal approval and released (Tripp &Ragasa 2015). This culminates into low number of local hybrid varieties in Ghana and Tamale in particular. There is also a challenge when it comes to the inspection and certification of seeds. As the capacity of the seed unit of MoFA is limited in terms of staff strength and funding to carry out their functions effectively (ibid 2015). A phenomenon that affects the effective operation of these departments.

This inefficiencies in the formal seed system give seed companies the leverage to rather import in foreign seeds instead of supporting government to strengthen its institutions. As a result of these weaknesses, many smallholder farmers in Tamale and its surroundings have little knowledge of the benefits of hybrids as they are unable to access them. Also these weaknesses have also accounted for the majority (80%) of smallholder farmers to rely on the informal sector for the source of seeds for farming (Niangado 2010).

4.7: Conclusion

Most of the smallholder farmers in Ghana and Africa in general, sourced their seeds from the informal seed system. Because it is easier to acquire seeds from the system. The formal seed system has been created to produce modern improved seed varieties that are suitable for the environment and able to withstand the erratic climatic conditions in the country. To achieve this, policies are enacted to guide and regulate the operation of the system. However, improper implementation of these policies, which is attributed to poor funding, poor staff strength and skills, has contributed to the poor performance of the formal seed system. A situation that is leading to the gradual control of the seed system by private actors.

Chapter 5 : Findings and Analysis

5.1: Introduction

This chapter discusses the evidence of the findings that are categorize into thematic sections. These includes some of the factors that drives hybrid seeds adoption in Tamale and the implications of seed diversity on smallholder farmers in the two study communities. The chapter further examines local/traditional Seed saving practices and it social and environmental effects on the people and their farms. As well as the challenges that affect or limit smallholder farmers' access to hybrid seeds in the study areas.

5.2: Factors That Drives Hybrid Seeds in Tamale

Evidences from the field suggest that elements that drive the adoption of hybrid seeds can be categorized into social factors and economic factors. However environmental factors are also raised to highlight the effects of hybrid seed usage. Social factors in the context of this study is going to look at elements like of taste of grains of particular seed varieties, colour of seeds and others factors that influences smallholder preferences of a variety. Also economic factors will specifically interrogates how the narratives around yield of hybrid seeds shapes farmers preferences of the seed over other varieties. Environmental factors largely looks at the effects of the complement of hybrids like fertilizers and other chemical inputs.

SOCIAL FACTORS: The choice of farmer's seeds depends on certain social factors. This came out strongly during the interviews and FGDs the researcher had with farmers. Farmers listed a lot of things that influenced their choice of a particular seed variety. The first set of respondents were particular on farmers owned saved seeds or seed from the local/informal seed system. Here are some of the respondent's views on reasons why they like certain varieties.

> I prefer the variety (maize seeds) that I am using now because it taste nice, and has a very nice colour. Apart from the taste, storing it is easier, you don't need to apply chemicals to protect it from pest attack. The traditional method of storage in this community is applied in storing the harvest. Also the quality of food prepared from the grains of this seeds counts a lot. Taking the variety we are planting for example, left over Tuo Zaafi (a staple food prepared from millet or maize) when it is prepared with flour can be consume after a day. Most of the other varieties cannot last up to the following day (Memuna, FGD Adubiliyili. On the 7th of August 2018).

The choice of seed as far as some smallholder farmers are concerned is not just about yield as the evidences from the respondents suggest. However, it sometimes borders on issues pertaining to taste of the grains of crops, how the colour of the grains appeals to them, and whether the storage processes of such crops are a challenge to farmers. This resonates with other studies where it was found out that farmers' selection choice of seed varieties is largely being influenced by taste, processing qualities and visual traits (Stromberg et al 2010). With

regards to hybrid seed and other improved seeds, from the formals seed sector, smallholder farmers has this to say;

> I have used both (saved and hybrid) seeds. The maize grains of saved seeds are hard to crack, and takes a longer time to dry as compare to hybrid maize seeds. Apart from that, Kawachia (a local saved maize variety) takes 3 and a half to 4 months to mature. On the other hand, with the hybrid seeds, in less than 3 months you will harvest them. Also, the farm management practices are less laborious as compared to Kawachia. Hybrid maize grains are easy to dry and also easy to mill as compared to the local varieties (Azaara. Chieseh, on the 5th of August 2018).

Hybrids maize grains according to this respondent have a better visual and taste characteristics than farmers saved seeds. Most of the women correspondents were much particular of the ease in which they prepared their local staple called Tuo Zaafi with flour of hybrid maize. A factor that influences farmers' choice of hybrid seeds over other varieties. These choices are informed by the fact that seeds from commercial sources are of good quality because of the rigorous chain of monitoring and inspections that they undergo, which gives them higher uniformity and purity than farmers saved seeds from the informal seed system (Tripp & Mensah-Bonsu 2013).

