The Politics of "Neoliberal Seed": Technology, Property, and Adoption in Northern Ghana

Local Meets Global: The Encounter Between "Farmer Seed" and "Neoliberal Seed" in Northern Ghana

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Disclaimer:

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

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List of Acronyms

ADVANCE-Agricultural Development and Value Chain Enhancement

AEAs- Agric Extension Agents

CSOs- Civil Society Organizations

EMD - East Mamprusi District

FGD - Focus Group Discussion

FARM Plus- Food and Agriculture Recovery Management

GMOs- Genetically Modified Organisms

HYV- Higher Yielding Variety

IPR- Intellectual Property Rights

UPOV- Union for the Protection of New Varieties of Plants

MOFA - Ministry of Food and Agriculture

NGOs - Non-Governmental Organisations

PARED- Partners in Rural Empowerment and Development

OPV open-pollinated variety

PBB-Plant breeders bill

PBR Plant breeder rights

PVP Plant variety protection

USAID-United States Agency for International Development

FAO Food and Agriculture Organization

ISS Institute of Social Studies

UNDP United Nations Development Programme

Abstract

This paper problematizes the promotion of neoliberal seed and role of actors in the process and engagement of farmers in utilization of these seeds in northern Ghana by conducting analyzes 'neoliberal seeds'. The study looks at how neoliberal seed through its delivery and promotion: restructures agricultural systems, reproduces a productivist/life sciences integrated paradigm and its political-economic relations, and how it undermines seed saving and among others.

To unpack neoliberal seeds the study situates the seeds in the paradigm conceptual framework. The paper explores three different paradigms that battle for future of agriculture. The research situates neoliberal seed and farmers seed within the wider agricultural production. The framework offer analytical lens through three handle namely technology, ownership and adoption.

This study explores ownership over seed in the context of establishing IPR in the country and how party involved see IRP and what it brings to agriculture and farming as a livelihood. The paper contextualise actors efforts to present neoliberal seed as a technology to solve farmers low yield gap. The paper move beyond yield attributes of NS to explore its strategic role and how in partnership with life sciences/productionist are repatterning agriculture in the district.

It highlights issues related to adoption and non-adoption thus, identifies reasons for non/low adoption of "neoliberal seed" and what actors consider important in selecting specific variety of seed.

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Keywords

"Neoliberal seed", "Farmers seed", Paradigm

Chapter 1

Introduction[1]

In agriculture production, seeds are an important element of the food system and to a large extent have become one of the controversial issues in present-day tussles over food system (Wittman et al. 2010: 11). This struggle is so, in part, because of conflicts around who owns seed, who produces seed, and what kinds of seed are being used to grow the food system (Kloppenburg 2005). While seed in Africa is predominantly from local varieties[2], corporations increasingly own, multiply, promote, and sell commercial seed to farmers (Kuhlmann and Zhou 2016: 4). This confrontation of farmer seed and commercial seed is happening in Ghana as well. In northern Ghana, 84% of farmers depend on local seeds while only 15.5% of farmers in this part of the country used commercial seed for cultivation (Gyesi 2016). Although, Kuhlmann and Zhou (2016: 2) argued that to improve rural occupations, agrarian output and food security commercial seed has a central role play.

This study employs the concepts of 'neoliberal seed' and "farmer seed" to analyze seed politics and practices in northern Ghana. "Neoliberal seed" describes seed that firms develop, own, and sell, often in cooperation with state agencies/bodies. "Farmer seed" includes seed that farmers develop, own, cultivate, and save each year. The study explores how the two seed types are distinct in terms of technology and production practices, property relations, and farmer adoption strategies. As "neoliberal seed" is owned and controlled by the commercial firms that developed it, the study is especially concerned with the impacts of "neoliberal seed" on farmers' ability to save and reproduce "farmer seed". From my work experience and observation in Ghana today, this has serious implications for farmers in the region particularly, and for seed politics generally.

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[1] This paper is based on essay presented on politics of agrarian transformation course (4335)

[2] McMichael and Schneider (2011: 129) state that, "in Africa, 90 percent of seeds are local varieties."

Understanding seed politics is understanding and categorizing different types and kinds of seeds, including who owns them, who develops them, and who benefits from them. Another important part of the puzzle is categorizing the many different names and labels used to describe seed. Table 1 details the seed types and descriptors included in the "farmer seed" and "neoliberal seed" concepts.

Table 1. Seed types and descriptions for "farmer seed" and "neoliberal seed."

Farmer Seed	**Neoliberal Seed**
Local seed	Genetically Modified Organisms (GMO) seed
Saved seed	Hybrid seed
Traditional seed	Higher Yielding Variety(HYV)
Land race	Commercial seed
Folk seed	High quality seed

Building on Kloppenburg 1988 the study follows the author to find out whether seed production/promotion has become a means of capital accumulation. In relation to seed, it is essential to enquire as to whether the neoliberal seed is the only seed that can enhance farmers output or has it become a way to amass capital? how has this been achieved, through what means? And with what impact if any?

Looking at how "neoliberal seed" are promoted, if much emphasis is placed on this seed, we are likely to lose sight of other alternatives. As Kloppenburg (2005: 93) notes that with open-pollinated varieties[3], no individual has attempted enhancing it, but enormously effort has been made to obtain better hybrids. Though if similar effort had been placed on open varieties by now, they might have been better than hybrids as attest by scientific prove.

In this paper, I will point out that seed does not exist in isolation but rather entrenched within three themes that the essay sees as essential in unpacking the issues around neoliberal seed and these are namely technology, proper-

[3] Matlon and Minot (2007: iv) define as "variety that can fertilize and reproduce naturally and resulting seed can be kept". This variety is "useful for providing low priced seeds and stable yields to farmers" (Kutka 2011:1544).

ty/ownership, and adoption, all the three are inextricably linked. Who are the actors involved in the promotion of neoliberal seed and how do the organization engaged farmers in the use of their seed. As Scoones suggests "organizations carry with them politics of meaning, reflecting different subjectivities, identity, and positionalities of actors concerned" (Scoones 2015: 53).

This paper seeks to problematize promotion of "neoliberal seeds" in the northern Ghana by analyzing the role of actors (individual/corporate and state actors, farmers, and organization) and their perspectives of these seeds. To analyze neoliberal seeds the study situates the seed in the paradigm conceptual framework to help understand and pinpoint the different political interactions involved in seed in relation to technology, ownership, and adoption. Considering promotion of neoliberal seeds, actors involved tend to influence and shape the farmer's knowledge and adoption of these products. On what grounds and in whose interest, are they promoting these products and is the products capable of delivery what it promises thus food security, improved livelihood among others.

1.1 Background to 'neoliberal seed regime'

1.2 Neoliberalism

Neo-liberalism is organization of social system based on market rule in which individual interest is ranked above others interest (McMicheal 2008: 341). Seed, as found in nature, can be capture by individual or firm by way of manipulating it for private gain. As Philip (2013:63) notes neoliberalization involves modification of non-human goods into individual assets through, altering of how nature is governed hence encloses, denationlizes public goods though its process is not perfect. For an autonomous small-scale producer, the seed was the last and the first in agricultural production. As the grain, it is the final product, and as the seed, it commences the production process (Kloppenburg 2005: 37). According to Phillips (2013: 64) the foremost connection in multinational seed ordering is

neoliberal seed given that seeds are the foremost connection in food system. As a way of regulating the seed, starting with HYVs to hybrids and now genetically altered seeds, commercial breeding has used diverse technological tools to have control over the seed (Freedom 2004: 2). But the nature of seeds presents a challenge as object of trade; it confines profit-making given that seed is purchased occasionally and kept, since, it has ability to multiply many folds and this permits farmers to use it continuously while increasing its diversity (Phillips 2013: 64) notes. Wright and Tyler (1994: 17) cite the case of northern Ghana where "there is a conflict of interest between the dealers and farmers over seed type. They claim growers' desire the seed that can be kept and renew every 3-4 years. Whereas, suppliers would prefer to bring hybrid stock, which the farmer needs to replace annually". Over the years through biological, and regulatory measures seed firms have made progress to achieve commodification though still inadequate yet (Phillips 2013: 65) claims. As Pionetti (2005: xii) indicates that against innovative control, financial profitability, and legitimate administration by firms, seed propagation has moved out of producers' fields and into the purviews of formal science, profitmaking with unbending practices of seed endorsement.

Given the crucial role of seed in agriculture production, and looking at seed from a diverse point of view, one would consider the role of actors who are championing the neoliberal seeds and see how their engagement with farmers has been like and to what extent have they influence farmers and with what impact. Therefore, there is the need to look at actors and the role they play at the various level in relation to seeds and how their roles shape farmers use, understanding, and uptake or rejection of these products.

1.3 Problem statement

Indeed, seed is instrumental in raising farm/farmers output hence, in food system, the significance of seed cannot be overstressed as a unit of reproduction (Ertwire et al. 2013: 1). A Research Scientist & Intellectual Property Rights (IPR) Advocate argued that NGOs and CSOs need to persuade farm-

ers to embrace commercial seed because it will enhance farmers' conditions as its been demonstrated that quality seed excluding other inputs like fertilizer has a likelihood to raise output 20-30% (Bortey 2016). Research has also demonstrated the benefit of local seed, for example, research conducted in Northern Ghana by (Nyantakyi-Frimpong and Bezner Kerr 2015: 29) revealed that often farmers expressed their desire for local seed because of it stable yield even under erratic rainfall. Similarly, Amanor (2011: 56) suggests that farmers keep on finding seed that they appreciate, which get acclimatized in their locality as they are selected hence they are often disillusioned by the nature of commercial seed.

Despite this, farmers in northern Ghana are increasingly being encouraged to adopt commercial seeds as Morris et al. (1999: 14) found in their study on adoption of improved maize varieties. The authors indicate that 'in Guinea Savannah (northern Ghana) 66% of the farmers adopted modern varieties'. They claimed that 'switching from a local variety to modern varieties (MV) results in a significant yield increase' (ibid: 24). Also, a similar study conducted by (Ragasa et al. 2013: 20) indicates 'a slight increase over Morris et al. and this shows a less progress in the attempt to distribute modern varieties, particularly the latest varieties'. This seems to reflect the motive of actors in agriculture to emphasize the need to increase farmers' access to these improved seeds for that matter their effort to reach out to farmers.

For example, the 'Programme for African Seed Systems (PASS) under AGRA has a goal to make quality seed of improved varieties accessible to small-scale producers. In the case of Ghana, it addresses this by producing commercial seed and supports breeds that are early maturing' (Aidoo et al. 2014: 3). As Amanor indicates that the championing and adoption of commercial seed is accomplished through activating of persuasive public–private systems that report about it output and possibilities to support resource-poor farmers (Amanor 2011: 56).

However, McMichael and Schneider (2011: 123) claimed that 'there is no proof that products from biotechnology seeds give more output, though, it is usually argued that biotech seeds give more harvests than do crops from

other techniques'. According to Amanor (2011: 57) the dominance conversation about commercial seed get farmers hooked into input markets due to lack diverse seed agenda in the country. Also, Howard (2009: 1269) notes that seed firms employ techniques such as hybridization, in which new offspring do not show similar feature as their parent hence, this often discourages seed saving among farmers. For Amanor (2011: 56) Intellectual Property Right(IPR) on improved seed favoured breeder through amending the law as well as regulations and similarly, Plant Breeders Bill(PBB) sought to protects breeders' rights (Amofah 2014: 117). Considering promotion and strategies employed, Phillips (2013: 6) therefore, reports that seed is secluded historically and technically transformed and possessed through IPR. The author points out that, seeds are submerged in, techno-political relations that encourage and condition specific thinking hence, any kind of seed do not exist separately as unbiased element but within arena of politics.

