UNIVERSITY FOR DEVELOPMENT STUDIES

ASSESSING THE EFFECT OF MAIZE FARMERS' PARTICIPATION IN OUTGROWER SCHEMES ON CREDIT ACCESS AND UTILIZATION IN THE UPPER EAST REGION

JOSHUA DIEDONG

2019

UNIVERSITY FOR DEVELOPMENT STUDIES

ASSESSING THE EFFECT OF MAIZE FARMERS' PARTICIPATION IN OUTGROWER SCHEMES ON CREDIT ACCESS AND UTILIZATION IN THE UPPER EAST REGION

BY:

JOSHUA DIEDONG

(B.Sc Agricultural Technology)
(UDS/MEC/0050/15)

THESIS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS, FACULTY OF AGRIBUSINESS AND COMMUNICATION SCIENCES, UNIVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PHILOSOPHY (MPHIL) DEGREE IN AGRICULTURAL ECONOMICS

APRIL, 2019

DECLARATION

I, Joshua Diedong hereby declare that except for references cited, which have been duly acknowledged, this thesis is the result of my own original work, and that no part of it has been submitted for any degree in this University or elsewhere.

Joshua Diedong ---------- ----------

(Student) Signature Date

Certify by:

Dr. Joseph Agebase Awuni/HOD ---------- ----------

(Supervisor) Signature Date

ABSTRACT

Despite the importance of credit to agricultural growth, economic development and poverty reduction, it is reported that access to credit is very low among farmers in Ghana. To overcome this challenge, the government of Ghana and NGOs has made attempt to empower outgrower schemes. Based on this argument, the current study attempts to examine smallholder farmers' participation in outgrower schemes and quantify its effect on credit access and utilization. Multi-stage sampling technique was used to select 226 maize farmers in the Upper East Region of Ghana. Employing the probit model, the determinants of maize farmers' participation in outgrower schemes were sex of farmer, farming experience, off-farm work, distance from house-to-output market, ease in accessing credit, land holding, farm size, FBO membership, support from NGOs and access to training on Good Agronomic Practices (GAPs) significantly influenced farmers' participation in outgrower schemes. The estimation based on the Heckman treatment effect two-stage model revealed that farmers who participated in outgrower schemes had significant higher amount of credit (GH₵379.2) compared with non-participants. The propensity score matching (PSM) results indicated no significant difference between average credit utilization of outgrower scheme participants and non-participants. Also, farmers identified low sales price of produce as their most important constraint in outgrower schemes. The study recommends that drivers of outgrower schemes should liaise with NGOs to acquire support for its members because it influences farmers' participation in outgrower schemes.

ACKNOWLEDGEMENTS

I am very grateful to the almighty God for granting me courage, energy and, most importantly, the peace of mind to finish my course work and thesis.

I sincerely convey my heartfelt thanks and appreciation to my main Supervisor, Dr. Joseph Agebase Awuni, (HOD, of the Department of Agricultural and Resource Economics) for the professional coaching and the patience he exhibited before and during the writing of this thesis. May the good Lord bless you and reward you bountifully.

My extended thanks go to Prof. Samuel Arkoh Donkoh (Dean of Students- FACS), Mr. Isaac Gershon Kodwo Ansah, Dr. Joseph Amikuzuni and all the lecturers of the Department of Agricultural and Resource Economics, University for Development Studies, Nyankpala campus for the knowledge and support they have imparted and assisted me with.

To my family, most specially, my beloved, sweet and caring wife Hilda Akabere who supported me emotionally, spiritually and financially, I appreciate your efforts. Your passion for my success at every moment in my life is immeasurable; I love you and this love is renewed daily. To my children Naah Delight and Maalo Dominion Diedong, I thank you for giving me joy when I am with you. I also thank my siblings Raphael, Frank, Noah, Hannah, Jesse and Philemon for your prayer support.

Finally, I thank my spiritual father Rev. Albert Adekaldu, Snr. Pastor, Emmanuel Temple Assemblies of God – Sandema and Regional Secretary, Upper East Region for his intense prayer support.

DEDICATION

This work is dedicated to my beloved daughter Naah Delight Diedong.

TABLE OF CONTENT

Title **Page No.**

LIST OF TABLES

Title **Page No.**

LIST OF FIGURES

Title **Page No.**

LIST OF ACRONYMS

Abbreviation	Meaning
ADB	Agriculture Development Bank
ADVANCE	Agriculture Development and Value Chain Enhancement
AU	African Union
BLUE	Best Linear Unbiased Estimates
FACS	Faculty of Agribusiness and Communication Sciences
FAO	Food and Agriculture Organization
FTF	Feed The Future
GAPs	Good Agronomic Practices
GCAP	Ghana Commercial Agricultural Project
GDP	Gross Domestic Product
GREL	Ghana Rubber Estate limited
GSS	Ghana Statistical Service
HOD	Head of Department
IFC	International Finance Cooperation
MOFA	Ministry of Food and Agriculture
NDPC	National Development Planning Commission
NF	Nucleus Farmer
NGO	Non-Governmental Organization
OG	Outgrower
OLS	Ordinary Least Squares

PNDC	Provisional National Development Council
ROPP	Rubber Outgrowers Plantation Project
RUT	Roldanillo-La Union-Toro
SADA	Savanna Accelerated Development Authority
SSA	Sub-Sahara Africa
UNCTAD	United Nations Conference on Trade and Development

CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

In many developing countries including Ghana, agriculture has contributed massively to sustaining the livelihoods of many poor people through direct and indirect employment that provide main or supplementary income, and also as a means of securing household food security (Breisinger *et al*., 2008; World Bank, 2007). The sector remains a significant contributor to economic growth through the provision of raw materials for agro-based industries and foreign exchange earnings (Breisinger *et al*., 2008; Tiffin and Irz, 2006). The agricultural sector remains the largest private sector employer in Ghana, engaging about 51.5% of the total labour force and 90% of rural labour force (GSS Ghana Living Standard Survey Round 6 report, 2014). In 2016, agriculture contributed about 18.3% to Ghana's Gross Domestic Product (GDP) (GSS, 2017). Agriculture remains a prominent path for lifting many families' from poverty to prosperity (Byerlee *et al*., 2009).

In Ghana, smallholder farmers' production alone account for about 80-90% of the national food basket (MoFA, 2010). However, majority of these farmers continue to linger in poverty and food insecurity thereby calling on other interventions such as the outgrower schemes.

Outgrower schemes operate in diversity of crops (Stringfellow, 1996), depending on the desired market to optimize production and supply chain. In Ghana, the concept has been

applied in the oil palm production, pineapple and cereal crops. The inclusion of cereal crops in the mainstream outgrower schemes in Ghana is being promoted by USAID-ADVANCE II Programme which focuses on maize, rice and soybean as food security crops (USAID, 2014).

The present study focused on maize since it is grown in all agro-ecological zones of Ghana. It accounts for over 50% of the total cereal production in the country (Amanor-Boadu *et al.*, 2015). It is one of the main crops for food security and income generation especially in the three Northern regions of Ghana (USAID-ADVANCE, 2014). According to the GSS Ghana Living Standard Survey (2014), about 2.1 million households are involved in the cultivation of maize in Ghana.

Major constraints however persist in the country's crop production. For example, in Ghana, actual yield levels of major staples like maize and rice are still far below potential yields (MoFA, 2016). According to MoFA (2010), maize yields are far below achievable yields, and this is as a result of low access and utilization of farm inputs and technologies.

One key factor influencing the low agricultural productivity in Ghana is low adoption of improved technologies, which is partly due to lack of access to credit to purchase inputs (Anang *et al*., 2015).

Over several decades, conclusions drawn from several publications (Dittoh, 2006; Akudugu, 2012; Abdul-Rahman and Donkoh, 2015; Anang *et al*., 2015) show that

Ghanaian farmers lack access to credit for agricultural production, further resulting in low farm incomes and food insecurity.

Idiong (2007) argued that access to credit is a potentially viable option for enhancing agricultural production and productivity through the adoption of improved technologies (Njogu *et al*., 2017). Kosgey (2013) defined credit as any monies or inputs or services offered to farmers by financial lenders upon agreement to be repaid to the lender either in cash or in kind at an appointed future time or period with or without interest.

Different credit programmes or models, which use a wide range of evaluation techniques such as value chain, Farmer-Based Organizations (FBOs), Village Savings and Loans Associations (VSLAs) among others, have been instituted by successive governments and development partners to increase the flow of funds into the agricultural sector. One of such programmes or models is the concept of outgrower schemes, which is sometimes referred to as contract farming. Currently, the outgrower scheme is highly propagated by many development partners, NGOs and private investors as a model for promoting the efficacy of the provision of credit to smallholder farmers (Kaminski *et al*., 2009; IFAD, 2012).

The motivation behind outgrower farming is to link smallholder farmers to credit and markets as a means of sustaining adequate incomes for them, thereby contributing to poverty alleviation (Binswanger-Mkhize and McCalla, 2010). Outgrower schemes basically provide production and marketing services to farmers on their own land (Glover and Kusterer, 1990). The concept of outgrower schemes has been defined by Amanor and

Pabi (2007) as contractual arrangements that exist between investors and the farmers, whether oral or written, specifying one or more conditions of production and/or marketing of an agricultural product aiming at a win-win situation.

Outgrower farming is primarily a way of dealing with risk between a producer and an investor; thus, the farmer takes the risk of production while the investor takes the risk of marketing (Baumann, 2000). Outgrower schemes also help to strengthen vertical coordination between producers and processing or marketing agents/firms (Bijman, 2008).

In Ghana and elsewhere in Sub-Saharan Africa, nucleus farmer-outgrower farming model is seen by development agencies, governments and NGOs as a promising strategy to integrate farmers into the mainstream agricultural value chains (Eaton and Shepherd, 2001). The Agricultural Development and Value Chain Enhancement programme (ADVANCE II) and Ghana Commercial Agriculture Project (GCAP) has been the dominant promoters of the outgrower scheme concept in northern Ghana. For instance, the ADVANCE II main goal is to sustainably reduce poverty and hunger through building business relationships between actors in the agricultural value chain. ADVANCE II adopted a long-term sustainable and comprehensive value chain approach by working through commercial actors as conduits for reaching out to large number of smallholder farmers, and ensuring that improved practices remain in the market system (USAID-ADVANCE, 2014). It built on a simple business model where nucleus farmers (NFs) identify smallholder farmers and facilitate their production and marketing needs.