ECONOMIC FACTORS: Apart from the social factors, economic factors also influence smallholder farmer adoption of hybrid seeds. Interviews with farmers and some MoFA official have pointed to the issue of yield as being a determinant that influences farmers' usage of hybrid seed in Tamale. These are the views of some of them;

> I have used pannar (hybrid maize variety) for sometimes now, and the yield is good. With my small parcel of land what I harvest is three times more than those who planted 10 acres of other maize varieties. Most famers complain of cost, but if you compare what you will harvest in an acre of pannar maize, is far better than what a 10 acre farm of Obatanpa or any other seed variety will give you. For instances, I had 24 bags of maize from the last planting season (Dawuni. Adubiliyili, on the 7th of August 2018)

The advantages of hybrids seeds in terms of yield have been the silver bullet of MoFA in advocating for smallholder farmers replacing hybrids seeds with their local varieties. At a meeting with the Assistant Regional Director of Plant Protection and Regulatory Services (PPRSD) of the Ministry of Food and Agriculture (MoFA), he gave strong defences for hybrids by stating that

> We are encouraging farmers to use hybrid seeds because of its yield advantage over the OPVs. For example, if all inputs are applied at the right time and with the right quantities, you can get at least 25 bags/acre. This you cannot get from farmers saved seeds. But farmers don't see it that way. Studies have shown that, an acre of hybrid maize gives a yield of 6.5tons as compare to 1.5tons for OPVs. (Afranie. Tamale, On the 11th of September 2018)

These assertions of hybrid seeds having higher yield by some smallholder farmers and officials of the Agriculture ministry is in line with other findings where they were found to be 14% more in terms of yield than others (Husain et al 2001). In related findings, it was also shown that Hybrids maize seeds out yielded Obatanpa (an OPV maize variety) by 8-23 percent (Tripp & Mensah-Bonsu 2013). But it is also important to point out the complementary inputs that go with hybrid seeds. Because the success of hybrids largely depends on the applications of other complementary inputs like fertilizers and other

chemicals (Tripp 1996), However, the issue about high yield of hybrid is been contested in literature, as trials in some parts of Ghana have proven that hybrids out yielding other varieties depends on the location and season (Tripp and Mensah-Bonsu 2013). For instances, in the coastal savannah where a trial test was carried out, Mamaba (hybrid) out yielded Obatanpa (an OPV) by 23 percent in the major rainy season, but at the end of the minor rainy season the yield were statistically the same (ibid 2013). Additionally, the issues of yield was also downplay by the General secretary of Food Sovereignty Ghana (FSG) who argued that there are other factors that need more attention if we want to improve the productivity of the farmers. He pointed out that;

> There are food rot on our farms, go to Ada, tomatoes are left in the farms in crates to spoil because people aren't purchasing them. Doesn't it make sense that we find a way to market these yields? Because when we talk of yields, the yield is here, so why don't we exhaust them and stop importing from other countries? So this whole fixation of high yield, if we minimize the losses, it would be better, because we already have enough yield to feed Ghana (Edwin. Tamale, on the 8th of September 2018).

The fixation on yield by authorities in the formal sector is understandable, as some surveys purged hybrid as having 70 percent more yield than other OPV varieties (Tripp and Ragasa 2015). Thus, smallholder farmers stand the chance of making more profit with enhanced productivity (Sudha et al 2006). As pointed out by FSG, issues related to post harvest losses and land related matters have an effect on yield. A survey conducted in 2016 revealed that Ghana losses 318,514 tonnes of maize annually to post harvest losses, with the northern region accounting for about 20,411 tonnes (GNA 2017). Conversely, the country spends $2.4 billion annually on the importation of food (Adombila 2018). A clear indication that it is not the issue of farmers not getting much yield, but it has to with matters relating to inadequate or lack of post-harvest management interventions like storage facilities, poor road networks, and transportation (Mutungi and Affognon 2013; Adombila 2018). If these interventions are put in place, it will reduce the cost of importing food into the country.

Also the availability of fertile land is a crucial determinant of yield. Evidences from the field points out that smallholder farmer's access to land and quality of farm land is of priority. Some farmers argue that, they've been farming on the same pieces of land for decades as a result, fertility levels have dropped. This is what a farmer had to say;

> I have been cultivating maize on this parcel of land for over a decade. The pressure on this land is enormous as I have no other to farm on. Elders of this community are reluctant to release new lands for farming purposes. They prefer selling them to estate developers. As you can see around, all these heaps of sand on those lands serve as notices to stay off any farming activities. Thus, we have no other choices than to keep depending on this land for survival. Without fallow periods the land fertility gradually dwindles (Ibrahim. Chieseh, 14th of August 2018)

Access to new lands for cultivation is also a challenge, as landowners (Traditional Chiefs and Tindanaa's) are faced with demands for lands for non-agriculture purposes. Privatization has transformed land tenure system in northern Ghana, to extent that landowners (chiefs and clan heads) are dispossessing community members of their farm lands without compensation (Yaro 2010). This challenge limits smallholder farmer's choices of alternating farming lands

in line with land fallow farming practices common in this area. A situation that has serious implication on crop yield as echoed by the farmers interviewed on the field.

ENVIRONMENTAL FACTORS: It is revealed that the use of both organic and inorganic fertilizers as well as pesticides and weedicides are higher in hybrids fields than other varieties (Hussein et al 2001). Interactions with farmers and officials support this stance. In the interaction with the AEA it was revealed that smallholder farmers into hybrid will need to apply a lot of fertilizers and chemical in order to ensure a good yield.

> An acre of maize hybrids will need more than 4 bags of fertilizers and other chemicals to ensure a good yield. For example, to a good yield, you have to apply 3 bags of NPK, and 2 bags of Sulphate Ammonia. You will also have to buy weedicides, and in some location we even advice to add pesticides and insecticides. However, the complaint is the cost of these fertilizers and other inputs (Nurudeen (AEA), Tamale. Interviewed on the 1st September 2018)

The economic factor that drives the promotion of hybrid is yield as this study reveals. The effects of the complements or inputs that go with hybrid is a source of worry. As it raises issues of environmental effects and cost. There are studies to the effect that increased application of pesticides can lead to habit loss and a rapid decline in the population of valuables species in the environment (McLaughlin and Mineau 1995). Other literature also points out that, the excessive application of pesticides has negatively affected and led to the deterioration of some parts of the flora and fauna (Ntiamoah and Afrane 2008). Which threatens the survival of biodiversity. Similarly, repeated application of in-organic fertilizers has the tendency of suppressing the production of certain enzymes in the soil (ibid 1995). These affect the biodiversity of both plants and animals in our environment. Conversely, the adoption of organic farming can mitigate this problems since the absences of these in-organic inputs will help preserve biodiversity and increased species richness in our environment (Bengtsson et al 2005). However, little of this is practiced in most of the farm in the study communities. More so, these complementary inputs don't come cheap, from my interviews with farmers, Urea is sold at a subsidize price of GHc 58.00 (approx. €11.00) and NPK is sold at a subsidize price of GHc 68.00 (approx. €13.00). Even at these subsidize prices smallholder farmers complained that it is expensive and they cannot afford it.