In northern Ghana, little effort has been made to understand seed within the current trajectory of ongoing debate on plant breeders bill in the country. Given the depictions of neoliberal seeds and the promise of what it can offer for farmers while, relating it to the politics around seed as a resource with respect to technology, ownership, and adoption of this seed. How would/does it affect the farmers' decision making from their perspective and experience of working with this seed. So, what are the realities on the grounds, in whose interests are these seed being promoted? The research looks at the impact of a "neoliberal seed" system on farmers' autonomy. And how the delivery and promotion of neoliberal seed: restructures agricultural systems (perhaps from diverse, locally-based systems that produce food to monocrop systems that produce commodities), reproduces a productivist/life sciences integrated paradigm and its political-economic relations, and how it undermines seed saving and other forms of farmer practices.

1.4.0 Research question

How does the promotion and adoption of "neoliberal seed" impact the production and reproduction of "farmer seed" in northern Ghana?

1.4.1 Sub question

How does the ownership of Neoliberal seed impact farmer seed saving practices and ownership claims?

How do the technologies, production practices between neoliberal seed and farmers seed differ and with what social and environmental implications?

Who are the actors (state, private, civil society) involved in the delivery of these seeds, and what factors influence farmers' adoption or non-adoption of this seed

1.5 Privatization of seed in Ghana and it objectives

1.5.1 Brief background on seed privatization in Ghana

In order to transform the seed sector, Ghana's seed policy (n.d) document suggests that the "sector was denationalized as at 1990 because it is acknowledged that the private sector is more proficient in the provision of products and amenities to the population. The choice for the denationalization of the seed industry was therefore grounded on the idea that seed production should be a private sector profitmaking activity". With regards to privatization, it sought boost seed trade to meet the present agriculture needs and food security. In order to give the seed sector, the attention it deserves, the national policy sees privatizing as a way to achieve this objective, and the national programs are directed towards this aim. According to Lyon and Afikorah-Danquah (1998: 4) since 'privatization, the sum of small-scale producers has increased. Hence, the new approach is intended to rejuvenate the seed industry, through the expansion of small and medium-scale private seed enterprises. While the role of the state, is limited to regulatory, production of foundation seed as well as policy issue.'

1.6 Organization of the paper

This paper is divided into five chapters. The first chapter introduced the study problematique. It also clarifies the research questions and briefly looks at neoliberalism. Chapter two provides an elaboration of research

methodology and the theoretical framework that informs the research. This chapter explored existing literature on adoption, property/ownership and technology associated with neoliberal and introduces the paradigm shift and APE as the conceptual framework that was used to conceptualize this study. Chapter three provides literature review on actors that work in this field, role of state and further explores ownership, technology and adoption. The fourth chapter provides/ explored political economic context of the spread of neoliberal seed thus, more in-depth outline of the current issues that revolved around the neoliberal seed promotion and explore data obtained from fieldwork. It organized data in relation to three themes (adoption, technology and ownership/property). The final chapter explored paradigm framework analysis, and implication of neoliberal was considered in this section as well concluding remarks.

1.7 Justification and relevance of the research

This research is timely and relevant because several program and actors in the north are pursuing strategies that promote the commercialization of seeds through public-private Partnerships that link smallholder farmers with multinational investors as a pathway to agricultural development and food security. This study will contribute to the body of literature in understanding and investigating of food production issues in agrarian communities. This study will offer an in-depth understanding of "neoliberal seeds" and how the introduction of these inputs affect decision making and livelihoods of smallholder farmers precisely in the northern Ghana. The study will contribute to existing literature which would be useful in advocacy for smallholders' farmers' right. Also, it will add to the academic body of knowledge that critically examines the role of the state agencies and other actors in agriculture in northern Ghana, and how their activities, associations in relation to 'neoliberal seeds' mighty have impacted on agrarian transformations and farming practices.

My justification for carrying out this study in the north is the introduction of new varieties of seeds into the agrarian communities where farmers are

mainly into subsistence farming activities. My basis for choosing Northern Ghana as a research location is that there are a number of actors promoting "neoliberal seed" in the region as well as farmers to select as respondents. Also, I have been working with communities in this part of the region and am familiar with farming issues and structures that have been employed in reaching out to farmers.

1.8 Risks and Ethical challenges in carrying out the research

There are many actors in agriculture in northern Ghana and selected district. Some of these actors are not within the district therefore to gather data on all of them will not be easy considering the time limit for the research. The study target specific actors who are promoting 'neoliberal seeds' and source data from one district thus East Mamprusi District. Also, the proximity of the farming communities was a challenge as the communities are far from one another, in addition, the timing of the data collection also pose a challenge as the farmers are usually busy during this period of the year. Mobility on the part of the research is worth mentioned as I don't own personal motor bicycle. Therefore, I have to rely on others or rent one for the period of the study.

During the data collection, consent of the respondents was sought, and the purpose of the research explained to the participants before proceeding of the interview or the FGD. Confidentiality and anonymity were guaranteed.

Chapter 2

2.0 Research methodology and conceptual framework

2.1 Primary data

This study employed mixed method approach to research, first qualitative research via a case study-based design to examined issues related to promotion of "neoliberal seeds" and how actors shape the production pattern in the district selected. According to O'Leary, qualitative research is said to be a subjective and ad hoc process that accepts multiple realities through the study of a small number of cases (O'Leary 2004: 99). This study sees the qualitative method as essential in getting the needed information from its target group. As (King and Horrocks 2010: 27) argue that this type approach is 'interested in how people differ in relation to a particular phenomenon as much as it is in what they have in common'. Since the research sought different view of selected group, therefore, the decision to employ these methods.

The research was mixed approach thus, quantitative and qualitative were employed for primary and secondary data. Primary data sourced through interviews, Survey and Focus Group Discussions (FGDs). Interviews were conducted with actors in the agriculture in the district that involved farmers in "neoliberal seeds" usage. In order to explore and obtain appropriate information through interaction with the respondents, questions were developed so that there was an opportunity to probe in order to get clarification on the response given by the respondent. Therefore, the research used semi-structured interview. This form of an interview, (O'Leary 2004: 164) suggests "neither fully fixed nor fully free, and are perhaps best seen as flexible". The questions were on perception, meaning and experience of farmers with the use of 'neoliberal seeds'.

The FGDs was conducted with farmers who have taken part in the use of seeds being promoted by the actors. Focus groups are 'effective for obtaining information on collective opinions, and the meanings that lie behind

those views. Also, helpful in generating better understanding of participants' experiences and beliefs' (Gill et al. 2008: 293).

Before the focus group discussion, there was a quick survey of the participants. Therefore, quantitatively survey was employed thus the survey was face to face. The responses were quantified and analyzed through descriptive statistic.

The focus group discussions were followed by one on one interview with some of the members of FDG who were selected based on their participation or non-participation thus active and non-active participant were contacted for further information. The study did pilot the questions with the actors (2) and farmers (2) thus the FGD which allowed for questions to be modified before the actual interview with the respondents. This pilot enabled the research to restructured some of the issues that were otherwise not clear.

2.2 Secondary data

This exercise is aimed at getting farmers perspectives of their experience with the neoliberal seeds. In order to support results obtained there was the need for secondary information source, for this reason, the research utilized data and material from secondary sources. The secondary data sources employed in supporting the findings from the field. The study employed secondary information, sourced from desk reviews of literature of existing work related to seeds. Google scholar was used to access scholarly journals, both published and unpublished articles as well as some policy documents. Also, News articles both online and print copy; the daily graphic and Adomonline which have been actively reporting on plant breeders bill issues were included in secondary data collected and analysed for this paper. Other information attained was basically, legal framework on seed act/bill, treaties, and conventions relevant to this study. These works were look over to get a better broad thoughtful of the study in the Ghanaian setting.

2.3 Sample

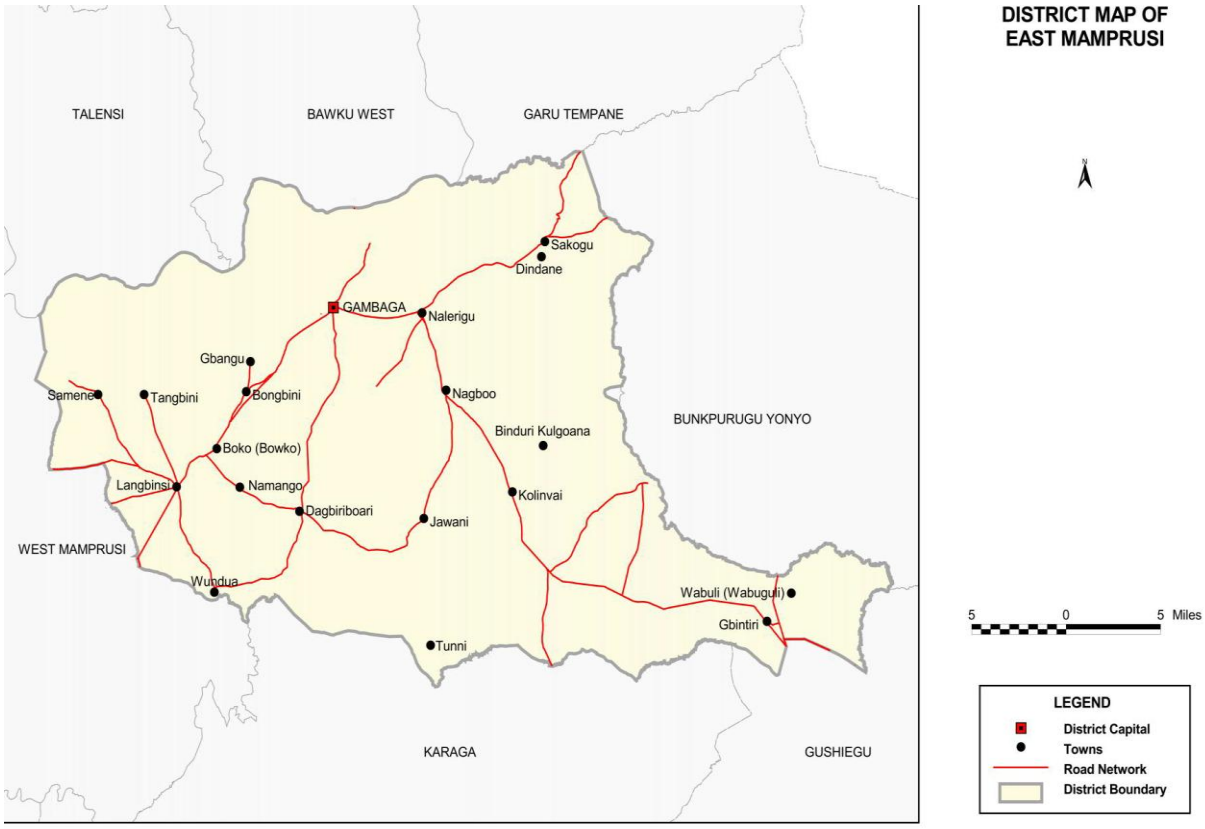
The selection of participants was purposeful; thus, the study targets were farmers involved and specific actors who were promoting "neoliberal seeds" and data was sourced from one district thus East Mamprusi District. The district was divided into 4 zones within each zone there is operational area and within this area are communities. Together with the extension or agriculture agent in the operational or community selected, the study selected purposely three communities namely: Boayini, Bowku, and Dabari to work with for data collection.

For FDG, each group, was made up of between 7 and 9 participants as Gill et.al (2008: 293) suggests focus group 'can successfully work with as few as three and as many as fourteen'. Therefore, this study worked with 7-9members per group in each selected community. While, for interviews three each for (MoFA and PARED staffs), Masara N'Arzik one staff, two lead farmers' two inputs dealers, 9 farmers (three farmers each) among those in FGD and in all three FGD were conducted. Whereas, with survey, it was administered to all targeted farmers in the study. Data were analyzed qualitatively using themes as way of categorizing data set. While descriptive statistic was used to analysed the survey by coding the responses.