The program's current approach focused on facilitation and strengthening the private investor's (Nucleus Farmer) capacity to deliver the services along the value chains that are needed to sustain inclusive growth and improved competitiveness through a nucleus farmer – outgrower farmers concept.

On the other hand, Ghana Commercial Agriculture Project (GCAP) operates on the concept of facilitating land acquisition for commercial farmers (Nucleus Farmers) who then engage outgrowers on the secured land to cultivate the desired crop for specific markets (MoFA, 2016). Under the GCAP, farmers are also allowed to farm on their own lands but with credit and marketing support from the nucleus farmer under situations where land is available to the smallholder farmer. The project holds the view that nucleus farmers already have their own outgrowers who they trust and have worked with over the years. The focus is then placed on the nucleus farmer by developing his capacity and resourcing him with warehousing and financing to continue and the outgrower business more sustainably.

Other studies (Ragasa *et al*., 2017; Opoku-Mensah, 2012; Jones and Gibbon, 2011) proposed that smallholder farmers' participation in outgrower schemes and credit accessibility and utilization can be a good gauge for policy analysis to examine the efficacy of credit delivery in agriculture. Participation in nucleus farmer-outgrower schemes tend to relax credit fungibility (Hussain *et al*., 2016) and improve credit repayment so as to establish a win-win result for both contractual parties thus between the creditors (nucleus farmers) and borrowers (outgrower farmers).

Access to credit will therefore ease the financial constraints to accessing farm inputs and enhance the adoption of technologies for higher productivity, thereby ensuring food and income security. Also, outgrower schemes are expected to facilitate farmers' access to credit and ensure efficient utilization of credit (Varajidas, 2005) to improve their personal guarantee status of getting institutional credit.

1.1 Problem Statement

Credit is critical in agricultural production because it eases liquidity constraints and enhances the farmers' financial capability to purchase farm inputs and other production services (Ettah, 2015; Baffoe *et al*., 2014). In Ghana and elsewhere in sub-Saharan Africa, access to credit especially from the formal sources is generally low among farmers (Akudugu, 2012).

This revelation is due to the following reasons; lack of access to legally tangible collateral, lack of formal employment as a source of security, low savings culture, poor credit worthiness and stringent loan application procedures by banks (Baffoe *et al*., 2014; Akudugu, 2012; Casuga *et al*., 2008; Rahji and Fakayode, 2009; Okojie, 2010; Adejobi and Atobatele, 2008). Most often, financial institutions, especially banks face the challenge of releasing loans to smallholder farmers due to high transaction cost, usually incurred in disbursing the funds to the highly scattered or dispersed smallholder farmers (Olubiyo, 2009). Most critically, banks, especially those who have fewer credit staff incur extra cost in monitoring and recovering their loans, and regard it unprofitable to deal with smallholder farmers individually (Olomola and Gyimah-Brempong, 2014). Due to this,

farmers often tend to borrow credit from informal sources to finance their farming business (Casuga *et al*., 2008). Nevertheless, these informal credit financiers charge extortionate interest rates on smaller loan sizes (Casuga *et al*., 2008).

Over the past years, development practitioners and research scholars are increasingly applying the nucleus farmer-outgrower model to enhance farmers' access to credit (Prowse, 2012). Outgrower schemes enhance access to credit in strategic ways. In the outgrower schemes, nucleus farmers who act as intermediaries or guarantors, usually stand in for smallholder farmers to guarantee their access to credit (Nagarajan and Meyer, 1995). Also, these schemes usually assist farmers with the needed support to increase production by offering contractual agreements for marketing their produce. These contracts serve as source of reliable collateral, which farmers can use as security to access credit or repay their loans. Moreover, the cost for providing credit to the numerous smallholder farmers directly in scattered areas is a disincentive for firms, so they often prefer to engage with medium or large-scale farmers so that these commercial farmers can disburse, monitor and recover the credit from the outgrowers (De Schutter, 2011; Yaron and Mundial, 1992). This is one major challenge that the outgrower schemes seem to resolve; thus, reducing the high transaction costs of credit administration due to dispersed nature of smallholder farmers and improving credit repayment behaviour (Owusu-Antwi and Antwi, 2010).

On the other hand, outgrower schemes tend to insist on proper credit utilization among farmers by providing technical services and market opportunities for them. Despite these

enormous benefits, farmers' participation in these schemes seems to be low and whether or not outgrower schemes influence credit access and utilization remains less explored in the Upper East Region. While several studies have been conducted on either farmers' participation in outgrower schemes or access to credit in other countries and locations in Ghana (Akudugu, 2012; Ragasa *et al*., 2017; Loggoh, 2013), specific empirical studies on the effect of farmers' participation in outgrower schemes on access to credit and utilization do not exist to the best of the researcher's knowledge.

In general, studies on Ghanaian farmers' access to credit mainly consider socio-economic, farm-specific and credit specific factors as key determinants (Opoku-Mensah, 2012; Loggoh, 2013), while the empirical correlation between farmers' participation in outgrower schemes and credit access and utilization are often ignored. Motivated by this study, the current study examines farmers' participation in outgrower schemes and quantifies its effect on their credit access and utilization.

1.2 Research Questions

The main research question of the study was: what is the effect of outgrower schemes on credit access and utilization in the Upper East Region?

The study, therefore seeks to find answers to the following specific questions;

1. what factors influence farmers' participation in outgrower schemes in the Upper East Region?

2. what is the effect of outgrower schemes on credit access and amount received by farmers in the Upper East Region?
3. what is the effect of outgrower schemes on credit utilization by farmers in the Upper East Region?
4. what are the challenges of farmers in outgrower scheme participation in the Upper East Region?

1.3 Research Objectives

The primary objective of this study was to identify the factors which influence smallholder farmers' participation in outgrower schemes and quantify the effect on their credit access and utilization in the Upper East Region.

The specific research objectives were to:

1. determine the factors influencing farmers' participation in outgrower schemes in the Upper East Region.
2. estimate the effect of outgrower schemes participation on credit access and amount of credit obtained by maize farmers in the Upper East Region.
3. estimate the effect of outgrower schemes participation on credit utilization by farmers in the Upper East Region.
4. examine the challenges of farmers in outgrower scheme participation in the Upper East Region.

1.4 Justification of the Study

Agriculture is a dominant activity for many poor families (MoFA, 2016). This means that access to credit to support their production activities is imperative. Therefore, a study on outgrower scheme participation will provide an insight of how farmers have embraced the intervention and the efforts required in ensuring an all-inclusive participation to achieve significant growth in agricultural productivity and income. The findings of the study will be beneficial to promoters (such as USAID ADVANCE and NGOs) of outgrower schemes to establish programmes to attract more farmers into the scheme. Improving rural smallholder farmers' access to credit facilities tends to tackle the root cause of food insecurity and poverty because such interventions directly engage farmers in proactive businesses. Brempong-Asuming (2003) found that the improvement of the livelihoods of farmers depends on the growth and development of the agricultural sector. The findings of the study on the effect of outgrower scheme participation on credit access and utilization will draw the attention of financial institutions on how to appraise and finance farmers who are requesting for credit. In short, the findings of the study on outgrower scheme participation and its effect on credit access and utilization can encourage financial institutions to expand more credit to the agricultural sector. To outgrowers and the nucleus farmers, the findings of the study on outgrower scheme participation will also provide useful information on the major determinants influencing maize farmers' decisions to help strengthen the relationships between the nucleus farmer and his/her outgrowers. Studies on whether participation in outgrower schemes increases credit access and utilization by maize farmers do not exist to the best of the researcher's

knowledge. This therefore serves as a gap requiring research. This study will also contribute knowledge to the stock of existing literature on outgrower schemes, credit access and utilization.

1.5 Organization of the Thesis

This study is grouped into five chapters: Chapter one of the study is the introduction into the research topic which involves the background of the study, the problem statement, research questions and objectives, research justification and organization of the study. Chapter two covers the literature review, which involves a comprehensive review of relevant studies related to the study. Chapter three incorporates the research methodology and analytical tools employed in the study. It contains the description of the study area, research design, sources and types of data, data collection methods and instrumentation as well as the data analysis tools employed to achieve each study objective. Chapter four comprises of the presentation of results and discussions. Chapter five provides a summary of key findings based on the conclusions and recommendations drawn in outgrower schemes.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviewed relevant literature on outgrower schemes and agricultural credit. The chapter discussed the overview of agricultural outgrower schemes and the types of outgrower models in Ghana. Furthermore, the conceptual framework for outgrower models was also handled. Relevant literature on the Socio-economic benefits and challenges of outgrower scheme operations in Ghana was also reviewed. Again, factors influencing farmers' participation in outgrower schemes and effect of outgrower schemes on credit access and utilization were also discussed. The chapter further reviewed literature on agricultural credit systems in Ghana and the determinants of credit access. The chapter concluded with literature on the determinants of credit utilization in Ghana.

2.1 Overview of Agricultural Outgrower Schemes for Smallholder Farmers.

Smallholder farmers are key actors in the agricultural value chain and typically form the majority (80%) of the producers of agricultural commodities in Ghana (Wood, 2013). Their production is mainly on marginal plots of fragmented farmlands with low productivity attributed to poor infrastructure, bad weather conditions, poor technology application and low credit access, which is the core among the constraints. Consequently, these smallholders are trapped within subsistence agriculture and serve only as mere producers with very little orientation towards the market.

Smallholder farmers tend to have high affinity towards agricultural supports sometimes irrespective of the source it is coming from with the expectation of improving upon their entire farming business. Government extension services are generally not reliable due to financial constraints facing government (SEND Ghana, 2014). The main objective of a farmer is to increase income with an acceptable level of risk by entering into contract agreements with an investor to have access to ready market (Baumann, 2000). Reduced production cost, access to market information, technology, technical advice, quality plant seeds, farm inputs and mechanization services motivate farmers to enter into contracts (Pasour, 1998; Delgado, 1999; Vellema, 2000). Capital and credit procurement is also essential to the farmers (Hudson, 2000).