Taste of grains, colour of grains, quality of flour used in preparing food and less difficulty in milling have been identified as some of the social factors that determines farmers choice of hybrid seeds in the Tamale. Evidences from the field have also pointed to yield as an economic determinant that influences the adoption of hybrid seeds in Tamale. However, there are opposing views from a section of farmer unions who felt that if post-harvest losses are managed effectively, they can guarantee enough yield to feed Ghanaian. Defeating the reasons for relying on hybrid varieties that have environmental implication and burden on farmers. The environmental implication of the increased intake of fertilizers and pesticides is exacerbated by the fact that these inputs cost money. Thereby pushing farmers into relying on loans and credits to afford them. Which can lead to indebtedness if they fail to pay back these loans and credits.

5.3: Hybrids Effects on Seed Diversity

Throughout my interactions with smallholder farmers in the field, I have observed that most of them are into maize cultivation, with just a few practicing intercropping. I probe further to find out why most of them are planting only one crop. And this is what one of the farmers had to say:

> We ve all been cultivating maize because it is easier to manage. Even with the maize, you can only plant those from the argic people (modern varieties). If you plant kawachia (a local varieties) it wouldn't give you a good yield. If we are going to practice intercropping, expect heavy losses, because yam, sweet potatoes and vegetables which our parents use to intercrop with maize are no more cultivated in these areas. Also, if you even plant these crops in this farms, they wouldn't give you any good harvest. Because the land has lost it nutrients due to the intake of the fertilizers and weedicides that we ve been using. Beside, maize are more accessible than these traditional crops. So we are better off with maize alone than intercropping it with other crops. (Issifu Tia. Chieseh, on the 5th of August 2018).

The farmer's views is indicating not only the abandonment of intercropping practices, but a gradual shift from sourcing of seeds from the formal seed system. And a pointer to the reluctant of farmers in continuing with the cultivation of some traditional crops like yam or sweet potatoes as mentioned by the respondents. A situation that is gradually causing genetic erosion of major traditional crops and reducing seed diversity in those communities. This resonates with other studies where it points out that intensification of hybrids (the higher inputs intake of hybrids) threatens diversity within crops, which consequently displaces local varieties and forces farmers to adopt to monoculture farm practices (Tripp 1996; Levin et al 1996)

Also, the dwindle seed diversity is also being informed by the officials of MoFA, who pointed out that not all traditional crops are produced by the CRIs and other institutions in the country. According to him, hybrid seeds production in the country is limited to a few food crops. The following is what a respondent

> Over the years the formal seed system has released improved varieties in crops like rice, maize, cowpea, groundnut and sorghum. When it comes to hybrids only few food crops have their hybrid varieties. For example, we have maize and I think rice, we have sorghum but it is mostly meant for commercial farmers. They are mostly on contract basis. (Abdullah. Tamale, on the 1st of September 2018)

This points to the limited or narrow production of seeds for commercial purposes by the formal seed system. From observations in the farms it also points to not only sweet potatoes, but millet, bambara beans and certain traditional vegetable were not found. A situation that has the tendency of not only causing genetic erosion of essential local crop varieties for smallholder farmers, but also the loss of the traditional knowledge of seed saving and the cultivation of these traditional crops. Apart from dwindle of local seed varieties, "hybridization also promotes the extinction of rare species by reducing the potential for plants to replace themselves and thereby inhibiting the growth of their populations" (Levin et al 1996:11). Which reduces the biodiversity population in the environment. Also, issues of dwindling local seed varieties has a correlation with food security, as the availability,

accessibility and adequate utilization of seeds by smallholder farmers can ensure food security (McGuire and Sperling 2011).

The gradual loss of certain local crop seeds will have some economic and cultural implication for smallholder farmers. The narrowing of seeds especially by the seed breeding institutions, is gradually shifting farmers to the direction of mono-cropping as the respondent revealed. An adoption of these crops meant farmers will not only buy seeds of these crops but will have to buy their complement like fertilizer and other inputs. This will complicate their financial standing. Conversely, multinational seed companies and local agro input distributers and dealers stands to gain, as farmers will have to continuously buy from them every planting season thereby creating a treadmill.

Certain traditional food are associated with certain community. The loss of the traditional food will mean a loss of an aspect of tradition. For instances, Tuo Zaafi was originally prepared with millet. So most of the traditional rituals was performed with millet. With the emergence of maize flour as the main ingredient for Tuo Zaafi, it will feel like a section of tradition has been tempered with. Also the increased application of inputs has an effect on biodiversity which is threatening the survival of certain herbs that have medicinal uses. The disappearances of certain enzymes and worms in the soil due to increased intake of chemical also weakened the fertility rate of the soil.