2.4 The Study Area

The study site for this thesis is East Mamprusi District (EMD). It is a chiefly countryside district found in the north-eastern area of the northern region of Ghana. It is among of the 20 districts of the northern region, and Gambaga is its district capital. The EMD has borders with Talensi Nabdam, Bawku West, and Garu-Tempane districts, all in the Upper East Region of Ghana, to the north; Bunkpurugu-Yunyoo district to the East; West Mamprusi assembly to the west; and Gushegu province to the south. The district covers a land area of 1,660 square kilometres representing about 2.2% of the total land area of the northern region (PHC 2010).

Figure1: showing study area map of East Mamprusi District



Source: (PHC 2010)

2.5.0 Conceptual framework

The issue of seed politics and agriculture production can be approached from diverse perspectives. Before delving into matters of neoliberal seed. It is useful to employ a lens through which the discussion in this research is organized and deliberated. This section seeks to use paradigm as a framework background while dividing the section into three main handles namely: technology, ownership and adoption. This section discusses the concepts employed in this study. The chapter begins with overview of paradigm; this was followed by brief introduction of Agrarian political economy. The section three discusses and presents conceptual understanding of ownership, technology and adoption in relation to neoliberal seed and farmers seed.

2.5.1 Paradigm framework

Building on the work of Thomas Kuhn, Timothy Lang and Michael Heasman define a paradigm as an 'established guidelines and basic theory that shape people belief and the way an issue is considered' (2015: 24). They note that "building on a concept spelled out by Ludwig Wittgenstein (1889–1951), Kuhn employed Wittgenstein's notion of paradigms and applied it to science as a philosophical method: it offers experts model problem and solutions through a set of standard scientific triumphs for a time" (ibid). For understanding and analyzing the political economy of food and farming systems and policy, Lang and Heasman propose the concept of "food paradigms" as model in which problems and solution about food is perceived based on basic rule and established guidelines (2015: 24). They argue that today, "three broad paradigms compete to understand pressure on the future of food" (ibid). These paradigms are: (1) the productionist paradigm, (2) the life sciences integrated paradigm, (3) and the ecologically integrated paradigm.

The productionist paradigm emerged during the time several states encountered extreme hunger and uneven distribution of food around the globe. This paradigm aim to increase output through technology and to realize it objective, its production was centered on single crop production and relied on

synthetic raw material such as fertilizers and herbicides(ibid:30). For LSIP it main approach is use of biotechnology to enhance agriculture production. This model manipulates organism in a manner which will not be possible in the natural environment(ibid:32). While EIP employs ecological principle and management of nature by integrating applied science in indigenous techniques to enhance production using low-cost input and practices such as crop rotation, cover crop to control weeds and the use of organic manure (Lang and Heasman 2015:36).

Considering the dynamic in the agriculture sector, the promotion of neoliberal seed in Ghana might reflect a particular paradigm, especially with respect to seeds; farmers are encouraged to shift from their traditional seeds to improved varieties being promoted by the actors. This shift can be examine using paradigm as an analytical framework to help unpack the relation between the old and the new order of production. Therefore, framework used in this paper to analyze the dynamic of seed and forces operating in the seed sector. As Yapa (1993: 255) put it, by turning our focus to different components of seeds other than their output, it offers noteworthy new essences to the notion by considering the diverse models, each with its "method for knowing".

In the case of Ghana for that matter Northern region, the idea behind the promotion of neoliberal seeds is that the farmers' seeds yield less. Thus, insufficient production is a result of low yielding varieties or existing traditional seeds. Hence, see neoliberal seeds as a way of solving the production deficit from local seeds through the improved and neoliberal seeds. As discussed by Yapa (1993: 255) that innovation can both make and devastate simultaneously; so, it offers comprehension of the element of the model and its root, shortcomings, and restrictions by this we can acknowledge how the new seeds have swing to be course for the control of individuals and nature.

2.5.2 Agrarian Political Economy framework

The Marxist agrarian political economy is employed along paradigm in the analysis of this research. It is "the social relation and dynamics of production and reproduction, property and power in agrarian formation and their

process of change, both past and present-day" (Bernstein 2010:1). However, it is worth noting that the research is not an agrarian class analysis, but when dealing with property, the political economy first question will be essential in unpacking issues related to ownership. Therefore, the paper employs the question of 'Who owns what?' Regarding "possession" and "property" which have had diverse implication in various society in different historical instance thus, the social relations of various "property" and "ownership" which deal with social connection of various property regimes and how factor of production are reproduced and circulated" Bernstein (2010: 22-23). This question specifically relates the ownership of seed which is the fundamental resource employed in the production. The extensive conversion of seed into individual/corporate property changing what belongs to common into commodity which the present-day approach to making resource available or accessible sought to do through technology by way of manipulating the seed and claiming ownership of the new product(seed) emanating from their work/effort.

Deliberations and choice about seed is of significant and issues arising thereof should be considered from the guided perspective and goals of the individual, organization involved. In as much as seed can be manipulated through technology and ownership claim through the IPR what will be the anticipated consequence of adoption of these sets of seed on the part of the those involved in use of the seed as a resource. The study, therefore, unpacks motives behind why certain seeds (neoliberal seed) is gaining attention and promotion from actors in the agriculture.

2.6.1 Conceptualizing Neoliberal Seed and Farmer Seed through Property/Ownership

IPR is the right that offers individual to secure and protect an invention from their effort hence, direct right to exclude others over utilization of their product (McMichael 2008: 174). The intellectual property paradigm is worldwide north ideas about proprietorship, property and individual inventiveness which uses western meanings of possession to offer a structure in

which to appoint rights though it is not fit well in region that depend on indigenous practices as way of life (Ewens 2000: 285).

One of the central issue of contestation of seed as resource in production process is ownership along reasoning that ownership offer incentive to originator of the seed, therefore, protection of the right of the inventor. Thus, if seed is viewed as individually owned but what becomes of seed that is owned in common. Seed as an individual or corporate property hinged on the deployment of IPR as a way of claiming the ownership of a specific seed by individual or corporate in their name or credit. As suggested by Kloppenburg (2005:11) the two social souls within the seed can be part by institutional and specialized arena provided that plant property rights are enacted. Ewens (2000: 286-287) asserts that legalistic paths, for example, the given of possession rights to improved seed and lately utility patent to enhanced seed, if achieved could break the barrier to claiming of ownership of a seed developed by a breeder.

As Rangnekar (1999:128) framed it, modification of the legitimate extent of protection are additionally valuable in controlling the utilization of harvested seeds. For Howard (2009: 1269) the legitimate and protection techniques utilized by the seed firm may limit farmers from replanting the seeds they purchase. He stressed that this might lead to the loss of cultural knowledge of how to save and propagate seeds if farmers don't proceed with these practices. Consequently, farmers might be lured to buying these inputs from breeder, as opposed to propagating them on the farm. While farmers still participate in seed saving, the commonness of this practice is declining. The author indicates that farmers are required to have the capacity and intends to deliver food free from reliance on external factor of production if they are to meet present and future demand.

In the case of Ghana, there is ongoing struggle over establishment the property right over newly developed seed by the breeders or company. Therefore, achieving this mile in seed will result in seed being legal property or invention of the originator. PBR bill’s prominence in recent debates on its ability to create variety suitable for the country and agriculture but critics see it as a way of excluding public from the right to use the invention, there-

fore, need for protection. Also, questions and controversies have emerged regarding the ability of PBR to achieve the many virtues that proponents assert it embodies hence, evidence of IPR paradigm's prominence in Ghana agricultural development policy/debate. Different groups and interests shaping this discussion hence debates pose thought-provoking viewpoints via which to analyze neoliberal seed and how it seeks to address, low yield resulting from farmers' seed.

2.6.2 Conceptualizing Neoliberal Seed and Farmer Seed through technology

Technology is a production mechanism/tool employed in the production process. However, techniques employed in the production of seed and agriculture over the years is changing from the traditional to a more advance form of technology. A technological paradigm can be defined as a technoeconomic issues grounded on belief systems got from the common sciences and pattern of solution chosen together with precise rules designed to gain new knowledge and protecting it against quick dissemination to the contenders (Rangnekar 1999: 126).

Kloppenburg (2005:4) notes that the character of emerging seed needs to be looked at as it facilitates and transforms farming through technological advances as scholars and political analysts recognized. Whiles, Lang and Heasman (2004:148) note that technology which includes manipulation of unit of reproduction, the invention of agrichemicals to fertilize plants and regulate weeds among others, can be the foundation for a change to monoculture and sameness in farming. Whereas, (Rangnekar 1999:126) claims "effect of technology paradigms, is that alternate model of progress is considered as backwards, while, selected route introduces an idea of improvement, in such case the leading technological paradigm defend the chosen route and offers its idea of progression.

So, hybridization has been one technical direction, trend to convert seed into commodity (Ewens 2000: 286) indicates. In order to transform seed and make cultivators rely on continuous purchase of basic input, Kloppenburg

(2005:11) indicates that "hybridization has proved be operative high-tech solution to the natural barrier that in history had discouraged individual investment in seed enhancement. Hence he pointed out that new technologies, emerge via series of efforts, assessment and promotion so they must be persuaded and negotiated into social system(ibid:18).

Recently, transforming seed into trade object has not only rely on utility patent protection, but also by taking an advance path in gene altering to succeed as Ewens (2000:287), elaborates. However, Kloppenburg (2005:8) notes that technology entails different options for individual to select therefore it does not dictate. Whereas, Rangnekar (1999:127) claims that the extent of securing technology is essential in all aspects of the technology including impending route of progress and the paradigm itself offers ways and manner to secure it (ibid). Therefore, the author maintained that there is the "needs to focus on the product symbolizing the inventions, the seed" (ibid:128). Ward (1993:351-352) states that new agrarian technologies profit individual differently in unlike manners as he notes modifying production involves altering rural ecosystem hence interrogation of pattern of uptake of these technologies.

The paradigms approach to technology employed in the production lead to question one form or the other technology used and to figure out why some technology were not considered as a way of improving seed for that matter the whole production system. So, technology as tool for exploring difference between farmer seed and neoliberal seed is useful model to assess the techniques employed and to see what impact it may have on the social and ecological aspect of farming.

2.6.3 Conceptualizing Neoliberal Seed and Farmers Seed through adoption.

In an agrarian base country, one issue confronting farming in developing countries is low yield. Planting of variety that yield less by farmers might partially be responsible. For this reason, stakeholders recognize enhancement of high yielding varieties of seed with the anticipation that it will be

adopted by peasant to improve their output (Idrisa et al. 2010:1397). In Northern region-Ghana, over the past decades', effort is made to encourage farmers to uptake new technology being championing by actors in the agriculture sector in the region, among this effort is the promotion of commercial seeds into the farming communities of the northern region.

Adoption is defined as an "extent to which a new technology is employed in long-run once peasant has comprehensive information about the know-how and its potential. Hence, at the farm level, it designates peasant's choice to practice a new technology in the production process" (Kaliba et al. 2000:37). Farmers have agency and take up new technology based on certain features associated with the technology. But, Langyintuo and Mekuria (2005:3) assert that if the percentage uptake of technologies is less, increased farmers output would be a deception. The authors note that recognizing features hampering the adoption of better technologies has been the mission to social thinkers to effectively come up with best technology for farmers. As recognized by Idrisa et al. (2010:1394) that farmers' exposure to improved agricultural technologies is one way of enhancing their output. The authors state that embracing better technologies is vital ways to increase their yield. Hence, the practicing of improved technologies is essential factor for improved farm output. So, researchers have depended on three major models to understand choice of technology uptake, to achieve the aim of enhancing farm output, namely these are "innovation-diffusion, the adopters' perception, and the economic challenge models" (Langyintuo and Mekuria 2005:3).