Smallholder farmers over the years have participated in development programmes from international development partners, governments, NGOs, financial institutions and private firms with the aim of improving their productivity and income. Agricultural outgrower schemes have become another route through which farmers especially, the smallholder identified for addressing production and marketing constraints. It could be viewed as an embedded marketing mechanism employed also by agribusinesses in the value chain to mitigate production and marketing risk. Smallholder farmers are made up of heterogeneous groups, with diverse resource base, choice of crops and livestock, market linkages and agricultural income which affect their access to agricultural support programmes (IFC, 2014).

Outgrower schemes are defined differently depending on the context and country of operation. The key elements are the provision of production and marketing services to farmers. Outgrower schemes are engagements in which production and marketing services are offered to farmers on their own lands (Barrett *et al*., 2012; Miyata *et al*., 2009). Also, Amanor and Pabi (2007), defined outgrower schemes as contractual arrangements between investors and farmers, whether oral or written, specifying one or more conditions of production and/or marketing of an agricultural product aiming at a win-win situation.

Outgrower partnership operations vary considerably in context or model from country to country depending on the extent to which inputs, labour costs, produce, risks and benefits are shared between outgrowers and companies. According to ActionAid (2015), there is little or no distinction between the terms “contract farming” and “outgrower schemes” and are often used interchangeably. The term "outgrower scheme" is sometimes synonymously used with “contract farming” (Poulton et al.1998). Contract farming is however, the generic term for any arrangement or agreement between companies and farmers from which different types of outgrower models evolved. Contract farming has been defined as agricultural production carried out according to an agreement between investors and farmers, which establishes conditions for the production and marketing of a farm product or products (FAO, 2012).

Despite the similarities between the terms “outgrower scheme” and “contract farming”, there exist some slight difference between the terms in the context of operations of the

outgrower schemes in relation to the USAID-ADVANCE II and GCAP projects in Ghana. Under the nucleus farmer (NF) outgrower schemes, farmers are duly registered under these schemes (USAID-ADVANCE, 2014) usually for long term operations compared to general contract farming where an investor do not necessarily have to register the farmer he signs production and marketing contracts with.

This study defined agricultural outgrower scheme under this concept as a business model whereby smallholder farmers (outgrowers) are registered and supported with production and marketing services by a nucleus farmer (NF) or an agricultural outfit through contractual means for the purpose of mutual benefits for two or more years. Under this arrangement, farmers (outgrowers) provide labour and sometimes land whilst investor (nucleus farmer) is responsible for the provision or linkage of outgrowers to inputs, credit, extension support and marketing services partially or fully as espoused by Vaeth and Kirk (2011).

2.1.1 Types of Outgrower Models

Different outgrower models exist and operate differently depending on the contractual agreements. Broadly, outgrower schemes are operated from the concept of five thematic models: the Centralized model, the Nucleus estate model, the multipartite model, the Informal model and the Intermediary model (FAO, 2012).

i. The Centralized Model – under this scheme, a large processor or firm signs contracts with large number of farmers, with strict requirement for production

quantity and quality. Products suitable for this model are usually sugarcane, tea, coffee, cotton and poultry (Eaton and Shepherd, 2001).

ii. Nucleus-estate model – Here, the firm undertakes the production of a commodity but also contracts with independent producers (outgrowers) for greater volumes usually perennial crops. Thus, this is the contract-farming model that utilizes outgrowers from a central estate.

iii. The tripartite model – This is a joint venture between a public entity, a private firm and farmers. Eaton and Shepherd (2001), noted that this model can involve national and/or local government and could potentially be politicized.

iv. The informal model – This is where small firms or traders enter into annual contracts, often on verbal or written agreements with a limited number of farmers, frequently for crops that require minimal processing. These firms usually depend on state or NGOs support to offer inputs, credit, extension and marketing services (Eaton and Shepherd, 2001) to their clients which sometimes are not reliable.

v. The intermediary model – Under this model, the firm sub-contracts an intermediary, such as a farmer based organization (FBO) or a trader with the farmers for the supply of needed products.

2.1.2 Input-output flow in the nucleus farmer (N.F)-outgrowers (O.G) concept

A nucleus farmer is someone who provides inputs and marketing services to certain number of outgrowers, who have to repay their indebtedness in cash or kind at the end of harvest. The outgrowers scheme is a type of scheme where an investor (nucleus farmer) registers smallholder farmers (outgrowers) under the scheme and usually provides them with production and marketing services for mutual benefits as revealed in ADVANCE II Annual Report, 2014 (see figure 2.1). The agreements/contracts are renewed annually/seasonally based on the type of crop, season and price variations (Smalley, 2013). This concept by way of its operations could be classified under the nucleus estate model. The operations of the outgrower schemes are however seen as a rudimentary form of the nucleus estate model but with potential high benefits. This is because farmers are usually registered with identity cards as scheme members but production and marketing contracts could be reviewed year after year with different conditions compared to the nucleus estate where contracts are permanent even under bad conditions. The cost of investment committed by the nucleus farmer including profit margins are recovered after harvesting the crop either in kind or cash (Da Silva and Ranking, , 2013).

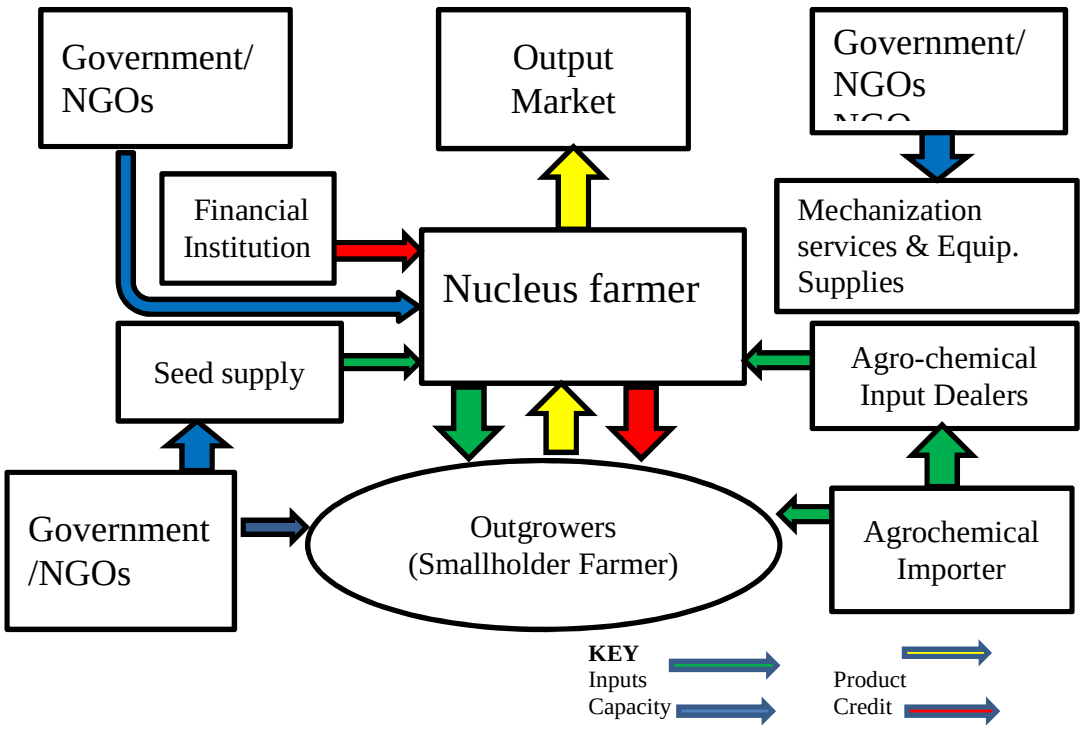

Figure 2. 1: Linkage between the nucleus farmer and outgrowers
SOURCE: Adapted from USAID-ADVANCE (2014).

2.1.3 Socio-Economic Benefits of Outgrower Schemes

In recent years, outgrower schemes also known as contract farming have received increasing attention in SSA, including Ghana (Houssou et al., 2016). Outgrower schemes are viewed as potentially important private sector suppliers of agricultural services to smallholder farmers in the area of inputs, extension, mechanization, marketing and financing (Stringfellow, 1996; Moyo, 2014). Different studies have found that farmers participate in outgrower schemes with the motive of benefiting from reduced cost of operation, access to market, improved technology, managerial skills, technical advice, quality plant seeds, farm inputs and mechanization services (Pasour, 1998; Delgado,

1999; Vellema, 2000). Contract farming through outgrower schemes have also been used in rural development strategies, as a tool for: i) linking small-scale farmers to supply chains; ii) overcoming factors that constrain smallholder commercialization, such as institutional deficiencies (access to inputs, technology and credit); and iii) provision of secure markets and fixed prices necessary for sustainable crop intensification (Vermeulen and Goad, 2006).

The benefits in participating in outgrower schemes are enormous as outlined below:

i. Access to production inputs and credit

Simmons (2002) argued that contract farming through outgrower schemes can potentially benefit farmers through improved access to inputs, credit, better use of technology and markets, thus improving their productivity and income. Outgrower farmers have potentially higher benefits compared to non-participants for input and output services. As argued extensively by Eaton and Shepherd (2001); Bijman (2008) and Prowse (2012), out grower schemes have played very significant roles in helping boost agriculture in diverse ways. Improved access to credit is very important in achieving agricultural input sufficiency. Many smallholder farmers in developing countries especially Ghana do not have the necessary collateral to obtain credit for investments and the necessary inputs required to meet the demands of modern food production (Nagarajan and Meyer, 1995).

ii. Access to agricultural extension services

Another key benefit has to do with extension services provided by outgrower schemes as part of the contract arrangement. They include the provision of various trainings on inputs such as seeds, fertilizer, agrochemicals and also training good agronomic practices to enhance crop productivity.

In some cases the schemes also help to introduce new technologies more appropriate to reach the high quality standards demanded by modern food markets. Hence, Smallholder farmers under schemes escape the high costs associated with the adoption of new technologies.

iii. Increased yield

Participating farmers in outgrower operations have over the years enhanced farmers' yield levels compared to non-scheme members (Ragasa *et al*., 2017). Outgrower schemes are also explored as an important means of promoting agricultural productivity and diversification.

iv. Access to market

Outgrower schemes have spread widely in developing countries, as a potentially viable resort for coordinating production and ensuring lower production and marketing costs and higher-quality products (UNCTAD, 2009). In addition, outgrower scheme may provide farmers with guaranteed market for their produce (Eaton and Shepherd 2001). In most cases the contractor will purchase a specified quantity, provided that it fulfills the

set quality requirement. Consequently, farmers save time and money searching for buyers. In some cases the contracting company even organizes the transport of their produce to the market. Having reliable markets enables small-scale farmers to increase production or diversify into new crops.