5.4: The socio-economic and environmental benefits of Farmers owned seeds

Many of the farmers in the two communities pointed to the informal sector as their sources of seeds for farming. This came out strongly in most of the interactions I had with individual farmers and at the FGD. According to one of the farmer;

> The seeds I used for this planting season were seeds I saved from last season's harvest. A friend of mine from the neighbouring village gave them to me two farming seasons ago. He assured me that, they are of good quality. I had a good harvest last season and hope it will be better this time around (Aduuna. Adubiliyili, on the 7th of August 2018)

Farmers over the years have produced and saved their seeds for planting in the subsequent planting seasons. In Ghana, it is estimated that majority (80%) of farmers seeds comes from the informal seed system which includes farmer saved seeds (Etwire et al 2013; Wright &Tyler 1994). Therefore, it is not surprising that farmers in these communities are relying on the informal seed system to acquire seeds for farming.

The advantages associated with the informal seed system are strongly expressed by most of the farmers, as they recognized they cultural attachment to seeds savings and the traditional knowledge of seed savings being sacred within families, clans and the entire community. This is what a farmer had to say;

> Knowledge of seed saving is passed from mother to daughter. It is something that is found in every family in this community. It saves as the cost of buying seeds as the government want us to do now. In seed stress situations, some of us rely on our in-laws

> from and other relatives from different areas. It is an activity that binds and strengthens relations within our community (Ayishetu. Adubiliyili, on 12th of August 2018).

The evidences from this respondents are concurrent with most sub-Saharan African countries where majority of local farmers seeds comes from the traditional or informal seed system which is based on seed exchange from farmer to farmer, as its mitigate seed shortfalls that are common in most developing countries (Almekinders and Louwaars 2002; McGuire 2008; Etwire et al 2013; Niangado 2010). Farmers over the years have built a strong tradition of seed exchange which is sometimes based on the customary norms of reciprocity, religious practices of a place or strong family ties with family and relatives elsewhere (McGuire 2008). This has been traditions that hold societies and communities together as the respondent pointed out clearly.

Also, farmers have pointed out that their attachment to their owned saved seeds are not just customary but also because those seeds varieties are adaptable to their environment and climatic conditions. These are some of the conditions that seeds from the formal seed system fail to withstand. This is a farmer response;

> These are seeds I have saved and used for the past 5 years. They are able to withstand the erratic rainfall we are experiencing these days. I have seen my friends buy different seeds variety year in, year out. They complain that they are not getting good harvest. A friend came for some 2 years back and he is still using the same variety. (Doe. Adubiliyili, on the 11th August 2018).

These revelations are similar to studies where Smallholder farmers are comfortable with farm-saved seeds because they are familiar with their traits and local environmental suitability since they grow them (Louwaars and De Boef 2012). This resonates with opinions of most of the respondents who attested to the advantages of Kawachia (local variety) and how it could withstand certain weather patterns in the past. Additionally, smallholder farmers preferences of informal seed systems are also largely attributed to the absences of formal regulatory and monitory mechanisms which makes the distribution of seed to farmers easier and faster as compared to the formal seed system (Etwire et al 2013). However, in some countries there are laws to regulate farm-saved seeds. An example is the India Protection of Plant Varieties and Farmer's Rights Act which allows farmers to save and exchange or sell seed that are specified under the act (Tripp et al 2007).

However, seeds from the informal seed system have also been criticized for not churning out quality seeds that could withstand diseases and other environmental externalities. This was revealed during the interview with the PPRSD official if the ministry of food and agriculture

> Farmers come here all the time complaining of poor performance of their varieties, and we keep telling them to abandon their owned seeds and adopt the modern varieties. Modern seeds varieties like hybrids can withstand striga which is affecting a lot of farms in our communities. Besides, some of these new varieties take two and half months to mature. Some can also withstand droughts (Afrane. Tamale, on the 11th of August 2018)

These shortfalls that were pointed by the respondent are in addition to other weaknesses in farmer saved seed that relates to the situation where farmers tend to concentrate on the

selection of their major crop variety in the expense of other crops, killing the quest of knowledge of a variety of crops (Louwaars and De Boef 2012). Nevertheless, smallholder farmers have an unflinching attachment to their owned saved seeds.

Farmers owned saved seeds have over the years been the sources of seeds for majority of farmers as pointed out in the analysis so far. The cultural and traditional bounding that farmers have with their owned save seeds accounts for this. The knowledge of seed saving has been institutionalize, as skills are passed on from one generation to the other. Certain seed varieties are maintained by farmers because they are adaptable to the prevailing environmental conditions of these areas. Seed exchange in farming communities serves as mechanisms of bounding among smallholder farmers as farmers can fall on kinsmen from distances villages in seed stress situations. Farmers own saved seeds save smallholder farmers money. As money for seed purchase could be channels to other household needs.

5.5: Smallholder Farmers Access to Hybrids Seeds

Smallholder farmer's access to modern improved seed varieties is critical in boosting production in agriculture. Improved maize seed variety like Obatanpa (an OPV) is acclaimed to cover about 40 percent of maize area in the country (Tripp and Ragasa 2015). Thereby making it one of the prominent improved variety among Ghanaian farmers. With hybrid seeds, the evidence is negligible when it comes to area of coverage. In 1996, the quantity of hybrid maize variety released could only cover only 2 percent of annual maize area in the country (Tripp and Mensah-Bonsu 2013: 5). Evidences from the field with regards to access to hybrid seeds in the context of Tamale Metropolis are discussed based on the elements of availability, affordability and gender power relations. These themes emerged based on the respondent's revelations on challenges they faced in accessing hybrid seeds in Tamale. Availability

5.5.1: Availability of hybrid seeds

Seed is a critical input in agriculture, hence its abundance and proximity to farmers cannot be underemphasize. The extent to which farmers access hybrid seeds is largely dependent on it availability, as such many factors comes into play in determining availability. Evidences from respondents from the field echoes these factors which are the subject of discussion in this sub-section.