Yield can influence uptake of technology as Idrisa et al. (2010:1397) documented that high yielding seed stands to be embraced by farmers because output is a directly related to seeds accomplishments such as yield and income. From their perspective, Dejanvry and Sadoulet (2002:8-9) argued that increment in profitability variable because of innovative change brings income gains to farmers. For this reason, selection of yield-enhancing innovative change requires expensive complementary inputs that come with the technology.

In conclusion, technology is employed in the development of new seed by way of improving one or more of seed features thus enhancing the performance of the new product emanating from the seed developed. Through IPR the originator claims the ownership of the new seed as their own property and therefore exclude others from the benefit thereof. With farmers being encouraged to adopt the new seed as way of enhancing their production hence divorcing farmers from their own input (seed).

The conceptual and theoretical framework presented in this chapter will offer thoughtful discussion and analysis of neoliberal seed and farmers seed as input resource for/in production and reproduction in the selected communities in EMD. In chapter 5, I will apply Paradigm framework to analyze agrarian transformation and the extent to which neoliberal seed is replacing farmers seed in the study area. While APE will be employed in chapter 4.

Chapter 3

3.0 Literature review

3.1 Introduction

This chapter reviews literature and research work related to the study in focus (seed). The chapter is divided into four section. The first part presents/explores actors involved in the process of privatization and role of the state are discussed in this section. The second section talk about ownership/property in relation to seed and information was sourced and reviewed includes current publications on plant breeders' bill and intellectual right to property in the context of seed in Ghana. The third section considered technology aspect of the neoliberal seed and farmers' seed. The last part discusses adoption issues, thus, why adopting and non-adopting are considered in this section.

In crop-based production "the significance of seed to agricultural system cannot be overstated. Therefore, enhancing the quality of seed of specific variety is the foundation for agrarian output enhancements" (Louwaars and De Boef, 2012 as cited in Etwire et al. 2013: 7). In Ghana and possibly sub-Saharan Africa, seed is perhaps the most central input of production and possibly the inexpensive factor of agriculture production" (ibid). There are "two parallel seed systems in Ghana thus, a customary system based on a tradition of exchanges and common provision among producers within any specific region and an official system established by the state and its technical associates" (Niangado, 2010 cited in Etwire et al. 2013: 7).

3.2 Who are the actors involved in the privatization of the seed in Ghana

According to Tripp and Mensah-Bonsu (2013: 2) there is a "number of donor efforts during the past years that fund seed production activities. In the early 1990s, Sasakawa Global 2000 (SG2000) was influential in launching a

system of small-scale seed growers. Since the mid-1990s, a GTZ West African Seed Network (WASNET) supported the evolvement of the commercial seed sector for several years". Also, "lately a USAID-funded West Africa Seed Alliance (WASA) funded activities such as training for input dealers and seed producers in Ghana" (ibid). The process of privatization involved different actors at each stage of seed sector denationalization as Scoones and Thompson (2011: 4) indicate "to achieve the set agenda on privatizing the seed sector there is alliance between state and other international or inter-state cooperation build so as to attain this target". One of such collaboration is the Green revolution, which Scoones and Thompson claim "are being played out in a post-Washington Consensus context, where alliances among the state, the private sector, and privately-funded NGOs are struck to carry out seed study, develop products and sell them" (ibid). Again, they highlight that "the focus of the new vision for African agriculture is the support of an active private sector through agro-dealer networks. These agents are supposed to convey the Green Revolution through the extensive delivery of seeds among other inputs" (ibid). Aidoo et al. (2014: 3) cite "the Programme for African Seed Systems (PASS) of AGRA which targets to make superior seed of better quality available to small-scale farmers". In the case of Ghana, "it intends to achieve this by assisting breeding early maturity seed and commercial seed production" in the country (ibid). According to McGuire and Sperling (2015:179), "establishments such as AGRA/PASS invest their resources largely in private sector seed industry development, thus, in the championing of private profitmaking seed and formal sector input companies". As alludes by Tripp and Mensah-Bonsu (2013: 2) that the "most noticeable current donor in the seed sector is (AGRA), which has been vigorous since 2007 in providing fund and support for small private seed companies, financing plant breeding and assisting the development of agricultural input dealers".

3.3 The role of the state in seed privatization

What role does the state play in denationalization of the seed sector in Ghana? What it is driving this process of privatization, according to Amanor

(2011: 48) since the 1980s, "public research systems in seed production in sub-Saharan Africa have come under pressures to privatize". As McMichael and Schneider (2011: 129) point out that, "seed privatization is gaining attention, since the development model expresses yield in terms of profit per plant, and therefore concentrates on seed technologies". Production of seed under private entity is assumed to pay off as Minot (2008: n.p) indicates that "seed production and marketing are often more proficiently carried out by private seed companies, but they must be reinforced with an enabling policy environment. Such an environment would include a clear legal structure for private seed companies". While Kugbei et al. (2000: 104) claim that "there are important roles for government in the evolving private seed sector of Ghana". Whereas, Amanor (2011: 48) argued that the state has been "transformed into a supervisory body of seeds and as a facilitator for the advent of seed markets". Accordingly, (Freedom 2004: 134) "recognize that states can play a role, either in providing the elementary setup principally within plant breeding research and development". Matlon and Minot (2007: 67) claim that even though the "role of state has declined, but, supporting a competitive and efficient private seed sector such as adoption of seed enactment that specifies the rules of the game and detailed the separation of tasks among diverse actors and the private sector is of essential". In the case of seed sector in Ghana, the state is to guarantee free market in the direction of delivery and efficiency in seed production and, it is responsible for policies that will expedite and protect property rights.

3. 4 Property/Ownership of Seed

Seed as a resource has again increase commercial value, and this comes along with debates over access to and ownership of seed or its product. As an input in the production, the vital capacity to transform output or production pattern could be achieved, however, control over seed as a resource is increasingly contested. Among the disputed issues are the farmers right to use the seed continuously. As discussed by Escobar and Velez (2016:69) the developing countries have been persuaded by the developed states to enact the 1991 Act of UPOV Convention (UPOV 1991), which restrains more

than the 1978 Act of UPOV Convention (UPOV 1978). Halting free exchange of seed is what this act sought to do as it rely on act the that transform organism into object of trade. The authors note that through PBR multinational firms privatize and regulate seed sector (ibid).

Concerning ownership, Freedom (2004: 134), indicates that it is not "compulsory for transnationals to exercise direct proprietorship over seed reproduction and delivery in the initial stages. What is of interest at the early stages is to set the legal structure for private ownership over germplasm, and this is the contemporary battle zone of the conflict for governance over genomic properties". The question then is it possible to privatized/commercialized seed production and attain food sovereignty? As Kloppenburg (2010: 365) shows that "one that regulates the seed will gain a significant chance of regulating the entire food system". However, considering the present-day paths of neoliberalism making its way into states via policies of the state, an interrogation is required to see how food/seed autonomy can be attained under a neo-liberal policy/government? And in the same vain, what is the role of government in the sovereignty. According to Kloppenburg (2010: 369) "at the center of the neoliberal edge is the seizure of that which belong to all thus, 'the commons' and its conversion into an exclusive, commodity form". As suggests by Freedom (2004: 21) that when it comes to seed it is essential to have provision that regulates since seed legal issues fundamentally protects plant patents.

Conversely, the privatization of the seed sector comes with it challenges in relation to changing of law or policies to suit the condition and enabling environment for successful operation of this agenda. In the case of Ghana, attempt to put mechanism in place to protects breeder's rights has been met with challenge from Food Sovereignty Ghana. This movement and other concern civil society have opposed the passage of this bill because they are of the view that the law does not adequately consider farmers right. The movement (Food Sovereignty Ghana 2014 n.p) argues that "it is thus enormously inacceptable to see that the Bill is skewed in favor of moneymaking breeders and weakens farmers' rights. The Bill does not permit farmers to sell and exchange seeds". Considering their opposition, they see the law to

favour the corporate breeders or the multinational seed company and as such as a threat to the farmers and the food system in the country. According to Bezner Kerr (2013: 870), the life sciences corporation pursues and erodes peasant seed sovereignty through seizure of farmers' seed so as to regulates the kind of seed produced and who owns those seed. This control comes to play because of manipulation of seed using technology.

3.5.0 Technology employed in production of Neoliberal Seed and Farmer Seed

3.5.1 Farmers seed (FS)

Ewens (2000:286) narrates that farmers have grown plants since agriculture began several decades back keeping in mind the end goal is to obtain an improved bred. One of such techniques employed is selective plant breeding which is described as one that sought qualities of the chose parent will be inherited by new plant and this is achieved through careful selection of preferred features from previous season harvest. According to Rangnekar (1999:128), plant breeding is "prehistoric practice with evidence of domestication and selection. The art of breeding involved the selection of varieties from those maintained by farmers on their fields." Lewontin and Berlan (1990:214) state decades ago farmers reproduce seed for the coming year manually as they select seed with prefer attributes and store in a safe place. Rangnekar (1999:129) notes there is economic incentive for farmers to keep and recycle their seed but this practice thwarts seed firms profit from sale of seed to farmers. Capital accumulation depend on the extent to which seed use is restricted though in the time past farmers have save seed but now PBR determines how seed is protected and used.

In northern Ghana, traditionally, farmers employed simple technique of selecting and keeping seed with desirable feature from their harvest which they intend to use for the coming season sowing/planting. Through this saving, farmers could keep seed with good trait for decades, passing it from one

generation to the other within a house hold as well as through exchange and gift among the farming communities.

Pionetti (2005: xiii) outlines that farmers do keep their seed with the hope that the seed acclimatizes and propagates unique features. To this end, farmers recognize the need to keep seed with desirable feature but not only desirable but with well-adapted character to their community in all aspect of their production system. On how the farmers in the Northern Ghana save their seed, Wright and Tyler (1994: 6-7) note "seed is selected at harvest time with cobs being chosen for large size and good colour. Groups of up to 40 cobs are suspended on trees, under roof and often protected with polythene or a wrecked gourd to avoid rodent attack. Cobs may also be kept in sacks and left open to avoid the risk of heating and untimely germination".

3.5.2 Neoliberal seed and its techniques of production

The present-day approach to seed improvement employs a different kind of techniques ranging from hybridization to gene manipulation. Some of these techniques are not easy for farmers to learn or difficult for them to combine this with their farming activities considering the nature and character of these methods. Rangnekar (1999:128) acknowledged plant rearing began changing from hand work to systematic activity in 1900 and it emphasis and preserves improved seed from one generation to another unadulterated. On this basis, plant breeders contended that growers return to them for fresh seeds after each harvest since breeder were the main individuals with ability to save and preserves seed as they distinguished their role from that of farmers.

Hybridization for seed producers is beneficial since it makes the buying of seed from a seed firm essential and has become ever-present techniques. However, coming up with varieties that perform best with substantial use of fertilizers is the core goal of this technique Lewontin and Berlan (1990:214). In line with crop improvement, Berlan (2000:523) argued stakeholders pursues the lucrative strategy, not the valuable one, as hybridization involves high social misfortunes hence rather, it is a displacement and enclosure system is not a yield enhancing strategy. Kloppenburg

(2005:94) states for private firms' hybrids offer more profit therefore all energies were deployed to this new technique. As Lewontin and Berlan (1990:214) asserts "a good example of inputs that farmers use to produce which are presently bought is hybrid. it seeds required that farmers purchased from a seed firm each season. Hence, hybrid is replacing seed farmers were producing by themselves.