The emergence of private-led outgrower schemes, triggered by market liberalization, is helping to overcome the market failures that smallholder farmers experience (Oya, 2012). Private-led outgrower schemes provide reliable market outlets with guaranteed prices before harvest (Bellemare, 2012), reliable sources of financed inputs (Masakure and Henson, 2005) and sometimes technology transfer.

The nucleus farmers under the USAID-ADVANCE programme and GCAP are among food stuff suppliers to schools, prison service and processing firms; example is the Akandem Farms Limited, Builsa North in the Upper East Region. This window offers them the opportunity to sometimes accept repayment both in kind and cash thus creating a high market access for outgrowers.

It is widely acknowledged that contract farming has considerable potential in countries where smallholder agriculture is widespread, and where agricultural processing and export enterprises are promoted. Smallholder farmers have benefited from reduced transactional cost and improved market efficiency through the different institutional arrangements of contract farming (Wooded, 2003). Also, outgrower schemes have become an increasingly important route for obtaining adequate quantity and quality of raw materials for processors, exporters, distributors, and supermarkets. Furthermore,

there is considerable attention on outgrower schemes in agricultural value chains, especially in an era where quality concerns require greater coordination and where failures in output, input, and credit markets persist, especially in developing countries.

v. Improved income

Evidence has shown that participation in outgrower schemes has resulted in increased incomes of farmers (Shumba *et al*., 2011). Loggoh (2013), who conducted a study on "contribution of outgrower schemes to farmers' livelihood-a case of oil palm farmers in the Kwaebibirem District of Ghana" found that contract farmers have higher income through improved yields because through the contract they benefited from technical assistance and specialized inputs provided by the contracting company compared to non-contract farmers. These benefits however depend on the socio-economic conditions such as gender, educational level, marital status and household size of participating farmer (Warning & Nigel, 2002).

Outgrower schemes have been acknowledged by participating farmers as beneficial dependent upon the terms of the contract, farmers' own demographic characteristics, institutional factors and the level of sales (Loggoh, 2013).

2.1.4 Outgrower Operations in Ghana and Challenges

Outgrower operations in Ghana have been observed in the oil palm industry as one of the pioneer industries which employed the concept. Under this industry, firms exhibit considerable control over the smallholder production and are responsible for input or

extension package and in turn, the farmers provide labour and land as highlighted by Vaeth and Kirk (2011). In Ghana, the government and its development partners use outgrower schemes as a strategy for developing and supporting agricultural value chains major among these are the Savannah Accelerated Development Authority (SADA), Ghana Commercial Agricultural project (GCAP) and the Agricultural Development and Value Chain Enhancement (USAID-ADVANCE II) which are promoter of the concept.

Private sector–led schemes also exist which include the Masara maize outgrower scheme, led by Yara Ghana, Wienco Ghana, and the Masara N'Arziki Farmers Association which have been shown by research, made positive contributions to yields, incomes, and access to inputs (Ragasa *et al*., 2017). The Akate Farms also operate an outgrower scheme with maize being the major commodity in trade. Larger schemes and those that provide more inputs typically engage in written contracts, whereas smaller schemes with smaller input packages often rely on verbal agreements.

Inputs provided on credit to smallholder farmers are based on what farmers need and request in the context of smaller schemes which range in size from 25 to 700 participating farmers. In the rubber industry, more specifically Ghana Rubber Estates Limited (GREL), the Rubber Outgrowers' Plantation Project (ROPP) was started in 1995 to increase GREL's supply of raw material, with support from the Government of Ghana and development partners. The scheme currently includes 5 540 outgrowers with a total plantation area of 21 500 ha (http://www.fao.org/3/a-at673e.pdf).

Theories of contract engagements focus on the incentives to honour contracts (Prowse, 2012), between the investor and outgrowers. The evolution of outgrower schemes in Ghana in the cereal crop production is becoming an increasingly important venture endorsed by the government of Ghana through support programmes like ADVANCE II and GCAP which operate in the Maize, Rice and Soybean value chains through the nucleus farmer – outgrower concept.

Several informal outgrower schemes operating in maize as a commercial crop, are driven by aggregators or traders, in recent years in Ghana. Recent development projects (such as ADVANCE II and GCAP) aimed to build on and provide assistance to these informal, private sector–led schemes. Majority of these schemes including popular ones like the Masara outgrower scheme and Akate Farms, embraced maize as a raw material for the food processing companies and the poultry industry.

a. Masara N'Arziki Farmers

The association known generally as "Masara" was created in 2009 by two major private agribusiness firms, Wienco and Yara (Amanor, 2011). Basically, it was registered as a non-profit organization but with intention of transforming into a for-profit association (Prorustica, 2013) with the overall objective to use maize growing as a source of prosperity (Guyver and MacCarthy, 2011). However, it was essentially set up as an outgrower scheme, and association membership is only possible through participation in the outgrower scheme.

Participant farmers engage in a written contract with Masara. They receive a fixed package of quality inputs and extension services but must pay back a specified number of bags of maize at harvest which is calculated based on the value of the inputs they have received. Masara provides an opportunity for the founding agribusiness firms to disseminate agricultural inputs

The Masara scheme started with 1,250 farmers in 2009 and had grown to about 10,000 by 2015 (Ragasa *et al*., 2017) with its operations in the three northern regions of Ghana and northern part of Brong-Ahafo

b. Akate Farms

The Akate farms on the other hand was set up in 2011 with 156 farmers and rapidly expanded to 695 farmers in 2015 and now have over 5,000 farmers. Its primary objective is to assure a consistent supply of quality maize to produce feed for its poultry farm. The Akate outgrower scheme operates very similarly to the Masara scheme, potential participants sign a written contract and receive a fixed input package consisting of fertilizer, Pannar 12 or Pannar 53 hybrid maize seeds, and herbicides. But there is some flexibility if participants do not want this comprehensive package, and the required repayment is adjusted accordingly.

Akate Farms also provide tractor services, trainings and extension services to farmers in collaboration with Ministry of Food and Agriculture. The amount of harvested maize requested to pay for the inputs is also similar to the Masara. The Akate scheme is

different from the Masara scheme in terms of fertilizer type, some flexibility in the seed variety and input package, the offer of tractor services, and the absence of a requirement to sell all produce to the firm.

c. Other outgrower farming Schemes

Other outgrower schemes range in sizes from 25 to 700 participating farmers. Larger schemes and those that provide more inputs typically engage in written contracts, whereas smaller schemes with smaller input packages often rely on verbal agreements. The required repayment is much lower and closer to market prices than that of Masara and Akate. Farmers are generally not required to sell all of their harvest to the aggregator.

Some of the outgrower schemes in the focus districts have recently received support from donor projects (mainly USAID's ADVANCE project) or the government (as part of the SADA program) in the form of capacity-building activities, training on agricultural and farm business practices, and provision or co-financing of some supplies and equipment.

i. The USAID – ADVANCE II model of nucleus farmer outgrower schemes

Agricultural Development and Value Chain Enhancement (ADVANCE) is a project under the global Feed the Future (FTF) program with a goal to sustainably reduce global poverty and hunger. The project works through a commercial and competitive approach where actors have commitments and incentives to invest in the transformation process. The dominant ADVANCE-facilitated smallholder finance model was outgrower credit through the Nucleus Farmer outgrower model, under which tractor services and

production inputs are provided to outgrowers on credit. Payments for the inputs and tractor services are made in-kind/cash after harvest with no collateral involved except contract between the NF and the outgrowers (USAID-ADVANCE final report, 2014). This findings was confirmed by the farm manager at Awintuma Farms Ltd in Bawku West District who said recovery issues are not usually persued with strict legal propositions but trust does the magic when he was questioned on how he gets his recovery. USAID-ADVANCE II outgrower model is a modified form of a value chain where all trainings, input supply, direct financing and marketing for smallholder farmers are obtained through the nucleus farmer.

ii. The Ghana Commercial Agriculture Project (GCAP) approach on Nucleus Farmer outgrower concept.

Ghana Commercial Agriculture Project (GCAP) is a seven-year Ministry of Food and Agriculture (MoFA) project, funded by the World Bank which started in 2013 and expected to end in September, 2019. The project seeks to develop agriculture in Ghana through facilitation to increased access to secured farm land, private sector finance, agricultural input and output markets for small-holder farmers from investors in commercial farming in the SADA Zone and Accra Plains. GCAP promotes inclusive commercial farming along the rice, maize and soybean value-chains. Commercial farmers otherwise known as nucleus farmers are modelled and supported by the project with land acquisition, warehousing, grants and capacity building. The nucleus farmers anchored by

the huge project support in turn register smallholder farmers through the outgrower system and then support them with production inputs and marketing services.

The key challenges of outgrower scheme operations are outline here:

Abwino and Rieks (2007), observed that outgrower systems that are primarily motivated by political and social concerns rather than economic and technical realities inevitably fail. Despite the many benefits enjoyed by actors within the framework of outgrower schemes, nucleus farmers who invest in the smallholder farmer at times suffer from negative actions of farmers, the most being side-selling when there is higher price offer than the contract signed (Ragasa *et al*., 2017). Side-selling has been found to affect business relationships. Schemes usually entail a range of activities (services) that secure access to produce – as in-kind input supply or on credit, extension services and transport for produce. These services rendered could be futile if outgrowers or nucleus farmers are not committed to the terms of the contract. Besides, nucleus farmers are in close contact with outgrowers, and this help the nucleus farmers to monitor them, thereby reducing fungibility (Hussian *et al*., 2016).

2.2 Factors Influencing Farmers' Participation In Outgrower Schemes

One interest of economists is to identify and quantify the factors that influence certain decision variables such as participation in outgrower schemes. Over the years, considerable body of literature exists on factors influencing farmer participation in outgrower schemes. However, results emanating from these studies are mixed and

inconclusive. In essence, demographic and socio-economic factors tend to be featured most in farmers' participation in outgrower schemes studies (Loggoh, 2013). Opoku-Mensah (2012), who conducted a study on factors motivating smallholder farmers to engage in contract farming arrangements with fruit processing firms in Ghana, found that, need for credit, experience in crop production and household size were among the major socio-economic factors affecting farmers decision to participate in contract farming. On the other hand, Swinnen (2007), found that the most important factors that influenced farmers to enter into contracts are credit support, input support, guaranteed product sales, avoidance of price uncertainty, pre-payment offers and technical assistance.