5.5.1.1: Absences of Outlets of Agro-inputs Dealers in Farming Communities

Farmer's access to hybrid seeds in Tamale is a challenge. As most respondents from the communities' laments on the absences of the presences of agro dealers in most of the communities affects the availability of hybrid seeds for smallholder farmers. This was evident during the focus group discussions held across the two communities. Some of the respondents has this to say;

> Unless you go to Tamale, you cannot get pannar or zanzalsima (hybrid varieties) to buy in this village or our neighbouring villages. Even in Tamale, not all the shops (Agro shops) are selling them, only the renowned agro-inputs shops like Jubaili agro-tech and Wunpini agro-chemical stores in town. Last planting season, I had to rely on Nurudeen (the extension officer) for zanzalsima for my farm. This makes it difficult for us to access hybrid seeds varieties in this community (Issifu Tia. Chieseh, On the 5th of August 2018)

This feeling resonates with most of the smallholder farmers I interviewed in the communities. The absences of agro-input dealers outlets have an effect on the availability of hybrids and other improved seeds in most rural communities in Ghana and other parts of Africa (Krausova and Banful 2010). Many smallholder farmers will have to travel long distances to urban areas to access seeds, as most of the dealers are concentrated in these urban centres (Krausova and Banful 2010:3). These realities defeat the Food and Agriculture Development Sector Policy II (FASDEP II) strategies of facilitating an enabling environment in all districts across the country for agro-input dealers to establish shops (MoFA 2007). This situation of fewer outlets of agro-inputs dealers especially in the rural areas has affected the availability of hybrids seeds the Tamale and other parts of the country.

Also, local agribusiness firms like Wienco and the Savanna Accelerated Development Authority (SADA) who imports hybrid seeds to the regions targeted specific projects like the Block Farms scheme (in the case of SADA), and contract outgrowers farmers (in the case of Wienco) as outlets for the seeds (Tripp and Ragasa 2015). Though not all smallholder farmers are included in such scheme. A Farmer who participated in SADA Block farm project shared her experience;

> Some of us were part of the block farm project that was carried out by the past government. It was my first experience with hybrid seeds. We were 12 farmers in all, and most of the participants of the project were men. They were only 3 women including myself, who benefited from the project. We were supplied with seeds and fertilizer from SADA. We also benefited from extension services. Since the closure of this project I ve not come into contact with hybrids (Zenabu. Adubiliyili, on the 10th of August 2018).

Outgrowers schemes like those mentioned above can serve as outlets for hybrid seeds to smallholder farmers as participating farmers stands a good chances of accessing other agricultural inputs and improving their income levels (Poku et al 2018; Baumann 2000). However, most of these schemes do not entirely cover majority of farmers, and those excluded are left out of benefiting from it (Poku et al 2018). Also, other studies have revealed that contract outgrowers schemes reinforces the processes of social differentiations in farming communities, where poor smallholder farmers are excluded from benefiting from inputs and other resources to the advantage of better-off farmers(von Bülow and Sørensen 1993). Therefore, perpetuating and deepening social differentiation in farming communities. Nevertheless, the presences of these schemes as enumerated above has positively affected the availability of hybrid seeds in Northern Ghana, though it did not include many smallholder farmers. Gender inequalities are evident in most of outgrowers schemes as pointed out by the respondent. Her assertion resonates with the finding of a research in Kenya, where it was found out that while men are encourage and supported to establish their independent tea growers, women were not given that opportunity. For fear of them having

access and control of family labour by their husbands (von Bülow and Sørensen 1993).This limit their access to economic input resources like seeds, fertilizers and pesticides as it reflects in the case of Tamale. Therefore, the availability of hybrid seeds in Tamale is largely affected by the absences of outlets in most of the farming communities for smallholder farmers to access.

5.5.1.2: Low Release of Hybrid Seeds in Ghana

Evidences from the field also reveal that, there are fewer hybrid seeds varieties in circulation as compared with OPVs. Thereby affecting the availability of hybrids for smallholder farmers to use. This is what the Assistances Regional Director of Plant Protection and Regulatory services had to say:

> Over the years our CRIs have not released as much hybrids as compared to the OPVs. And this has contributed to the importation of different hybrid varieties of different crops by companies like Wienco and Dizengoff to augment the numbers in circulation. We also had support from AGRA. Who are also into hybrid seeds especially around communities in the Upper West Region (Afrane. Tamale, on the11th of September 2018)

The assertion of the director confirms the responses of some smallholder farmers who complain that certain varieties that they know are not available even in shops in the urban centres and this has an effect on the availability of hybrid seeds in these communities.

> Before the start of this planting season I ve gone round almost all the renown seeds outlet in Tamale township but couldn't find wangdata (hybrid seeds) to buy. I even ask the extension officer to get some for me. He also complaint that he couldn't get some to buy. So it is difficult getting it these days (Habiba. Adubiliyili, on the 5th of August 2018)

These evidences from respondents resonate with studies where the current national usage of maize hybrid is less than 5 percent, thus informing the low penetration of hybrids in the country in general (Tripp and Mensah Bonsu 2013). Table1 throws more light to the situation. Between the periods of 4 years (2010-2013), certified hybrid maize (Mamaba) quantity released a total of 82 metric tonnes of maize seeds as compare to Obatanpa (OPV) which accounted for 11,878 metric tonnes to Ghanaian farmers. This huge disparities in a way has an effect on the availability of hybrid maize seeds for smallholder farmers to access.

Table 1: Release of certified maize varieties from 2010-2013 in Ghana.