Lewontin and Berlan (1990:214) outlines production of hybrid maize, in four phases namely production of inbred, crossing of inbred, growing of superior hybrids and crossing of large numbers for seed sale. These processes required techniques which farmers cannot do as it need systematic approach. As Kloppenburg (2005:93) emphasized hybridization enables and changes seed from a use-value to an exchange-value as seed from hybrid crop, when kept and replanted, shows a significant drop in yield so separates seed as "seed" from seed as "grain" Therefore, hybridization offers private firms and seed producers a strategy to evade the biological factor that did not permit to have control over seed. Having deployed the mechanism to bypass barrier formally pose by seed ability to reproduce continuously now farmer are encourage to adopt.

3.6.0 Adoption of agriculture production technology

Embracing technology, idea or new knowledge or practice that leads to improvement over the former method/practice previous employed in farming will depend on farmers' decision to choose a set of the newly introduced technology. Oyekale and Idjesa (2009:45) defined adoption as the "choice to apply an innovation and to continue to use it. The authors note researchers are interested in farmers adoption of new agricultural technology but farmers' decision to adopt a technology or not is influenced by certain factors." For Asiedu – Darko (2014:13-15) "farmers attitude and background influences adoption and distribution of new techniques. However, adoption of farming technologies is central to farm improvement

3.6.1 Farmers adoption of technology

According to Ibrahim and Florkowski (2015:2) "understanding peasants' readiness and passion in adopting a new agricultural technology is still a challenge for agricultural academics and the many stakeholders." So, in order "to improve growers' earnings, the introduction of new agricultural know-hows/innovations such as improved seed varieties, have been promoted over the years. The extent of adoption of such new agricultural technologies has been mixed". As Kaliba et al. (2000:35) put it "farmers' adoption of new technology, such as improved maize seeds, is a decision between traditional and new technology. Farmers' decision to adopt or not adopt is usually based on the profitability and the risk associated with technology" (Heisey et al. 1998: 4; Kaliba et al. 2000:35).

From the farmer's point of view, several factors influence the profitability of adopting hybrid maize, for instance, the amount of seed purchased might determine the profitability at the farm-level and uptake hybrid technology if there is the yield advantage associate with price of paid Heisey et al. (1998:4). Therefore technology will be adopted of anticipated return is high so there is direct relation between adoption and return Akudugu et al. (2012:7). While Ibrahim and Florkowski (2015:5) added that "adopting the new technology will be enhanced if the introduced technique is better that former practice. As study show that farmers are motivated to adopt technologies if improved varieties partially or otherwise have high output and ability to withstand drought (Asiedu – Darko 2014:15) reports. Hence, "technology can be successfully adopted by small-scale producers, even if they are in marginal production environments" (Heisey et al. (1998:18). However, in adopting a variety in some locality, farmers take into consideration the time taken for new variety to mature as factor that influence them to embrace the new seed (Ibrahim and Florkowski 2015: 7).

3.6.2 Non-adoption of technology

On the other hand, Heisey et al. (1998: 18) argued that "if the hybrid fails to outperform the local variety, regardless of seed prices and other associated factors considered adoption is unlikely to take place on the part of farmers.

As Akudugu et al. (2012: 7) claimed the “cost negatively related to the probability of adoption, this means an expensive technology will not be adopted and the anticipation of losing incomes is a social cost that farmers factor in their adoption decisions” (ibid).

In the case of Ghana, less adoption of agricultural technology is associated with dependence on the supply-driven path to technology generation and dissemination, costs of production, cultural practices, tastes, and limit access to the market (MOFA, 2007; Asiedu-Darku, 2014 cited in Ibrahim and Florkowski 2015). Without a much difference in “outcomes between two alternatives, and in the returns from alternative and conventional practices, it is less likely that peasant will adopt the new practice, especially small-scale farmers” Akudugu et al. (2012: 7) argued. Regarding capital intensive technology, it might not be adopted because farmers do not have enough resources to do so(ibid:8) the authors added.

In summary, perception associated with the technology which is often backed by cultural and traditional considerations is one of the key factors that influence the grower's decision to adopt or not to adopt crop-based technology (Asiedu – Darko 2014:14) states.

Chapter 4

Chapter four

FIELD RESULTS

4.0 Introduction

The political economic context of the spread of neoliberal seed. This section attempts to respond to the study questions by offering and deliberating the results from the field. The study employed primary data gathered through interview and Focus Group Discussions (FGD) as well as the survey of respondents and secondary data thus, reference was made to literature or publications that are relevant to intellectual property rights globally and in the context of Ghana. The discussion is in three parts; the first part dealt with the property related issues around the neoliberal seed in Ghana. With respect to property right or breeders bill, the discussion covers current debates in the country. The second part talks about a technological aspect of neoliberal seed. The questions related to seed improvement through technical know-how and improvement for who is addressed in this section. The third part discusses the actors involved in the promotion of the neoliberal seed and adopting, and non-adopting questions are raised. The section further tries to figure out reason(s) for adoption and non-adoption.

4.1 Contested ownership claim related to neoliberal seed

The property related issues around the neoliberal seed will be looked at from perceptive of ownership-who owns the seed. This section explores ownership claim thus, contestations on property about claims to, and denials of, ownership with regards to farmers' rights to seed ownership which are being denied by intellectual property rights rulings that favor corporate ownership. It draws on relevant aspect of seed treaty and articles in global

and Ghana context. It also uses results from interviews to understand how actors acknowledge seed ownership.

In the first instance as stated in the Seed Treaty foreword, that peasants' right to keep and use farm-saved is essential if farmers' rights are to be achieved. However, other global trade and intellectual property (IP) treaties equally limit these rights (Peschard 2016: 23).

Secondly, Article 9.3 of the Seed Treaty states: "Nothing in this Article shall be interpreted to restrict any rights that peasant have to save, use, exchange and sell farm-saved seed, subject to national law and as appropriate" (Peschard 2016: 23)

The property related issues when looking at it from the property right perspective; one will acknowledge the possibility of neoliberal seed being owned by the corporate or the breeder who develops/produces that product as the law will give a right to the originator. In this case the "inventor" of improve seed, therefore, have the right to decide as to how the seed should be used. In the case of Ghana, there is a struggle over what should constitute the breeders bill which is yet to be passed. According to Aidoo et al. (2014: 6) presently breeders bill is pending in parliament for endorsement, it has been drafted to provide ownership and protection for new varieties, when approved, and enforced, it could serve as a major enabling environment to provide inducements for breeding programmes. Accordingly, Iles (2014) is of the view that PBR will 'allow firms to have legal ownership and control over seed varieties they claim to have developed'. While, Pionetti (2005: xv) outlines that firms control seed by altering it genetically or through imposition of intellectual property rights regimes such as breeders' rights which makes it an offence for farmers to recycle seeds. The argument ranges from how the bill will not be in the interest of the farmers but rather the breeder will be beneficiary of the act, how the new variety should be considered or what kind of seed should be protected.

As Peschard (2016:22-23) acknowledged that globally one of the controversial issue in crop production, is farmers' right to keep seed of protected varieties, thereby, restricting farmers seed-saving practices hence, farmers'

rights to seeds are express as 'privileges' and 'exceptions' and less important to 'rights' of breeders. In the case of Ghana, as pointed out by the movement (Food Sovereignty Ghana 2014 n.p) the PBR bill undermines farmers' rights and restricts their usage to "personal use" and which may be subject to pay patentee. Accordingly, Peschard (2016: 23) notes that "limiting peasants' usage of seeds conflicts with their rights that are assured in the Seed Treaty". Considering the character of neoliberal seed regarding its reproducibility, the farmers cannot use harvested produce as seed, but they (farmers) should always renew their seed. Breeders have been involved in development of seed over the years through participatory research and on-farm trial together with farmers, researchers and extension agent without any form of restriction to the use of the new seed developed via this process, why then the need for protection for the neoliberal seed.

The movement (Food Sovereignty Ghana 2014 n.p) contended that in the PBR act, a breeder is entitled to intellectual property protection without proof to the contrary. However, the movement argued that such act is a disservice to farmers as it lacks clarity with regards to disclosure of source of genetic material and role played by farmers in Ghana therefore, see this as an exploit of smallholder farmers through such a provision. As argued by Ewens (1999: 292) that "over-protection of high-yield seeds might restrict peasants' capacity to cultivate useful crops as well as peasants' and seed firms' capacity to select subsequent generations of seeds." Looking at the issues raised and relating it to the means of production, the nature of neoliberal seed lead to a basic question of who owns what? around these seeds. In the case of Ghana, there is an ongoing struggle over establishment of property right over newly developed seed by the breeders or companies. Putting the issues around neoliberal seed in the perspective of the farmers' adoption of these seed under such an act if passed into law.

An interview with the District Director of Agriculture (DDA) on who owns the seed when he was asked whether those seeds belong to the farmers or does farmers see it as their own? He asserts that *"with these seed, farmers do not see themselves as owning these seed because they depend on the source to buy*". A respondent also said, "*once you buy something (seed) then*

it is not yours because with my own seed I don't buy but I fetched from my barn since I have always to buy these seed I will not say is mine".

4.2 How has neoliberal seed affected farmers' seed saving practice?

Over the years' farmers have produced, reproduced and saved their seed for subsequent season planting. They save their seed differently depending on the techniques the farmer is familiar with or one which he has been taught through years of experience or practice with these techniques. However, with the introduction of the neoliberal seed to farming communities by actors in the agriculture sector, these seed by their feature are disincentive to farmers saving and reusing of the grain obtain from their harvest. As Howard (2009: 1269) argued the that strategies employed by the seed firm, makes farmers have less interest in saving or replanting the seeds they purchase.

Through the interview conducted, survey administered as well as the focus group discussion held with farmers, when they were asked whether they still keep their own seed it came to light that farmers still save their seed. However, some farmers said they do not keep their seed any more. With regards to the survey, 22(85%) of participants indicate they keep their seeds. While 4 respondents representing 15% said they were no longer keeping their seed when asked why they (interviewees) gave varied responses as follow:

Box: 1 Respondents reason(s) for saving or not saving their seed

"I don't keep my own seed because it is not helping me because I won't get enough produce."

"I do not keep because currently, we are looking for varieties that give more yield so no need to keep variety that gives low yield". (An interviewee)

"Why I still keep my own seed is that if I cannot buy as you know these seeds are expensive, I can always use my own seed. You know I have to plough, apply fertilizer and buy seed for 240 Cedis (65 dollars) then that means a lot. If I don't have enough money, then it means I will use my available saved seed". (Iddiris)

"I keep it small for emergency so that if am not able to buy seed I want; I can squeeze and buy small and add to the local seed". With old seed, you can harvest and select from the old stock. I don't select from my own farm again but I buy every year, I go to reliable sources and get my seed for sowing". (Ben)

"I still keep the old seed because you may not know if during planting you will have money or not but if I have money I leave the local seed and plant the new one". (Alhaji Baba)

"I keep my seed because I may not get money to buy these seeds then I use my own seed because other seed (pannar) is expensive" (Respondent in Boayini)

"I cannot leave my old seed because if I lose here thus new seed, I will not lose the old one. With my seed I can harvest and select from the old stock for coming season, however, I don't select seed from my own farm again but I buy every year. I go to the reliable sources and get my seed". Haruna

Source: (Field work 07/2016)

Of the three FGD held and eleven farmers interviewed, majority still keep their seed however, their practices differ as 6 respondents indicate they save their seed by hanging them on kitchen roof while the 5 said they keep theirs in room well ventilated and bagged the seed in sacks while placing it on a

raised plat form in the room. Similarly, in FG participants gave different responses and description of how they save their seed.

On how farmers keep their seed, a female interviewee describes how she save/keep her seed: "*I select my seed by looking for good seed that is those cobs without insect or damage and I allowed them to dry very well then I look for a store. I usually leave the grain on the cob with the stalk. During the storage, I put ash by pouring or sprinkling it on the floor and then raise a wooden plat form with plywood on top and pour ash on the plywood as well. When it is time for planting, then I shell it and go and do the planting/sowing*".