In literature, outgrower schemes have been used inter-changeably with contract farming. Notwithstanding, several studies have examined the determinants of contract farming in Ghana and beyond. For instance, Abdulai and Al-hassan (2016) revealed that in Ghana access to ready market, credit and extension services positively affect participation in contract farming. Besides, Swain (2012) using the binary logit model found that large scale farmers having bigger family size with better irrigation facilities are more likely to be in contract farming.

A study by Sambuo (2013), to analyze the factors affecting farmers' participation in tobacco production in Tanzania showed that farming experience, farm group and age of the farmers have significant influence on farmers' participation in contract farming. Furthermore, Bellemare (2012) studied the determinants of farmers' participation in contract farming (CF) and found a positive relationship between farming experience and

the likelihood to participate in CF. In the northern region of Ghana, Etwire *et al*. (2013) also found that schooling years, access to agricultural credit and agricultural extension service significantly influence farmers' participation in agricultural interventions. In Zimbabwe, Musara *et al*. (2011) in examining the determinants of smallholder cotton contract farming participation found that income reduces farmers' participation in CF.

Another study by Azumah *et al*. (2016) in the Northern Region of Ghana using a treatment effect model showed that access to extension services and credit, farm size and off-farm income significantly influenced farmers' participation in CF. Furthermore, Bellemare (2012) found a positive link between age, farm size and farmers' participation in CF. On the contrary, Musara *et al*. (2011) revealed a negative influence of age on farmers' participation in CF. The reason is that older farmers tend to appreciate the importance of agricultural interventions and will devote much effort to explore its activities.

2.3 Effect of Outgrowers Schemes on Credit Access and Utilization

Access to agricultural inputs and credit is a major challenge for smallholders in developing countries. Within the context of contract farming, financial and input requirement as well as labour is often higher for non-traditional crops compared to inputs requirements for traditional crops at the household level. For this reason access to inputs and for that matter inputs supply arrangements is an important element of a contract design that targets smallholders in particular (Key and Runsten, 1999). Indeed it is partly the lack of access to specialized inputs and credit that limits the capacity of smallholder

farmers to produce on large scale, and their small farm sizes make it difficult for them to compete with large scale producers for inputs and especially credits from the open market (Chavas, 2001).

In an imperfect input market situation or in a situation where there are not many suppliers of inputs, smallholders have limited access to specialized inputs. They may consider to participate in contract farming in order to have access to such inputs from the contracting firm, especially in the light of the fact that public provisions of agricultural inputs and services especially in developing countries have been noted to be inefficient and ineffective due to unreliable delivery (Dorward *et al*., 2004) and also due to political interference (Banful, 2010).

From the viewpoint of the farmers, the contracting firm is the claimant of the produce from the inputs and therefore will offer a high quality input compared to other sources. From the standpoint of the contracting firm, it stands the chance to control input quality and key farm management practices when it supplies inputs directly to farmers, risk associated with quality is reduced as inputs are usually obtained from reliable source (Wolf *et al*., 2001). Empirical evidence by Abebe *et al*. (2013) shows that Ethiopian potatoes contract farmers preferred seeds supplied by the contracting firm because it is believed to be of high quality and more reliable compared to other sources.

2.4 A Review of Agricultural Credit in Ghana

According to Bawumia (2010), the importance of credit to the development of Ghana's agricultural sector has been recognized even before independence when the British Bank of Gold Coast was established in 1953 to serve the needs of farmers. Subsequently, the Agricultural Development Bank and the Rural Banks as part of their mandate, were established in 1961 and 1976 respectively to provide credit to the agricultural sector (Steel and Andah, 2003; Bawumia, 2010).

More recently, the Ghana Shared Growth and Development Agenda has also emphasized the expansion in credit provision to farmers which was to be achieved through the Central Bank in the area of capacity building and provision of incentives to various financial institutions (NDPC, 2010). Despite the continuous emphasis by governments to increase credit allocation to the agricultural sector, studies have shown there is reluctance on the part of banks to lend to the agricultural sector (Owusu-Antwi and Antwi, 2010).

According to Osei-Assibey (2009), rural banks set up to mobilize and advance finance to rural areas where farming is their major occupation, have virtually stopped expanding their branch network to these areas. Many banks regard lending to the agriculture sector, a high-risk venture in view of unreliable weather conditions, perishable nature of agriculture produce, low prices for agriculture produce and the relative high risk of default among farmers (Aryeetey and Hyuha, 1991).This is evident in the decline in credit allocated by Deposit Money Banks (DMBs) to the agricultural sector between the periods of 2005 and 2008. Only the periods 2009 and 2010 experienced an increase. In

2011 there was another fall in credit allocation to the agricultural sector from 6.13% in 2010 to 5.74% in 2011 (ISSER, 2011).

2.4.1 Determinants of Access to Credit

Access to credit as conceptualized in this study refers to the likelihood of a farmer to apply and obtain credit (or loan) from financial institutions. This decision is often affected by demographic and socio-economic characteristics, farm-specific characteristics and institutional characteristics. As a result, many studies have examined or measured the various factors influencing farmers' access to agricultural credit. For instance, Chauke *et al*. (2013) conducted a study to ascertain factors that affect smallholder farmers' access to credit sources in the Capricorn District Municipality of Limpopo Province, South Africa using the logistic regression model. They found that need for credit, attitude towards risk, distance between lender and borrower, perception on loan repayment, perception on lending procedures and total value of assets were the significant factors influencing access to credit.

In South Africa too, Biyase and Fisher (2017) examined the factors affecting access to formal credit by poor households using Heckman Selection model. According to their study, age of the household head, race, educational level, gender, employment, and geographic location of households were the significant factors influencing the likelihood to borrow by poor households? Odu *et al*., (2014) investigated the relationship between rice farmers' characteristics and access to formal and informal sources of credit using the multinomial logit model in Niger State. Their results also showed that experience in rice

farming, expenses on fertilizer input and rice income significantly influenced farmers' access to formal credit whereas gender, duration of village residency, experience in rice farming and expenses on fertilizer input significantly influenced access to informal credit.

Using the logit model, Iliyasu *et al*. (2014) found that age, marital status, membership of cooperative society, household size and years of farming experience significantly affect access to credit in the Kogi East Senatorial District. Furthermore, Elias *et al*. (2015) examined the factors influencing access to agricultural credit from banks by the small and marginal farmers in Dharwad district, Karnataka, India using the logit model. Their study revealed that landholdings, educational status, irrigation facilities, income level and gender were the significant determinants of access to agricultural credit. Specifically, Koskey (2013) found that men were more likely to access credit than women while Sekyi (2017) and Chandio *et al*. (2017) revealed otherwise in Pakistan. These findings are often attributed to differences in social capital, roles and responsibilities, control over production resources and credibility of the borrower to repayment.

In terms of age, Koskey (2013) revealed a positive link between age and access to credit while Denkyirah *et al*. (2016) established that age reduces farmers' access to credit. These differences have been discussed in relation to experience and the strength to work to increase productivity. Most often leaders fear to grant the aged access to credit because of the fear that the aged may not live long enough to pay back the money. Education also has been found to increase access to credit (Saqib *et al*., 2017; Chandio *et al*., 2017; Hananu *et al*., 2015; Koskey, 2013) or reduce access to credit in (Etonihu *et al*., 2013;

Akudugu, 2012). Literature also shows that household size influences access to credit positively (Saqib *et al*., 2017; Chandio *et al*., 2017) and negatively (Iyanda *et al*., 2014). Also, Saqib *et al*. (2017) revealed that farming experience positively influenced farmers' access to credit due to the fact that highly-experienced farmers have greater networks and access to information about financial facilities. Land size has been found to influence access to credit positively because it serves as a source of collateral (Saqib *et al*., 2017).

2.4.2 Determinants of Credit Utilization

Credit utilization has been measured as the proportion or amount of credit used for the intended purpose over the total amount of credit accessed. Nwaru and Onuoha (2010) argued that when credit is utilized effectively and efficiently it encourages diversification and increases resource productivity and incomes. For this reason, analyzing the factors influencing credit utilization by farmers has been of particular importance to economists. In the United States of America, Katchova (2005) studied the influence of demographic and socio-economic as well as farm-specific characteristics on farm credit utilization. The author found that the degree of indebtedness, and debt consolidation, gross farm income, risk management strategies, and operators' age and risk aversion were significantly related to the probability of farm credit utilization.

Isito *et al*. (2014) also carried out a study to examine the factors influencing credit utilization among arable farmers in Kwara state, Nigeria. They revealed that household size, use of hired labour, awareness of credit source, past loan size, possession of collateral and proximity to the credit lending institution had a significant effect on credit

utilization. In terms of the influence of farmer group membership on credit utilization, their study also revealed that participation in farmer cooperative significantly and positively influences credit utilization by farmers. This is probably because when farmers are in groups, they tend to receive technical advice that enables them to enhance the use of credit and its associated gains in productivity and incomes (Matthew and Uchechukwu, 2014). In the northern region of Ghana, Danso-Abbeam *et al*. (2016) examined the factors influencing the amount of received credit allocated to farming operations in the Bole district using the tobit regression model. The study revealed that the credit utilization by farmers was significantly influenced by sex of farmer, level of education, the size of loan received, loan delay (number of days between loan application and receipt) as well as farmers receiving extension services.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter gives the background, geography and population of the study area. It also presents the materials and methods used to collect and analyze the data.

3.1 Study Area

3.1.1 Background and Location

The study was carried out in the Upper East Region of Ghana, which is bordered by Burkina Faso to the North, Togo to the East, Sissala East district in the Upper West Region to the West and West Mamprusi District in Northern Region to the South. The region is located in the northeastern corner of the country between longitude 00^{o} and 10^{o}W and latitudes 30^{o}N and 110^{o}N. Bolgatanga is the capital city of the region. Other major towns include Bawku and Navrongo (www.Ghanadistricts.com). Until 1961, the region was part of the Upper Regions (which included the Upper East and Upper West Regions respectively). From 1902, the old Northern Territory was a British protectorate until 1960 when it was separated into the Northern and Upper Region. The Upper Region was later apportioned into Upper East and Upper West in 1983 during the PNDC rule.