Variety	Name	2010 (metric tons)	2011 (metric tons)	2012 (metric tons)	2013 (metric tons)
OPV	Obatanpa	4,282	2,634	2,761	2,201
Hybrid	Mamaba	54	3	4	21

Source: From Ghana Strategy Support Program (Tripp and Ragasa 2015)

Various factors accounted for the low varietal release of hybrid seeds in Ghana and some parts of Africa. The general lack of awareness of the availability of hybrid varieties which is attributed to high cost of starting of seeds companies and, absences of credit facilities that entrepreneurs can rely on (Smale et al 2011) is one of the causative factors. This discourages entrepreneurs from starting up seed producing companies. Also, the bad implementation of seed policies that can be attributed to low staff strength that are underfunded to carry out or operationalize those policies, even in situations where the staffing is okay, they sometimes lack requisite skills and competences to carry out their mandated activities. (Tripp and Mensah Bonsu 2013; Tripp and Ragasa 2015). This affects productivity and leads to poor performances which eventually affects the availability of hybrid seeds in the country. Therefore, farmers can only access hybrid seeds if they are available for them at enough quantity and closer to smallholder farmers at the right time for sowing (McGuire and Sperling 2011).

5.5.2: Affordability

Smallholder farmers from the two communities who have access to the markets in Tamale complain that the cost of hybrids maize seed is an obstacle to its adoption. The interviews and focus group discussions I had with farmers suggested that affordability remains a stumble block to access hybrid seeds. A respondent has this to say;

> I am not using zanzalsima (hybrid variety) because it is expensive to buy. A kilogram costs GHc 16.00, which is expensive than Obatanpa (OPV) which is GHc 7.00. And with my current financial standing I don't think I can afford it. Because I need 9 kilograms of the seeds for an acre. If you calculate the cost of 9 kilograms of these seeds by my two acres, then you will understand what I am talking about. (Fuseina. Adubiliyili on the 2nd of September 2018).

Smallholder farmers who are even interested in hybrids seeds are faced with the challenge of raising money to buy them. Therefore, if even, the seeds are available in the market, it is the purchasing power of farmers that will determine their access to it. This resonates with Scoones (2015) assertion that, the abundances of a resource in a market does not necessarily guarantees access to it (Scoones 2015).

Also, reacting on the issue of cost, the president of the Association of peasant farmers of Ghana in an interview felt that, the cost of hybrids would have an impact on the fortunes of smallholder farmers in Ghana. This is what he has to say;

> They want to "squeeze water out of a stone", this farmers are working hard to make ends meet in this current economic hardship. To encourage farmers to go for hybrids is to tell them to sign their death warrants. It is just too expensive for them (Akaribo, Tamale, on the 5th of September 2018).

Farmers who are interested in hybrids are being strongly challenged by the issue of the cost of the seeds which has far reached implications. Farmers who cannot raise the money will have to rely on subsidies or credits. Leading to issues of indebtedness which has negative implications for smallholder farmers in rural areas (Gerber 2014). Cost issues also affect seed producers, as they also complain about the cost of buying from breeder houses as well as the

cost involved in crop management that will result in bringing out good quality seeds to meet certification from the regulators. This is what the Chief Executive Officer of Heritage Seed Company had to say when I interviewed him:

> I understand farmers when they complain of the cost of hybrid seeds. However, they should also bear with us, the entire enterprise of hybrid seed is expensive. In fact just yesterday I spent about GHc 1,000.00 on labour and transport cost. I am likely to spend the same amount today. You can imagine the amount I would have spent by the time of harvesting (Mr. Sumani. Tamale, on the 30th of August 2018).

These lamentations resonate with other studies in other parts of Africa, where among other factors the high cost of establishing a seed company contributes to the problems facing the seed industry (Smale et al 2011; Tahirou et al 2009). It was also echoed by most of the farmers I conducted interviews and FGD with in the field. Indeed, seed sellers themselves affirm the complaints of farmers when I interviewed the Manager of Jubaili Agro Chemical. This is what he had to say:

> We tried to encourage farmers to buy hybrid cereal seeds, by explaining its advantages over the other. But they keep complaining that it is expensive. My company is preparing to undertake a demonstration exercise to show to farmers why they should switch to the use of hybrid seeds in northern Ghana. This we are planning to do next planting season (Mr. Hassan. Tamale, on the 3rd of September 2018).

The complaints of agro-inputs dealers resonates with most of the interviews and focal group discussion held at the two communities. Here is the experience shared by a farmer;

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The lamentations of the seed sellers further buttress the point of the expensive nature of hybrids farming. As many agents and actor in the value chain of hybrid seeds are affected one way or the other.

5.5.3: Gender limitations

Results from the data collected also point to the fact that men and women access to seed and other resources is based on gender differences. Customary laws in most communities' grants unequal access to resources by member, women are mostly at the disadvantage as they must rely on their husbands or other male relatives to access valuable resources such as land or seeds for cultivation (Jacob 2013). Women farmers in Chieseh and Adubiliyili communities also face these challenges. Access to essential resources like seed largely depends on their relationship to their male family members i.e. husbands, uncles, brothers etc. Access to hybrid seeds or any form of seed variety also has a gender face to it. Most of the women I interacted with in the communities especially during the interviews had this to say.