In light of the responses above, it can be deduced that farmers are still saving their seed with different reasons some say if they are unable to buy the expensive seed then they will use their saved seed while others said they are not keeping their seed because it does not help them get more yield. Though majority did indicate they save their seed but for emergency that is when they are unable to purchase expensive seed

4.3 Technology associated with neoliberal seed

To assess technique linked to neoliberal seed, I began the discussion with where the seed an actor promotes is produced. Majority indicated that their seed comes from outside country but on the technique employed in the seed production, most of the interviewee could not tell or describe how their seed are produced except for one extension worker with MOFA who could described how the seed his outfit promotes is produced.

There are different technologies associated with seed production over the world, most of these technologies attempt to produce seed of quality and high yielding varieties to meet farmers or consumers need. According to McMicheal and Schneider (2011: 129), "the development paradigm defines productivity in terms of output per crop and therefore concentrates on seed technologies". With regards to technology, it was looked at from two perspectives thus the technology employed in the (re)production of the seed

and the technology promoted alongside the seed. As Lang and Heasman (2005: 128-129) framed it "paradigms are locked in competition between themselves out of which they are adopting strategies such as a dependence on technology to resolve most problems". One technology employed in development of these seed as Kloppenburg (2005: 100) outlines: *production of double-crossing hybrid maize seed using manual detasseling. The process begins with two pairs of homozygous inbred lines. Each pair crossed by planting two lines in alternating rows and emasculating the female parent by detasseling. Seed from the female parents only is collected to ensure that no selfed seed is obtained. Plants grown from this single-cross seed are themselves crossed following the same procedure. Seed is again gathered from the female parent, and it is this pollen that is double-crossed hybrid seed sold for farm production*".

Out of seven actors interviewed six do not have fair knowledge of technique employed in the production the seed their outfit is promoting however, only one was able to describe how the seed

An extension agent described the technology employed in production of seed his outfit promotes, as follows: "*it starts with planting of one male row and two female rows and detassle the female row so that the male gene fall on the female and fertilize it. You plant the male early thus 2 or 3 days earlier and then be observant and visit the field regularly. Now you remove the female tassle before they appear and leave the male, so the crossing agent then does the pollination*". As Kloppenburg (2005: 112) claimed "Production of hybrid seed involves detasseling of the female parent lines. It is essential that the removal of pollen-producing flower be successfully accomplished since any release of pollen by female parents will lead to certain percentage of self-fertilisation". The "seed from a field that has been ineffectively detasseled is of combination of hybrids and inbreds. Inbreds are weak and the resulting seed mixture, if planted, will be poor in performance". From the kind of technology employed it means the seed obtain can not to utilized for reproduction purpose, but new seed must be bought to start a new season planting otherwise there would be yield decline.

On the other hand, farmers seed employed simple selection by identifying seed with good characteristics that will be expected to show in the next generation. With their technique, farmers rely on appearance, size of grain, and absence of insect's damage as the basis for selecting their seed to be use for coming crop season.

4.4 Technologies promoted along neoliberal seed

Technology are often associated with other method so as to realize desire outcome likewise for neoliberal seed comes with other techniques that complement it production practices. One technology neoliberal seed promoted alongside its seed is planting in row. As point out by Ragasa et al. (2013: 6) that farmers are encouraged to do row planting and appropriate planting distance per unit area. Farmers adopting neoliberal seed do plant in rows. The FGDs and interviews conducted with participant on technology employed in cultivating seed they are adopting they shed some light on these technologies. All the farmers interview indicated that they plant in row with field cropped with neoliberal seed as they were told and trained on this practice. A female respondent (Kande) narrates how she plants in rows: "*with pannar I usually plant in rows so with this I hold the rope with somebody assistance, and the other person will be dibbling while someone will be doing the planting, so the planting required at least two people to hold the rope, 1 to dibble, one or two to plant so more hands are required to complete such a task*". It is recommended that farmers plant in lines to regulate plant per unit area and facilitate subsequent farm operations such as weeding and fertilizer application (Ragasa et al. 2013: 6) stressed. This was confirmed in an interview with Director of operation of Masara N'Arizik "*the planting in line-row this is one thing farmers are not used to, so we have to give them training on that*".

Other technologies promoted along the neoliberal seed were the fertilizer usage and no-till or minimum tillage. According to Ragasa et al. (2013: 6) "zero tillage, or no-till, with mulch as a sustainable alternative to slash-and-burn was introduced by CRI in collaboration with Monsanto, and Sasakawa

Global 2000". It emerged from a FGD in Boayini that farmers are supplied with chemicals along the seed and fertilizer as part of the inputs given to farmers under the Masara N'Arziki. A farmer explains how he sprays and plants his field as follow: "*you first spray with chemical and wait for one week. And then plant/sow your seed after planting, they will give a chemical, and so you spray twice and weed once or if you are 'lucky' the weeds may not be there, so you don't weed in that case*" (A participant in FGD).

On fertilizer usage, as was contained in a draft protocol for maize demonstration, that three 50kg bags fertilizer should be applied per acre at planting and two 50kg will be applied /acre four weeks after planting. In an interview with the actors it came to light that they championed fertilizer use in the study area by encouraging farmers to apply fertilizer at right time and right doses. Regarding fertilizer application, all the actors interviewed indicated that trained farmers on fertilizer application. Most of the respondents(farmers) also said they trained on fertilizer application.

Box 2 Actors responses on fertilizer usage

"farmers think they can buy fertilizer at any time and apply anytime, but we have to train them on timely application of fertilizer and how/rate of application, and spraying as well". (DDA).

"we educate farmers that generally Pioneer uses more fertilizer than the local varieties but based on farmers practice they use 3 bags, but it is recommended that farmers should use 4/5 bags for pioneer".

"it responds to fertilizer better when you apply it the way they ask us to apply. If you put the number of bags required at the appropriate time and do as they say, you get a good yield but anything less than that you may not get enough harvest". (Amina)

"if you apply the required fertilizer thus five bags per acre you will get a good yield" (Haruna)

Source: (Field work 07/2016)

Regarding fertilizer utilization, Ragasa et al. (2013: 5) claim that 'farmers stated that planting hybrids require more fertilizer use'. Lang and Heasman (2015: 31) argued that the "feature of productionist is the increased use of inputs, therefore, to achieve its goal this model relied on artificial inputs such as herbicides, and fertilizers". From the responses above it can be deduced that the neoliberal seed takes more fertilizer than farmers seed as most respondents said they applied four to five bags per acre to realize the target yield per the acre. Therefore, neoliberal seed generally requires extra inputs to realise their full yield potential. Their (participants) responses indicate that much emphasis was given to the high yielding seed and generally they were all hybrid.

4.5.0 Which organization are involved in the promotion of neoliberal seed

Improved technologies are made available through negotiation, persuation and promotion as Kloppenburg (2005:18) indicates. It was discovered from the field that all actors interviewed championed neoliberal seed and among them are non-governmental organizations (NGOs), state department, and individual/private Companies. As Ragasa et al. (2013:5) pointed out that "private companies(Wienco) have begun promoting hybrid maize varieties (pannar) in Ghana'. As Aidoo et al. (2014: 5) added "Wienco has been promoting two PANNAR hybrid maize varieties mainly for the poultry feed industry". The research reveals that neoliberal seed has been championed by Masara N'Arzik and other actors in EMD when they were asked which seed they are promoting. Their responses were as follow:

Box 3: Responses on seed promoted by actors

"hybrid seed –Pan 12 and 53 and he added that last year we did Obatanpa. However, there was no demand then we stopped". (The director of operations of Masara N'Arziki)
"under FARMPLUS and collaboration with SADA we provided farmers with seed basically pannar seed (pannar 53)". (The project coordinator of PARED)
"we are involved in promoting hybrid, high yielding seed, commonly Mamaba because of maturing period, and it is high yielding". (The DDA)
As highlighted from the actors' responses that these are the seed they promote none of these permit farmers to use these seeds season after season.

Source: (Field work 07/2016)

In a bid to identify how actors engage farmers to uptake these seed, they were asked through what channel do they reach out to farmers. All actors interviewed indicated that largely they involved farmers through demonstration and often they organize field days during this demonstration. Some also indicate they engage farmers through media basically local radio station run programmes on varieties of seed available for in the community. As Kloppenburg (2005:95) notes that to encourage farmers to adopt improved seed the idea of corn show was employ as mechanism to achieve that purpose. The actors use of demonstration in the district was meant to increase their adoption. On this note I turned to adoption and non-adoption questions.

4.5.1 Non-adoption of neoliberal seed

This section engages the results of the interviews conducted and FGDs held with participants to explore their reasons for non-adoption of neoliberal seed. From the results gathered, it indicated that adoption of neoliberal seed has not been impressive as most respondents said they are adopting partially because it too expensive to purchase. While some said, neoliberal seed restrict seed usage for next season farming and the seed from it cannot be

shared with other farmers. While others said labour and inputs required is one thing that deter them from adopting. It emerges that notwithstanding its high yielding, farmers still do not give all their hope on the neoliberal seed. According to Ragasa et al. (2013: 9) farmers indicated that using hybrid is discouraging because the seed cannot be used season after season therefore, they do not desire to switch their non-hybrid with hybrids though hybrid is associated with increase in output. This was in line with a respondents' observation: "some farmers are not adopting because it restricts them from recycling the seed for use for the next season. If one does not have money, it means he cannot farm. If all seeds are hybrid seed, all resource-poor farmers will be knock out of farming". (The DDA). As Ragasa et al. (2013: 5) argued "hybrid seed have to be bought fresh for every season.

Box 4 Responses for non-adoption of neoliberal seed

"I planted my harvested grain from previous season it did not germinate. Am telling you if you plant your saved seed it will not germinate he emphasized I have tried but like I said it did not germinate". Musa
when you cultivate (saved grain) it may not germinate even if it germinates it will be very poor and may not get any yield". (input dealer)
"if you are able to apply enough fertilizer, you will get better yield but if no fertilizer the yield is poor this one thing I don't like about this seed" (Imoro).

Source: (Field work 07/2016)

An interview with (APO) he states: "Hybrid demand that you need to get the seed yearly. If you use the harvest produce, you will get less than 50% yield as its yield decline". This agrees with Tripp and Mensah-Bonsu (2013: 5) where they point out that "in most instances, peasants are able to keep and recycle the seed of new variety for at least a few years, but in the case of hybrids, whose yield and uniformity declines with second generation seed".

The hybrid is not being adopted much by small-scale farmers even though; they are high yielding. The idea that they must be buying seed every year makes them not want to adopt. Linking their non-adopting to Scott (1979:

18-19) in what he described as the 'safety first' principle. Thus, in the selection of seed and methods of farming, farmers prefer to minimize the likelihood of having a disaster relative to maximizing their average return. Hence, the essential thing to note about the output of the traditional variety, is its reliability (ibid: 16).

Accordingly, Etwire et al. (2013: 11) report that the "demand for hybrid varieties is also low because it usually requires a lot of fertilizer". Considering that these "seed cannot be recycled and expensive but being promoted in a system where the local political economy offers little support for the small farmer" (ibid). Therefore, the less desire of farmer to adopt these seed leads to the need to be examined to see, who gains and who loses and to know which interest is being pursued. Since majority remarked that neoliberal seed yield higher, but they don't adopt. Thus, Nyantakyi-Frimpong and Bezner Kerr (2015: 30) "raises questions, as Scoones and Thompson (2011) point out, about who benefits, who loses and whose interests are being served with high-input agriculture". In a FG with participants in Dabari, when the question of adoption was raised, a female discussant said *–yes I adopt it partially because it is good. Thus, the seed was good but not the company because they are looking for profit.* While, Haruna added: "*they said they are going to help us with seed, chemical, fertilizer (5) bags and pre-emergent chemical but after harvest, you pay 16 bags the first year. The second year they increase it to 20 bags per acre and third year, 24 bags*. Asana agreed that "*it yield better-good and product from it is also good, but they are cheating us. She added that the land is for us so if we agreed with that arrangement we will not get anything, so we left the contract*".