3.1.2 Geography and Size

The UER occupies a land area of 8,842 square kilometers, which translates into 2.7% of the total land area of the country. The area has a relatively flat landmark with few hills to the East and Southeast (GSS, 2012).

3.1.3 Population and Size

The population of the region according to 2010 Population and Housing Census (PHC) was 1,046,545 with 506,405 males and 540,140 females. Currently, the population of the region is estimated at 1,188,850 with 583,573 being males and 605,277 females based on the 2016 projections (GSS, 2012). The region has a population growth rate of 1.2% compared to national growth rate of 2.5%.

3.1.4 Agriculture

Agriculture remains the dominant economic activity employing about 80% of the population in the region. Agriculture is predominantly on a smallholder basis with about 90% of farm holdings being less than 2 hectares in size (MoFA, 2010). There is little mechanized farming, but bullock farming is practiced in some parts of the region. Agricultural production varies with the amount and distribution of rainfall in a particular year. The major crops cultivated in the region are millet, guinea-corn, maize, groundnut, beans, sorghum and dry season tomatoes and onions. Most food crop farms are intercropped while mono cropping is mostly associated with larger-scale commercial farms in the case of outgrower systems (MoFA, 2016). The UER was chosen because

maize is a relatively new crop in the region, and majority of the farmers still cultivate on smaller pieces of land (Amanor-Boadu *et al.*, 2015). In particular, the average land allocated to maize production by farmers in the UER is smaller than those of the other regions in the north (thus, Northern and upper West regions respectively). Meanwhile, the demand for maize in the region has been increasing of late (Ragasa *et al.*, 2018). Hence, an analysis of outgrower scheme participation could be used to increase farmers' access to credit in order to expand their maize crop productivity in the region.

3.2 Research Design

The study employed mainly quantitative research design (QRD) to collect and evaluate the data. QRD helps to provide a clear 'snapshot' of the characteristics associated with the sample at a specific point in time (Labaree, 2009). According to Creswell (2003), quantitative research design is used to determine relationships between an independent variable (s) and a dependent or outcome variable (s) within a population based on which inferences or conclusions are made.

3.3 Source of Data

The study collected mainly primary data from 226 farmers in the UER for the analysis of the research objectives. The data was specifically gathered on the status of outgrower schemes, credit accessibility and credit utilization by farmers. The specific socio-economic variables of the sampled farmers included gender, age, education level, household size, income and expenditure, number of years in farming, the number of years

in outgrower scheme participation, credit access and amount as well as credit utilization. Data on farmer perceived challenges were also gathered for analysis.

3.4 Sampling Technique and Sample size

The Multi-stage sampling approach was employed to select the respondents for the study. In the first-stage, clustered sampling approach was employed to select four (4) districts out of the thirteen (13) in the Upper East Region based on three (3) zones: Central, Eastern and Western. Two districts were selected from the Central zone whereas one district each was selected from the Eastern and Western zones. Two districts were selected from the Central zone because it has more districts with outgrower schemes as compared to the Eastern and Western zones. In the second-stage, the stratified sampling technique was used to select four (4) communities in each of the 4 districts by sub-groups: thus, 2 communities where outgrower schemes were in operation and 2 communities which did not have outgrower schemes operating. Selecting 4 communities from each of the 4 selected districts gave a total of 16 communities. In the third and final-stage, the simple random sampling approach was adopted to select 15 respondents from each community, summing up to 240 respondents (in reference to the sample size of 236 farmers, four (4) additional respondents were selected). However, 226 respondents were used for the analysis after deleting 10 responses with large missing data. This number was deleted in the estimation processes. The overall sample size was computed using Cochran (1977) formula, which rely on the actual population size. From the 2010 Population and Housing Census (PHC), the farmer population of the region was

estimated to be 392, 019 (N=392, 019). Using a margin of error of about 6.5% (α-confidence level=0.065), the following sample size (n) was obtained:

$$n = \frac{N}{1 + N(\alpha^2)} = \frac{392{,}019}{1 + 392{,}019(0.065^2)} = 236.4 \approx 236 \quad (3.0)$$

3.5 Data collection and Questionnaire Design

The survey was done at farm households using personal interviews and semi-structured questionnaires to collect the data. The questionnaire included questions about socio-demographic and economic characteristics (sex, age, educational level, household size), farm-specific variables (e.g., farm size, years of operation in farming, types of crops grown, quantity of crop harvested in the last season, farm income, labour employment), general participation in outgrower schemes, sources of information on outgrower schemes, farmers' motivation in outgrower participation, years of participation in outgrower schemes, credit access status of farmers and amount of credit accessed. The questionnaire was constructed in three (3) sections; section 1 provided questions about farmers' socio-demographic characteristics, section 2 provided questions on farmers' participation in outgrower schemes and section 3 captured questions about credit access and utilization by farmers.

3.6 Methods of Data Analysis

The binary probit model was used to analyze the factors that influence farmers' participation in outgrower schemes. The Heckman Treatment effect Two-Step model was employed in analyzing the effect of outgrower scheme participation on credit amount while the Propensity Score Matching (PSM) model was used to determine the effect of outgrower scheme participation on credit utilization. The Kendall' coefficient of concordance was used to rank and test for agreement between farmers' challenges of outgrower scheme participation. Also, descriptive statistics such as frequencies, percentages, means, standard deviations and cross-tabulations were employed to summarize key variables.

3.7 Theoretical framework

This section identifies and explains the theory behind farmers' participation in outgrower schemes and credit access and utilization. Generally, farmers' decisions toward production activities are guided by the theory of utility-maximization. This assertion is applicable to the main premise of this current study, which intends to analyze the factors responsible for farmers' participation in outgrower schemes and its effect on credit access and utilization. In particular, farmers will participate in outgrower schemes or access and utilize credit if their net utility is greater than those he/she enjoys from alternative sources (Loureiro and Umberger, 2007). The utility of a farmer making choice of either to participate in an outgrower scheme or access and utilize credit can be described as having two components; the deterministic (observed) component and the unobserved component

also known as the random component. The deterministic component is exogenous and may include outgrower characteristics and socio-economic characteristics of farmers and a set of linearly related parameters and the random component may result from missing data/variables (omitted variable), measurement errors and misspecification of the utility function such that:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (3.1)$$

where U_{ij}=farmers' utility of participation in outgrower scheme j, V_{ij} = deterministic component of utility and ε_{ij} = random component. Analysis of such rational behavior is widely studied under discrete choice models. Discrete choice (binary or multiple responses) models have been employed extensively in many areas of agricultural economics research. Binary probit or logit models are applicable to outcomes with only two alternatives such as adopt or not adopt; access to credit or no access, participate or not participate.

So a farmer will participate in outgrower scheme only if the expected utility for participating is greater than the expected utility for not participating. This can be represented as:

$$U_{ij}\left(V_{ij}, \varepsilon_{ij}\right) \geq U_{ik}\left(V_{ik}, \varepsilon_{ik}\right) \quad (3.2)$$

3.8 Conceptual Framework

Outgrower schemes operate on a complex network of actors geared at the production of a desired commodity for specified markets. The actors directly or indirectly benefit from the network or associations for continuity and sustainability of the linkage. Key among the team is government/policy-makers, financial institutions, service providers (inputs/mechanization/off-taker), the nucleus farmer and outgrowers. The government/policy-makers with a policy objective plays a coordinating role as well as provision of an enabling environment to network existing actors together. The direct focus of operations is centered on the nucleus farmer who receives and channels services to concerned actors in the network. Per the framework illustrated in fig. 3.1 below, outgrower scheme participation is a form of horizontal integration that tends to enhance farmers' access to credit through the support of a nucleus farmer. Through outgrower scheme participation, farmers receive capacity building through the nucleus farmers to improve credit utilization. Outgrower scheme participation also reduces fungibility because credit is usually disbursed and recovered in-kind by the nucleus farmer. Figure 3.1 shows the relationship between outgrower scheme participation and credit access and utilization. Outgrower scheme participation, credit access and utilization are also in turn influenced by broad socio-demographic and economic characteristics; farm-specific characteristics as well as institutional factors.

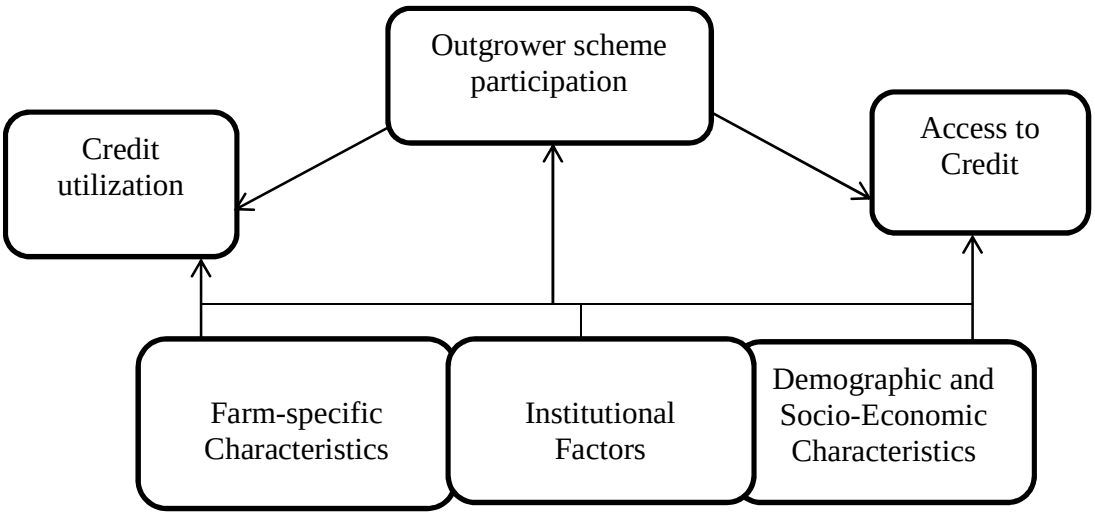

Figure 3. 1: Conceptual Framework for outgrower scheme participation, credit access and utilization

Source: Author's own construct based on literature review

3.9 Econometric Specifications

3.9.1 Probit regression model analysis of Factors Influencing Farmers' Participation in Outgrower schemes

To determine the factors that influence farmers' participation in outgrower scheme, the binary probit regression model was used. This implies that the dependent variable (participation in outgrower schemes) contains only two alternatives, which assume the value 1 if the farmer participates in outgrower schemes and 0 otherwise. The probit model has been employed on dependent variables which contain only two outcomes (Greene, 2003). The probit model was employed because it has the ability to constrain the estimated probabilities to lie between 0 and 1 with standard normal distribution function (Maddala, 1983), which does not exist for the linear probability model (LPM). In general, the probit regression model proposes that the value of the observed variable (Y) is dependent on whether a latent (unobserved) continuous variable lies below or above 0 such that:

$$y_i^* = \beta_0 + X_i' \beta + \varepsilon_i \qquad (3.3)$$

and

$$y_i = \begin{cases} 1 \text{ if farmer participat es} & y_i^* > 0 \\ 0 \text{ otherwise} & y_i^* \leq 0 \end{cases}$$

where y_i^* = latent (unobserved) continuous variable, y_i = observed binary dependent variable, X = explanatory variables, β_0 =constant; β = regression parameters to be estimated and ε_i=error term.