> My husband gave me these seeds for cultivation, and in times of difficulties I had to rely on my brother, father or uncle for seeds to supplement what he gives me. You know by our customs, when you are married to a man, you become his responsibility. Even this farm belongs to him (husband), and whatever we get from the farm he decides what we do with it. Therefore, whatever we need in this farm, comes from him (husband) (Sanatu. Chieseh, on the 10th of August 2018)

The assertions of the women respondents of Chieseh in respect to access to seeds is not that different from other parts of the country, as access to land and other resources within and outside the household is a challenge for most women in Ghana and other parts of Africa

(Tsikata 2009; Dos et al 2012; Lastarria-Cornhiel 1997). Who gets what and who does what largely influences and shapes access in this context. For the men, their ability to get what they want, do what they want, and benefit from what they do is informed, and protected by customary laws. At the same time, these laws limit women's access to get what they want, do what they want and benefit from what they do.

In northern Ghana, traditional households places males as head, as boys are socialized to emulate what their father do while girls are positioned as potential wife's and mothers (Apusigah 2009). These positions males as potential providers, whiles the females are at the receiving end. Additionally, it prepares them to take full control of property and their allocation within the household and the large community. Similar gender inequalities resonate in women ownership and control of valuable assets like land and other resources (Doss et al 2014). Research has shown that women ownership of land is much lower as compared to their male counterparts in most developing countries. For instance, women formed 28 percent of landowners in Ghana, while similar studies in Latin America also confirms that 32.3 percent of landowners in Mexico are women (Doss et al 2012). These and other factors such as women lack of access to capital, extension services and technology perpetuates and reproduces the already existing gender inequalities and women poverty (Tsikata 2009).

Also the processes of privatization endangers women and other marginalised groups ability to gain access and control of land and other resources, as the concept of private property in Africa has led to the transfer and registrations of land titles and deeds in the names of male family members in most communities to the disadvantage of women (Lastarria-Cornhiel 1997). In Swaziland for example, where the laws allow women to register lands in their names, local authorities interpret it differently by insisting that women come along with their husbands or male relative to register on their behalf (ibid 1997). This tends to exacerbate and deepens the gender inequalities with respect to women access to valuable agrarian resources. Evidences from the two communities' gives credence to the fact that gender power relation also limits access to resources especially on the part of women farmers in Adubiliyili and Chieseh.

Therefore, smallholder farmers access to hybrid seeds in Tamale is being challenged by the absences of outlets in most of the farming communities for them to access, as agro-input dealers have no shops in many of the farming areas. Also, initiatives like outgrowers schemes and contract farming has not been able to close the gap as it excludes a lot of farmers from benefiting. This is coupled with the fact that there are fewer hybrid varieties in circulation for farmers to access. The few varieties that are made available are not accessible due to its cost. Thereby discouraging farmers from accessing it. Farmers who are even interested might have to rely on subsidies or credit which can lead them to indebtedness if they fail to pay back those credits. A situation that perpetuate poverty among farmers. Gender inequalities also excludes certain groups from accessing hybrid seeds. Customary laws and traditional

practices in most farming communities in Tamale discriminates against women access to land, seeds and other essential resources within communities.

Chapter 6 Conclusion

The study sought to understand the challenges smallholder farmers face in accessing hybrid seeds in Ghana. This elicited the posing of the central research question: *how do smallholder farmers access hybrid seeds in Ghana?* With Tamale Metropolis as a fulcrum of study. In answering this question, the study further examines the factors that drive smallholder farmers to adopt hybrid seeds and other improved seeds in the study communities. It emerged that smallholder farmers prefer hybrid seeds over other varieties because they taste better, have a nice colour, drought resistance and above all a higher yield than most of the OPVs. These factors featured prominently in the field and were categorized as social and economic factors. However, the use of hybrids requires certain inputs like fertilizers, pesticides and weedicides. These inputs have dire implications on the soil as it depletes its nutrients and destabilizes biodiversity. Apart from this, it also has economic implications on farmers, since they will continue to buy this input every planting season in order to maintain the yield. This sets up a treadmill. Where smallholder farmers are hooked to the market for these inputs. While input distribution companies like Wienco and Masara N'arziki (who controls the market in northern Ghana) benefit substantially. Which raises the agrarian question of who loses and who gains.

The use of hybrid seeds also poses a hazard to both seeds and crops diversity. Many Smallholder farmers are gradually shifting to the formal seed system to source seeds for farming. The challenge in this is that, there are a few food crop seeds that are produced in this system: rice, maize, millet and cowpea. Which limits the choice of farmers, as local varieties like millet, sweet potatoes and other vegetables are left-out. This is also coupled with the fact that, the high intake of input to support hybrids and other improved seed varieties, renders the soil infertile to support the growth of the local varieties. As they are not compatible with most of these inputs. Farmers are therefore pushed into mono-cropping of largely maize or rice. A situation that does not only leads to the depletion of seed diversity, but also an erosion of the traditional knowledge of seed saving and crop management of these local seeds. Conversely, traditional seed saving, and exchange has been beneficial to smallholder farmers in the study communities. It strengthens family ties as farmers rely on each other for seeds during seed stress situations. Farmers saved seed has also demonstrated resilience and ability to withstand the local environmental challenges.

Access to hybrid seeds in the study communities is a challenge. Smallholder farmers who are interested in hybrid seeds for farming are faced with the problem of availability of the seeds, cost constraints and gender limitations. Availability issues largely hinges on the absence of outlets in the farming areas for farmers to access the seeds. Initiatives like out growers' schemes and contract farming (which serves as conduits for the circulation of hybrids) have not done enough to realize this. Because such schemes do not robe in all farmers. With many farmers excluded from the benefits of the projects. Besides, the quantity of hybrid seeds that

are released annually by the breeder institutions is negligible as compared to that of OPVs. For example, within the period of 2010 -2013, the quantity of certified hybrid maize seeds that was released for sale was 82 metric tonnes as compare to 11,878 metric tonnes for OPVs. These disparities in terms of quantity release have informed the dominant presences of Obatanpa (an OPV maize seed), as well as other non-hybrid varieties. The non-availability of the seeds forces farmers who are interested in using them to travel long distances to the urban centres to access them. This has an economic implication for farmers as they have to spend on transportation cost and other expenditures.