In an interview with the director of operation with Masara he indicates: "*we supply them with the inputs – the grain that comes from the output should come to back us. The farmer is obliged to settle with 20 mini bags of maize*". When asked if a farmer default he said "we go through legal procedure to get our money back. Because in the contract, it says the produce should come to us. When asked further that if the default is due to circumstance beyond the farmer's control for instance as result of drought or flood he said

if you buy a car and something happen outside of your control you still have to pay.

4.6 Adoption of Neoliberal seed (NS)

The study revealed that among the main reason for adopting NS is the yield potential of the neoliberal seed. This is one reason that runs through majority of those who said they adopt these seeds. Most of the respondents agreed that the neoliberal seed yield more than the traditional seed. As argued by Kloppenburg (2005: 92) that "as everyone knows, hybrid corn increased corn yield". This impression was confirmed by many of the farmers during FGD and interview and actors interviewed as well when asked about adopting NS and their opinion or experience with these seed concerning yield. A respondent (Iddirisu) in Bowku narrated as follows: *when I was using the old seed, I get 5bags per acre and then Agric brought some seeds and you can get 10 bags from one acre and then it also later reduce in yield. For dobidi I can intercrop with millet and get 10-13 bags per acre after this, there came obatanpa, and with this, I get about 13 bags and now pannar. I use pannar, and I called it the "father" if I plant/farm and follow the regulation they laid down I get 16-18bags (100kg). The fertilizer I applied is called Yara, I used five bags per acre, but if I use 3bags or less, I will not get the number of bags I mentioned. If I apply three bags, I only get ten bags*. Based on his narration it can be deduced that there is yield difference with his experience with various seeds he worked with.

Box: 5 Respondents' reasons for adopting neoliberal seed

"Generally pioneer gives more yield than our local variety/seed followed by panaar. Because pannar gives more yield, we always add one bag to it to make five bags per acre while obatanpa I use three bags to one acre. If you compare the yield, pannar can give you 20 or 16 bags per acre while obatanpa will give 9 or 11 bags per acre" (Ben)
"In terms of yield, if you plant pannar one acre, the yield will be higher as compared to others for instance 20 bags per acre". (An input dealer)
Mamaba and Pannar – they are high yielding. They are closed varieties, so regarding yield, the closed varieties yield high than open varieties. They "out yield" the open varieties. (An extension agent)
"for pannnar and pioneer because of superior performance in yield. It gives maximum yield for Pannar 20-25 bags per acre (100kg) while pioneer gives 30-40bags per acre
They adopt these products because of increase in yield since they want to maximize profit. The yield difference is what inform farmers' decision that alone informs them to make such a decision". Agriculture Production Officer (APO)

Source: (Field work 07/2016)

As contained in Pannar document that their product Pan 12 medium variety has "very high yield potential – 8Mt/ha and higher". As noted that "productivity gains are often coined as increases in basic indicators: per unit seed (yield)" as Weis (2007: 315) framed it. Judging from the participants' responses the study confirm that majority of respondents see yield as the essential when referring to reasons for adopting.

However, from my observation of a participant field that I visited during the field-work, my visit reveal that she paid much attention to the Pannar than the local variety she cultivated. As the time of my visit, she had applied fertilizer to the field planted with the pannar whereas, the field with the local variety was left unattended to so the yield participants associated with the

Pannar possibly could be due to the fertilizer they applied adequately or on time.

4.6.1 What circumstance or preference makes farmers adopt neoliberal seed?

One theme that was highlighted in the interviews regarding circumstance and preference for adopting the neoliberal seed was the issue of climate change. Another circumstance that made farmers go in for neoliberal seed is the ability of the plant to withstand some disease or pest attack while some said because they have limited land so they adopt seed that gives more yield. Whereas, some said it helps them pay their loan. Therefore, respondents gave different situation which make them up take neoliberal seed.

According to DDA suggests that farmers these seed prefer these seed, because: “they are early maturing and most farmers run out of food stuff, so they prefer short duration or early maturing so that they can harvest them very early and use the proceed to buy food stuff”. However, this in contrast with Wright and Tyler (1994: 14) has found in their study that a “local (yellow) varieties have stable yields, and the taste is preferred. These early maturing varieties are planted at the beginning of the first rains - on the compound farm. This provides the first foods after the 'lean season' (April- July). High yield from this crop is less important than an assured harvest”.

Box 6 Preference and circumstance that influence adoption

"they adopt because they realized that climate change is real and there is local saying that 'if a rabbit changes its style/way of running you have to change the type stick you are going to use'. Because the weather is changing the farmers know that the seeds they use were inherited from their grandfather, so they have to change to new seed" Sadiq.
"because of changing climate, the new variety respondent better when there is a fail in rainfall so you will get good yield even if the rain is not enough". An input dealer
"I depend on the new variety because of the change in climate, it is better to go with the new variety than local variety". A participant
because am a woman I do not have a lot of land to plant, so I have to depend on pannar which give more yield. A female participant
Farmers are adopting but not all farmers but "well to do" farmers. They have been looking for these seeds and buying especially varieties with Striga resistance, drought, and short duration varieties are adopted. The DDA

Source: (Field work 07/2016)

A farmer narrates: "*I have been using pionner/pannar because I want good yield to pay my debts and still feed our family. I renew my seed every year almost five years now. I always borrow from bank, and I think it helps me to pay my debt. I get enough produce to pay back my loan or money I borrowed. with the local seed, I will not be able to meet my target. My target is 15 bags per acre, and the local seed cannot give me that. So, with this I can use 10 to pay my debt and the remaining for me but with the local you will not be able to pay your debt, even though it is not easy to come by these seeds (purchasing) but it is still better because, if I plant a good seed and everything germinate and the rain did not fail I know I will get enough*".

4.7 The impact of the neoliberal seed on the house hold food security as well as respondents' income

In survey conducted, 12 (46%) of the respondents indicated that their household food security has improved with the adoption of these seeds.

While 10 (38%) said their household security before and now with the adoption of these seed has not improved. Whereas, the remaining 41(5%) said is still the same.

Regarding income majority 18(70%) indicated that their income has not improved even though they said they have enough food, but their income has not improved much because they still have other responsibility, therefore, they spend more on expenditure such as their ward school fees among others. The remaining 8(30%) indicated that there had been improvement in their income since they take up these seeds. It stands to reason from their responses above that while the seed are being promoted to improve farmers' conditions much has not change though majority said food security has improved but for majority their income has not.

Chapter 5

5.0 Introduction

How does "neoliberal seed" impact the production and reproduction of farmer seed in Northern Ghana. in answering the research question, it was argued that seed, does not exist alone but entrenched in the three themes: technology, ownership and adoption. First, the manipulation of seed using technology to develop or enhance seed performance in terms of yield; second, the claim of ownership of seed developed using intellectual property rights to seed products; and third the adoption of the seed by the farmers to realize increase in output. Thus, technology will help to break barriers that will otherwise prevent individual from owning seed. And property right aid in the protection of investment to recoup cost involved in the technology now farmers are encouraged/induced to adopt the new seed as a way of ensuring continuous accumulation of profit from proceeds that result from the new product.

5.1 Seed ownership claim through IPR

Paradigm framework provides an insight into struggle and contentious issues in property regime and conceptual understanding of the dynamics of power in IPR. The tussle between farmers right to seed and breeders right is being fought out in the IPR in Ghana. The main theme of arguments about IRP is neglect of farmers right at the expense of the breeder as well as failure to recognize role farmers played in the genetic diversity in the country. Also, opponent argued that if PBR is passed into law, it will benefit breeders' only, though, initial seed from farmers was offer for free, but farmers will now be required to purchase from the breeder or producer consistently. With IPR seed are legally defined as property which needs to be protected. As Lang and Heasman (2015: 30) note the tussle is not only around firm owning seed but extended to possession, domination as well as property right over seed. In relation to ownership, Sofía et al. (2016: 22) argued that

seeds are not items and should not be considered as goods and services that are bought and sold. Hence, acquiring seed should not be framed as access to goods and services manufactured by firms but should be considered as common goods within community.

Different provisions regulate ownership and use of seed as Peschard (2016: 23) notes that Article 15.2 of the 1978 Act of the UPOV Convention "allowed farmers to save, use, and exchange seeds. However, in the 1991 revision, farmers' right to seed have become an exception left to the discretion of national governments; it is restricted to farmers' own use while safeguarding the interests of the breeder". Hence, violates and deprives them of their right to usage" (ibid:24).

In the context of ownership, IPR regime is around principle and act that provide proprietorship for breeders through the enactment of Act that sought to protect product from breeder/corporate effort. The act favouring breeder and corporation is at the center of the ongoing battle in the country. The tussle between the farmers' right versus breeders' right is an issue of contest as the bill infringed and denied farmers right over the breeders right as contained in the draft bill. Lang and Heasman (2004: 140-141) asserted It is noteworthy that, the transformation and legitimately upheld right to ownership has realized major changes lately.

5.2 Neoliberal seed(NS) influence in production process through technology

In terms of the paradigms and their application in agriculture production in the district, two of the three paradigms outlined in the framework were noticed in the case of northern Ghana: productionist and LSIP these two were more pronounced. As Lang and Heasman (2015:26) argued that focusing on raising output in food system while neglecting other concerns is a feature of productionist. In the case of Ghana, (Nyantakyi-Frimpong and Bezner Kerr 2015: 18) note that with an attention on Northern Ghana the state has given much essence to agrarian advancements so as to twofold yield under various

strategic programmes in the country. In the context of East Mamprusi therefore, the farmers placed more emphasis on output when referring to seed feature that influences their choice to adopt a specific seed and actors as well said they consider yield potential as significant in the kind of seed they promote. Productionist worldview "built up technological base to advance the objectives to double yield' as (Lang and Heasman 2004: 19) framed it. However, Lang and Heasman (2015: 31) explain: the utilization of large quantity of inputs such as is what typified productionist model. The study reveal Neoliberal seed production methods use a range of technical and synthetic interventions to increase productivity and control weeds. As most respondents indicated that they use more fertilizer in the field planted with neoliberal seed.

Technology adoption a is battle arena in agriculture production so, to resolve problems paradigm compete among each other using technology as a way out (Lang and Heasman 2005: 127-129). The technology employed in the production process is another way the farmers seed different from NS. The former relied on techniques like hybridization in it seed production while the farmer's seed was based on simple selection of seed from previous harvest to serve as next season seed. While farmers seed is grown randomly, the NS is said to be planted in lines or rows. The technology used to produce seed offer another lens of differentiation between FS and NS as well as techniques employed in the production process. As Lang and Heasman (2015:26) indicated the productionist "attracted upon progressive farming innovation and plant reproducing systems". The difference between NS production is that it uses chemicals and synthetic fertilizers and therefore directly connected to the productionist/LSIP through inputs and technology employed. One the other hand, farmers seed may be linked with EIP production methods, practices, although these are not automatically connected to the other features within the EIP framework. Agroecological methods are more readily fit into the farmers' practices as some respondents did indicate that they do intercrop field planted with their own seed. However, there is no much evidence of the EIP in district agriculture production pattern for East Mamprusi. As noted in Chapter 2, EIP emphasis on ecologically friend-

ly production and the synergies between and within the production and ecosystem. Nonetheless, in the EMD, there is no organization/actor, that employs EIP approach to increase production a signal that this model may take a long time to be noticed in the district.