In the probit regression model, functional distribution of the error is very important to constrain the values of the latent variable into a desirable property of probability values of 0 and 1. The probit model assumes a cumulative distribution function of standard normal distribution, which is represented by $F(\bullet)$ such that.

$$\begin{aligned}\pi_i &= \text{Prob}(y_i = 1) = \text{Prob}\, y(X_i'\beta + \varepsilon_i > 0) \\ &= \text{Prob}(\varepsilon_i > -X_i'\beta) \\ &= \text{Prob}(\varepsilon_i < X_i'\beta) \\ &= F(X_i'\beta)\end{aligned} \tag{3.4}$$

The general formula for the probit model can be stated as:

$$\pi(y_i^* > 0) = (X_i'\beta)\int_{-\infty}^{X_i'\beta} \frac{1}{\sqrt{2\Pi}} \exp\left[\frac{-z^2}{2}\right] \partial z \tag{3.5}$$

where

π = probability of the farmer participating in outgrower scheme; Z = standard normal variable (Z ~N $(0, \delta^2)$; X = explanatory variables, β = regression parameters to be estimated. The method of estimation of the probit model was the maximum likelihood.

The Log-likelihood is given by

$$\log\ell = \sum_{i=1}^{10} Y_i \log(\pi_i) + \sum_{i=1}^{10} (1 - y_i)(1 - \pi_i) \tag{3.6}$$

In the probit model the magnitudes of the estimated parameters are expressed as marginal effects (probabilities) which explain the partial derivative of the probability that a farmer will participate in outgrower scheme when the explanatory variable changes by one unit. The marginal effect from the probit model is given below:

$$\frac{d\pi[y_i = 1]}{dX_i} = \beta_i (F(X_i'\beta)) \tag{3.7}$$

Therefore, the empirical probit model is specified in the following form:

$$y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} + \beta_9 X_{9i} + \beta_{10} X_{10i} +,...,+\beta_k X_{ni} + \varepsilon_i \tag{3.8}$$

Table 3. 1: Description of Variables Used in the Probit model

Variable		Measurement	Expected sign
X_1	Sex of farmer	Dummy, 1 if respondent is male; 0 otherwise	$\beta_1 < 0$
X_2	Age of farmer	Number of years of farmer at the time of data collection	$\beta_2 < 0$
X_3	Status of farmer in the household	Dummy, 1 if respondents is head of a household; 0 otherwise	$\beta_3 < 0$
X_4	Education of farmer	Number of years in school	$\beta_4 < 0$
X_5	Household size of farmer	Number of people in a household	$\beta_5 < 0$
X_6	Farming experience	Number of years in farming	$\beta_6 < 0$
X_7	Off-farm income work	Dummy, 1 if respondent does off-farm income work, 0 otherwise	$\beta_7 < 0$
X_8	Distance to local inputshop	Number of kilometres travelled to reach local inputshop	$\beta_8 > 0$
X_9	Distance to local output market	Number of kilometres travelled to reach output market	$\beta_9 > 0$
X_{10}	Ease in accessing credit	Dummy, 1 if respondent obtain credit easily; 0 otherwise	$\beta_{10} < 0$
X_{11}	Knowledge of credit packages	Dummy, 1 if respondents has knowledge of credit packages in outgrower scheme	$\beta_{11} > 0$
X_{12}	Total landholding	Total size of land owned by respondent in acreage	$\beta_{12} > 0$
X_{13}	Maize farm size	Size of maize farm owned by respondent in acreage	$\beta_{13} < 0$
X_{14}	Extension contact	Dummy, 1 if respondent has access to extension services; 0 otherwise	$\beta_{14} > 0$
X_{15}	Membership in FBO	Dummy, 1 if respondent is an FBO member; 0 otherwise	$\beta_{15} > 0$
X_{16}	Access to NGO support	Dummy, 1 if respondent receives external support; 0 otherwise	$\beta_{16} > 0$
X_{17}	Access to training on credit	Dummy, 1 if respondent receives training on credit; 0 otherwise	$\beta_{17} > 0$
X_{18}	Access to training on GAPs	Dummy, 1 if respondent receive training on GAPs; 0 otherwise	$\beta_{18} > 0$
X_{19}	Access to training on input application	Dummy, 1 if respondent receives training on input application; 0 otherwise	$\beta_{19} > 0$

3.9.2 Heckman Treatment effect Two-Step model analysis of the Effect of Outgrower Scheme on Credit Access and Amount Obtained

The main premise of using the Heckman treatment effect two-stage model instead of the traditional Heckman two-step model was to measure both the selection problem and the direct effect of outgrower scheme participation on amount of credit obtained. In the former, the participation variable directly enters the substantive equation to measure the direct effect on credit amount (Maddala, 1983). Under the treatment effect two-step estimation, the decision regarding the outcome in the second stage largely depends on that taken in the first stage.

Based on Heckman (1979) assumption, the dependent variable is not completely exogenous because of non-random selection or self-selection by the individual being investigated. Since some farmers choose to participate in outgrower schemes and others do not, some values on the outcome variable of interest may be missing. Instead, it estimates a probit model (which is the treatment) in the first stage to obtain the predicted values of outgrower scheme participation and lambda (inverse Mill's ratio (IMR)), which is later included in the substantive (outcome) equation in the second stage as an additional explanatory variable to correct for selectivity bias. This approach produces unbiased and consistent parameter estimates because the unobserved heterogeneity or characteristics in the data are cleared (Heckman, 1979). Besides, the pure effect of participation on amount of credit is however, measured.

The general outcome equation is supposed to take the following form if both the participation and selection problem was not taken care of:

$$A^c = \gamma' W_i + u_i \quad (3.9)$$

where A^c = amount of credit obtained by the i^{th} farmer, W = explanatory variables, γ= regression parameters to be estimated and u= error term.

To account for the problem of selectivity bias, an inverse Mill's ratio, which is predicted from equation 3.3, was included as an additional explanatory variable in the credit amount equation. Before this, the participation variable enters the outcome equation directly to estimate the effect of participation on credit amount. This is shown in the equation 3.10

$$A^c = \gamma' W_i + \delta P + u_i \quad (3.10)$$

where δ measures the effect of participation on credit amount and P is the participation variable.

To address the problem of selectivity bias, the model includes the lambda (IMR) into equation 3.10 such that:

$$A^c = \gamma' W_i + \delta P + \alpha\lambda + u_i \quad (3.11)$$

λ_i is the IMR and α coefficient of lambda. The error term of the selection equation (ε_i) and (u_i) follow a normal distribution - (0, 1) and (0, σ_u), respectively. The parameters obtained from the second stage are consistent and asymptotically normal. The inverse Mills ratio depicts the probability that an observation will belong to the selected sample and this is computed as:

$$\lambda_i = \frac{\varphi(X_i\alpha)}{\Phi(X_i\alpha)} \tag{3.12}$$

where φ and Φ are the probability density function (PDF) and the cumulative is the cumulative density function (CD) of the standard normal distribution, respectively. The empirical model for examining the effect of participation in outgrower schemes on the amount of credit obtained is specified as follows:

$$\begin{aligned} A^c = {} & \gamma_0 + \gamma_1 W_1 + \gamma_2 W_2 + \gamma_3 W_{31} + \gamma_4 W_4 + \gamma_5 W_5 + \gamma_6 W_6 + \gamma_7 W_7 + \\ & + \gamma_8 W_8 + \gamma_9 W_9 + \gamma_{10} W_{10} + \gamma_{11} W_{11} + \delta P + \alpha\lambda + u_i \end{aligned} \tag{3.13}$$

The description of variable and their a*priori* expectations are presented in Table 3.2 below.

Table 3. 2: Description of Variables Used in the Treatment two-step Selection model

Variable		Measurement	Expected sign
X_1	Sex of farmer	Dummy, 1 if respondent is male; 0 otherwise	$\beta_1 > 0$
X_2	Age of farmer	Number of years of farmer at the time of data collection	$\beta_2 < 0$
X_3	Education of farmer	Number of years in school	$\beta_3 > 0$
X_4	Farming experience	Number of years in farming	$\beta_4 > 0$
X_5	Off-farm income work	Dummy, 1 if respondent does off-farm income work, 0 otherwise	$\beta_5 < 0$
X_6	Ease in accessing credit	Dummy, 1 if respondent obtain credit easily; 0 otherwise	$\beta_6 > 0$
X_7	Knowledge of credit packages	Dummy, 1 if respondents has knowledge of credit packages in outgrower scheme	$\beta_7 > 0$
X_8	Maize farm size	Size of maize farm owned by respondents in acreage	$\beta_8 > 0$
X_9	Extension contact	Dummy, 1 if respondent has access to extension services; 0 otherwise	$\beta_9 > 0$
X_{10}	Membership in FBO	Dummy, 1 if respondent is an FBO member; 0 otherwise	$\beta_{10} > 0$
X_{11}	Access to external support	Dummy, 1 if respondent receives external support; 0 otherwise	$\beta_{11} > 0$
X_{12}	Participation in outgrower scheme	Dummy, 1 if respondent is an outgrower scheme participant; 0 otherwise	$\beta_{12} > 0$
Dependent variable			
Amount of credit obtained			

3.9.3 Propensity-Score Matching of the Effect of Outgrower Scheme on Credit Utilization

The Propensity Score Matching (PSM) technique, proposed by Rosenbaum and Rubin (1983) was employed to evaluate the effect of outgrower scheme participation on credit utilization. According to Diagne and Demont (2007), the PSM does not correct for unobserved heterogeneity in the data due to sample selection. According to Abdulai et al. (2018), the PSM helps to compare the credit utilization of outgrower scheme participants to that of the control (non-participants) according to the predicted propensity of participating in at least one scheme.