The high cost of hybrid seeds and its requirements like fertilizers and pesticides poses a challenge to smallholder farmers. Even at subsidized prices, it is difficult for some farmers to afford them. Interested farmers would have to rely on credits schemes from micro finances and agro-loans institutions to buy the seeds. This has economic consequences as farmer who are not able to pay back are faced with indebtedness, which has implications for the livelihood of smallholder farmers. Defaulting farmers will have to trade their labour to raise money to defray the debt or move in search of payed jobs in other sectors to pay off the debt. These scenarios perpetuate and deepen poverty among smallholder farmers.

The use of hybrids might have cost implications on farmers. This is informed by transnational corporations, who have global presence and control the seeds and fertilizers markets. Their quest in the seed sector is the continual accumulation of capital which gives them the power to influence and shape agriculture policies in many developing countries

Gender power relations also affect and shape how women and men access hybrid seeds in the study communities. Women are at a disadvantage as they had to rely on their male relations to access seeds. This affects their ability to own and control land and other important community resource. This gender discrimination is institutionalised and protected by the tradition and customs of the people. In other jurisdictions where there are laws protecting women rights of ownership of property, local authorities misinterpret and insist the presences and permission of male relations in registering such property. A condition that reproduces gender inequalities and lead to women poverty.

There is the need for the promotion of traditional knowledge of seed saving, as it is an effective measure for adapting to local environmental conditions. It will also mitigate the gradual genetic erosion that is being perpetuated by the effects of increased intake of fertilizers and it will boost the survival of biodiversity. Increasing seed and crop diversity will be assured if smallholder farmers are encouraged to choose and decide what and how they want to go about their farming. A road that that will lead to the realization of food security.

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Appendices

Appendix A

Table 1: Table of Respondents

Date of Data Collection	Activity	Organization	Numbers
5/8/2018	FGD	Chieseh smallholder farmers association	12
7/8/2018	FGD	Adubiliyili smallholder farmers association	10
8/8/2018 to 29/8/2018	Interview	Smallholder farmers from the two communities	25
30/8/2018	Interview	Heritage seed company	2
1/9/2018	Interview	AEAs	4
3/9/2018	Interview	Jubaili Agrotech	1
3/9/2018	Interview	Wunpini Agro-chemical	1
5/9/2018	Interview	PFAG	1
8/9/2018	Interview	FSG	1
11/9/2018	Interview	PPRSD	1

Appendix :B

Data Collection Questionnaire Guide

MoFA: Plants Protection and Regulatory Services.

What types of seeds are in use by farmers in Ghana?

Which of them is predominant in the country?

What is/are the policy direction as far as hybrid seeds are concern?

Who are those responsible for implementing these policy/s?

What is the response of farmers to this policy?

What is the take of the policy in the area of seed producers and marketers?

Are there any challenges that the policy is facing?

District level: Agriculture Extension Agents.

How long have you been working in this capacity?

How many villages are under your jurisdiction?

How many times do you visit each villages under your supervision?

What kind of services do you offer to farmers in these villages?

What experience do you have working with seed?

What is the rate of farmers using hybrid seed in areas under your supervision?

Does the Department encourage the adoption of hybrid seed by farmer in your district?

If no? Why?

If yes? What sort of programs are put in place to achieve this?

To what extent is the private sector or NGOs engage in the promotion of the adoption of hybrid seeds by farmers in the Tamale?

How does this programmes by both the public and private sector influence smallholder farmers in the adoption of hybrid seeds?

What are some of the responses you get from farmers who use hybrid seeds?

Seed Producers Association of Ghana (SEEDPAG)

What are the core activities of SEEDPAG?

What are your source of foundation seeds?

What is the pattern of the production of hybrid seeds?

Does government support you financially in the production of hybrid seeds?

Apart from funding, what kind of support do you get from the government in your business?

What support do you get from the private sector?

What are the reaction of seed sellers and distributers on hybrid seeds?

What is the farmer's reaction on using hybrid seeds?

What are the major challenges facing SEEDPAG?

Are there any solutions in addressing those challenges?

Farmers Focal Group Discussion

1. Which seeds are found in your locality and where are their sources?

2. Have used hybrid seeds before?

3. What is the medium or channel through which you access hybrid seeds?

4. What are your experiences with hybrid seeds in terms of?

a, yield

b, chemicals, fertilizers and other inputs,

c, labour

5. Farmer agency regarding

a, Access

b, adoption and technology employed in the cultivation of hybrid seeds

6. Apart from yield what other advantages do hybrid seeds have over locally saved seeds?

7. Any challenges you encountered with hybrid seeds?

Questions for Farmers Associations, Movement Groups and NGOs

Groups like Food Sovereignty Ghana (FSG) and Ghana National Association of Peasant Farmers will be consider in this category for interviews.

When was your organization formed?

What is the objective and vision of your organization?

Is your organization found in all the ten regions of Ghana?

What sort of programmes do you organize for farmers in the country?

How do you fund your programmes?

Do you have area where you collaborate with government or private sector?

What role does your organization play in seed policy?

What is your organization take on the Ghana national seed plan, and the Plant Breeders Bill especially areas that had to do with hybrid seeds?

With your interaction with farmers, do you find any misfit between Government policy (on hybrid seeds) in the seed sector and the response of farmers in the country?

If there are inconsistencies, what are some of the measures that you have put in place to address them?

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Notes