Differentiating farmers seed and NS per mode of production is the essential thing to do when looking at FS and NS. However, from the study, it was revealed that differentiating between different input of production employed in relation to the method and character of production, in the long run there seem to be no difference in the farmers' income though some said their food security is enhance but income still remain the same for majority. The difference between neoliberal seed and farmers seed is that NS depend on chemical and more fertilizer in production through technology promoted alongside the seed thus, it demands that more input is utilized. On the other hand, farmers seed has seen/realize minimum use of input as most respondents indicate they use less fertilizer and no chemical was used in the field with farmers' seed.

5.3 Promoters and (non)adoption of neoliberal seed

While it is often assumed that adopting high 'quality' or 'improved' seed implies small-scale farmer, will enhance their food security and income as NS technology is often associated with increased output and farmers are encourage to adopt. A private entity like Masara N'Arizik engaged farmers and supplied them with input such as seed (pannar and pioneer), fertilizer and chemicals. The promotion carried out by the actors is designed to maximize the use of purchased input. The notion that agricultural output can be enhanced via deployment of "improved technologies" such as improved seed has root in effort geared toward engaging farmers in the use of these technologies to increase farm productivity. From the data gathered which reveal low adoption which can be in part attributed to cost involved in the purchase of seed and other inputs that come with seed. As Idrisa et al. (2010:1397) acknowledged that if seed hinges on less inputs like inorganic chemicals the probability that it will be adopted is higher.

Lang and Heasman (2015:260) cited organization in India that partner farmers on sustainable farming and conservation of their seeds. However, it emerged from the interview with the DDA that the MOFA does not promote farmers seed consciously. But rather encourage them to adopt and plant high yielding varieties to enhance their output. Lang and Heasman (2005:148) report that for farmers to remain in farming, they are required to uptake new techniques of production.

5.4 Implication of neoliberal seed for Agrarian Transformation

Farmers have adopted neoliberal production principles. This shift has serious, but little-understood implications for local farmers who have to redefine their roles and relationships with other farmers regarding exchange of seed. As Lang and Heasman (2015: 32) note 'in spite of unrefined condition of the innovation, GM has been brought into agriculture in way some observers seen as irreversible. GM seed and it associate inputs are reshaping the farming at a speed that is exceptional with little understanding of its consequences'.

During the FGD and the survey with participants on seed sources and seed found in their locality. It was revealed that majority could not tell which seed was local seed expect few especially the elderly who could mention and identified the traditional variety. The common farmers' variety identified include; *Kanchalanchu*, *Valenga*, and *Noakchinja*.

However, from observation, the promotion of neoliberal seed is likely to uncoupled farmers from the autonomous reproduction of their own seed if effort is not made to educate farmers on the need to broaden their source of seed rather narrowing their seed source to outside of their own.

The neoliberal seed are promoted without considering their ecological and social dimension on the part of the adopters and the environment as respondents indicated they apply more fertilizer to realize incremental output. Neoliberal seed promoters neglect the consequences which will have great implication for farmers' seed, practices, environment and their indigenous

knowledge A respondent (Ben) indicates: *my children will be affected because I will not be able to teach them how to keep seed. I will deny them knowledge on how to save seed. Which means future is not bright for farming because other country will be benefiting while we Ghanaian farmers will be losing because the seed am planting now comes from a different country. So now whatever we have, we are going to use it to buy seed because these seeds are expensive*.

Conclusion

The has sought to problematize the promotion of neoliberal seed in northern Ghana. In doing this, the study explored a paradigm and APE theoretical framework to analyze seed. Data collected through secondary data, interviews, FGDs, survey and participant observation, it emerged that, there are differences in technology, ownership and adoption between farmers seed and neoliberal seed. With regards to property related issues around seed, it was outlined through the seed treaty act and convention. In the context of Ghana, PBB/PBR was employed to provide understanding of claims and denial of ownership conflicting in the act.

Of technology employed in (re)production of farmers' seed and neoliberal seed. The former is grown randomly while the latter is cultivated in rows/lines, it uses herbicides and more synthetic fertilizers, so it associates with zero-till techniques while the farmers seed get less fertilizer application and often mixed with other crops or in rotation. With seed improvement techniques farmers seed relied on simple selection of seed with desire trait while Neoliberal seed employed advanced form breeding ranges from hybridization to gene manipulation. Regarding seed saving practices majority still save their seed, but few farmers indicated non-saving on their part.

Regarding promoters of neoliberal seed, largely all actors interviewed confirmed their outfit promotes these seed and engaged farmers through demonstration. However, on the part of adoption, there is mixed adoption as some farmers are adopting these seed partially while others indicated they no longer use their saved seed. Reasons for adoption includes yield, climate

change and ability to withstand striga among others. Whereas, rational for non-adoption were, price of seed, restriction in usage and associated inputs.

In conclusion, the paper demonstrated the significance and links that exist in the three themes that run through the paper thus technology, ownership and adoption. The results from the field and secondary data provides and demonstrates how paradigm play out in the study area by influencing the production and technology employed in agriculture operations. Therefore, In EMD the emergence of NS and their associated input shaped how production and reproduction especially of seed were conceptualized and technically managed. Along state department and other actors in the district their activities were manifested in the agriculture production pattern/development with the transformation of non-purchase input into market obtained input.

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Appendix

Appendix 1: Interview Guide for Actor (institution/organization/enterprise) that are promoting seed in East Mamprusi District

I am a MA student of International Institute of Social Studies of Erasmus University Rotterdam, major in Agrarian Food and Environmental studies

and conducting a research in a bid to analyze the politics of neoliberal seed: Technology, Ownership and Adoption in Northern Ghana.

Please note that the exercise is an academic one and has no relationship with any organization or stakeholder in Agriculture.

This are the list of question the research asked during the interview with the actors. It consists of open ended semi-structured questions. The questions are subject to changes depending on the circumstance on the field or during the interview phase of the research. If respondent is not comfortable with the question I will discontinue the interview thus the study will respect the participant's view. Below are questions the study asked.

Introduction:

What is your academic background?

What position do hold in your organization

How long have you been working in this capacity

What experience do you have working with seed?

What role does your organization play in seed policy?

Now let's talk about seed

How involved is your department in promoting seeds, which seed? And Why?

1. Where are these seed you are promoting produced Lab or research station

2. What technique do you employ in your seed production if any?

3. Who are your target? Small scale or large scale farmers

4. How different are these seed from other seeds you know or worked with before

5. Can you tell me some of the characteristics of these seed your organization is promoting?

6. In developing these seeds, does the seed program incorporate local knowledge/farmers?

7. How does your organization engage farmers thus, what are – mechanisms and process you adopt to reach out to farmers?

8. How responsive are farmers to your product-What preferences and circumstances influence their decisions to take up your product

9. Is there any restriction to farmers use or reproduction of the seed you are promoting?

10. Do farmers see these seeds as their own?

10. What are the challenges your department encounter in promoting your product

Appendix 2: Farmers' interview and FGD Guide

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

2. How have you produced and reproduced your seed over the years

3. How do you choose your seed for next season?

4. How do you select best seed from your farm?

5. Who taught you how to breed or select seed from your farm?

6. Have you been involved in the use other seed different from your own seed? What are your opinion impression and experience with these seeds in terms of yield and others such as inputs, labour etc

7. How did you get to know of these seeds which organization(s) is/are engaging you in the use of these seeds and how or through what medium or channel can you elaborate on the method employed

8. Are you adopting these seeds being promoted why or why not?

9. Are these seeds complement of your folk seeds or how do you perceive these new products

10. Will you want to depend on the these product or prefer to use own seeds

11. What kind of seed do you plant yearly and how often do you renew your seeds

12. Did the seeds program make any difference to your access/restriction to and utilization of seeds If yes, how?

13. How do you see your agricultural production system and yield before and after taken up seeds?

14. Do you see these seeds as your own

Appendix 3: Survey for farmers

Respondents are free to answer questions they are comfortable with and opt out of the survey if not comfortable with the survey process or procedure

1. Sex of respondent (a) Male (b) Female

2. Age of respondent (a) 18-35years (b) 36-60 years (c) 60 and above

3. Marital Status

a) Single b) Married c) Divorced d) Separated e) Widowed

4. Number of dependents.....

5. What is your level of education?

a) No formal schooling b) Basic (Number of years) c) Secondary (number of years) d) Tertiary e) Others…….

How long have you stayed in this community?

a)less than 1 year b)1-5 years c) 5-10 years d) 10-20 years e)more than 20 years f) my entire life

How long have you been farming?

a)less than 1 year b)1-5 c) 5-10 d) 10-20 years e)more than 20 years f) my entire life

Do you own land?

What is the size of your farm holding?

What crop do you cultivate – monocrop or mixed crop

a)less than 1 acre b)1-5 acre c) 5-10 acres d) 10-20 acres e)more than 20 acres

Do you have or keep animal(s) yes or no

If yes circle and indicate number(s)

Cattle……. Goat…….. Sheep …….. Poultry…… Donkey……..

Others please specify…….

Do you own a tractor(s) or farm implement(s)

Indicate……

What is your source of seed?

1. How do you see agricultural production system and yield before and after taken up seeds?

2. How did you become a part of or beneficiary of the program?

3. Are you in need of the seeds, and why do you say you need it?

4. Do you still keep your seeds? If yes/no why

5. What are some of the good things about the seeds?

6. What are some of the things that aren't so good about the seeds?

7. How much yield, on average can be obtained from these seed?

8. What are the features you look out for when selecting a particular variety

9. How is your household food security before and after adopting these seed?

10. How will you compare your income now and before adopting these seed?

11. How did you become a part of or beneficiary of the program?

12. How does the seeds get to you or community?

13. What does it mean to you to be seed secured?

14. what consequences do you think these seed have on you as an adopter

Appendix 4: List of participants

Name	Designation	Date interviewed	Community
Peter Lipaya Namibymado	Agric Production Officer(APO)	09/08/2016	Gambaga
Musah Neindow	Training officer	08/08/2016	Nalerigu
Fausta Ayale	Management information Officer(Miso)	08/08/2016	Gambaga

Zakaria Alu	District Director of Agriculture (DDA)	07/08/2016	Gambabga
Fuseini Putamna	Agricultural extension Agent (A.E.A)	06/08/2016	Gambaga
Moses Assani Tampuri	Programme coordinator	29/07/2016	Nalerigu
Abakari Sadiq	Field officer	02/08/2016	nalerigu
Peter te Kulve	Director of operations	17/08/2016	Tamale
Alhaji Kasim	Input dealer	01/08/2016	Nalerigu
Saani Achiri	Input dealer	04/08/2016	Nalerigu
Ben Awuni	Farmer	02/08/2016	Nalerigu
Alhaji Mahamud Baba	Farmer		Sakogu
Mukaila Tia	Farmer	05/08/16	Bowku
Alhassan Iddirisu	Farmer		Bowku
Sule Dauda	Farmer		Bowku
Kande Tindana	Farmer		Bowku
Manyia Kasimu	Farmer		Bowku
Napoka Yinbila	Farmer		Bowku
Sapaka Gumaru	Farmer		Bowku
Sanatu Iddirisu	Farmer		Bowku
Yakubu Saaka	Farmer		Bowku
Asana Amadu	Farmer	03/08/2016	Dabari
Memunatu Abdulai	Farmer		Dabari
Aminatu Adam	Farmer		Dabari
Safia Zakari	Farmer		Dabari
Musah Issahaku	Farmer		Dabari
Haruna Muktari	Farmer		Dabari

Adam Salifu	Farmer		Dabari
Imoro Baaka	Farmer		Dabari
Abila Seidu	Farmer		Boayini
Musah Kombat	Farmer		Boayini
Simon Lambon	Farmer		Boayini
Marry Kwabena	Farmer		Boayini
Akua Yakubu	farmer		Boayini
Musah Marry	Farmer		Boayini
Wandu Alhassan	Farmer		Boayini