Besides, the PSM allows for examination of the probability of participation in addition to assessing the effect of participation on credit utilization. In the estimation of PSM, certain basic steps must be followed. The first step is to predict the propensity scores using the probit model. The second step in PSM analysis is to select a matching algorithm (for example; Nearest Neighbour, Caliper, Radius matching and Kernel Matching estimator) that will use the estimated propensity scores to match participant farmers to non-participant farmers. This study employed the Kernel Matching estimator to match participant farmers to non-participant farmers who closely resemble them in the measured characteristics.

The third step is to check the matching quality to confirm whether the matching procedure can balance the distribution of different variables or not. To check the matching quality, the propensity score (ps) test and the propensity score (ps) graph were

used. If the matching quality is satisfied, then the ATT (average treatment effect on the treated) can be specified as the mean differences in credit utilization of outgrower scheme participants matched with non-participants who are balanced on the propensity score and fall within the region of support. The last step is to estimate the treatment effect and the standard errors. There are two treatment effect concepts then, the average treatment effect (ATE), the average treatment effect on the treated (ATET) and the average treatment effect on the untreated (control group) (ATU). The ATE is computed as the mean difference in credit utilization between participants {Y(1)} and matched control group { Y(0)}.

$$ATE = E[Y(1) - Y(0)] = E[Y(1)] - E[Y(0)] \quad (3.14)$$

The ATE compares the credit utilization of outgrower scheme participants and non-participants.

On the other hand, the ATET measures the effect of participation on credit utilization of farmers who actually participated in outgrower schemes as opposed to potentially viable participants. This is however, computed as follows:

$$ATT = E[Y(1) - Y(0)/P = 1] = E[Y(1)/P = 1] - E[Y(0)/P = 1] \quad (3.15)$$

The average treatment effect on the untreated (control group) (ATUT) also measures the effect of participation on credit utilization of farmers who did not actually participate in outgrower scheme. ATUT is given by:

$$ATT = E[Y(1) - Y(0)/P = 0] = E[Y(1)/P = 0] - E[Y(0)/P = 0] \quad (3.16)$$

3.10 Kendall's Coefficient of Concordance

The Kendall's coefficient of concordance was used to measure farmers' challenges of outgrower scheme participation. The Kendall's coefficient (W) measures the level of agreement between several quantitative or semi-quantitative variables that are assessed as a set of objects of interest (Legendre, 2005). It is a non-parametric test of ordered categories. It is used when the result comes from different sources (from different judges) and concerns at least two (k >= 2) objects. W is calculated on an ordinal scale or an interval scale and its value lie between 0 and 1 ($0 \leq W \leq 1$). A value of 1 represents perfect concordance and 0 denotes null concordance. The Kendall's coefficient of concordance is given by the following formula:

$$W = \frac{12S}{m^2(n^3 - n) - mT} \quad (3.17)$$

where n = number of observations; m = number of variables; the S = sum of square statistic over the row sum of ranks and T = correction factor for tying rank, which are given by the following equations:

$$S = \sum_{i=1}^{n} (R_i - \bar{R}) \quad (3.18)$$

$$T = \sum_{k=1}^{g} (t_k^3 - t_k) \quad (319)$$

where $\overline{R}$ = mean of the R_i; t_k = number of tied ranks in each group of ties.

Testing the Significance of W

The chi-square test of significance is used to examine whether there exist statistical significance differences between the levels of agreement among the constraints being ranked.

Hypotheses:

$H_0 : W = 0$ There is no significant level of agreement in the constraints reported by the respondent.

$H_1 : W = 0$: There is some significant level of agreement in the constraints ranked by the respondents.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents the results of the data collected from the field. It also provides a detailed discussion of the results by comparing them to past studies.

4.1 Respondents' Demographic and Socio-economic Characteristics

This section of the chapter presents the results of the socio-demographic and economic characteristics of the farmers interviewed. The results of such variables (sex, age, education, head of household, household size, off-farm income activity and farming experience) were represented by frequencies, percentages, means, standard deviations, minimum and maximum values.

4.1.1 Sex of Farmers

From Table 4.1, the majority of farmers representing 57.1% were males, indicating that maize farming in the study area is done by more men than women. Maize farming usually requires more production resources which are highly accessible by men in Northern Ghana (SEND Ghana, 2014). Besides, women in general tend to provide labour for agricultural production on their husband's farms (Ziba, 2015; SEND Ghana, 2014).

4.1.2 Age of Farmers

The results in Table 4.1 also showed that the ages of the farmers ranged from 22 to 70 years, with a mean age of 42 years. This finding is in conformity with the results of Ziba (2015), who revealed an average age of 42.6 years for farmers in the UER. The mean age indicates maize farmers in the region are within the middle age group (aging class). However, the farmers are still within the economically (active) age bracket capable of managing their farming business for more years. Furthermore, the mean age signifies a good source of strength and own labour for agricultural production activities (Sampoa, 2012).

4.1.3 Education of Farmers

The education of farmers from the study ranged between 0 and 16 years, which corresponded to no formal education and tertiary education respectively. The mean education of farmers was 3.8 years, and this also corresponded to primary education (Table 4.1). On the average, the education of farmers in the study area is still low. This finding agrees with that of Ziba (2015), who revealed that on average, farmers in the UER had up to primary school education (about 4-5 years in school), which has implications for agricultural production in that higher education could be a source of formal non-farm occupation. For instance, highly-educated farmers are more likely to engage in formal employment, which may reduce the time and efforts needed to participate in outgrower schemes. For instance, Hall *et al*. (2017) reported that agricultural commercialization in Ghana is driven by investments from outside of

agriculture, such as wage or salaried employment, retirement funds or remittances. Apart from this, highly-educated farmers tend to have higher knowledge about other credit programmes which may reduce their participation in such in outgrower schemes.

4.1.4 Household Head

The results further found that about half (50%) of the farmers were household heads, which suggests that a substantial part of the sample were likely to be men, with greater access to production resources and decision-making.

4.1.5 Household size of Farmers

In addition, the farmers tend to have 7 people per household on average. The household sizes of the farmers range between 2 and 21 people per household. This result is in line with that of Ziba (2015), who found that farmers in the UER have average household sizes of 5-6 people per household. Having more members in the households is important to provide family labour since most farmers in Ghana and the study area tend to conduct their farming operations with own-labour. The mean household size represents a fairly high source of family labour for the farming business by farmers, and for increasing farmers' participation in outgrower schemes because farmers with larger household sizes can designate extra responsibility to other household members in other to have an ample time to participate.

4.1.6 Farming Experience of Farmers

The results also revealed on average, farmers have spent approximately 16 years in the farming business, which implied that farmers were fairly experienced in maize farming. The farming experience however, ranges from 3 to 42 years, which is expected to have a positive effect on productivity because highly experienced farmers are better able to search for new innovations and undertake critical decisions to support agricultural production. This may increase farmers' participation in outgrower schemes and access to credit for agricultural production. The result was not consistent with Ziba (2015), who found that the farmers in his sample had spent approximately 19 years in the farming business

4.1.7 Off-farm work

The study also found that the majority of farmers representing 59.3% were engaged in off-farm income generating activities. This means most farmers in the UER derive income from other off-farm businesses. These incomes could be used to supplement the farming business.

4.2 Institutional Factors

Similarly, table 4.1 captured the results of the institutional variables used in the study. These include distance from house to the nearest input shop or output market, extension contact, FBO membership, access to NGO support, training on GAPs and credit or input application.

From the results, the mean distance from house to the nearest input shop was 8.7 kilometers and this was the same with that of house to the nearest output market (8.7 kilometers). In addition, the lowest proportion of the farmers, representing 44.4% had no contact with extension agents, indicating that agricultural extension dissemination in the study area is still low. This could have an adverse effect on farmer participation in outgrower scheme, technology adoption and agricultural productivity among maize farmers in the study area. The result is however, consistent with that of Ziba (2015), who stated that 46% of farmers in the UER had access to at least one extension contact.

The results also revealed that the majority of farmers, representing 56.7%, were members of farmer-based organization (FBOs), indicating that farmer-to-farmer relationship in the study area is fairly high. Access to production and marketing information and inputs could be high among farmers. Furthermore, the results revealed that only few farmers had access to NGO support (38.7%) and training on credit (38.2%) respectively whereas 65.3% and 48.0% of the sample had access to training on good agricultural practices (GAPs) and input application respectively (see Table 4.1).

4.3 Farmers' Knowledge of Scheme and Experience in Credit Access

Under this section, the study presents the results of farmers' knowledge in credit packages, ease in accessing credit and their default status. In general, farmers response on whether they had defaulted on loans before was very low as 3.1% of the farmers reported that they had ever defaulted on loans. Furthermore, about 17.3% of the farmers indicated

high easiness in accessing credit whereas 82.7% has not. Also, 59.6% of the farmers stated that they had knowledge of credit packages for agricultural production (Table 4.1).

4.4 Farm-specific Factors

The study collected information on farm-specific characteristics as demonstrated in Table 4.1. From the results, the average maize farm size for the farmers was 3.36 acres (or 1.34 hectares), with minimum and maximum farm sizes of 1 and 15 acres, respectively. The result is below that of the regional and national agricultural data of MoFA, which states that farmers in Ghana and UER in particular cultivate on average farm sizes of 2-3 hectares (MoFA, 2010). The average farm size of the present study is higher than the ones revealed by Quaye (2008) (0.98 hectares) and Amanor-Boadu *et al*. (2015) (0.6 hectares). Similarly, Ziba (2015) reported that in the Upper East Region, farmers cultivate on an average farm size of 0.77 hectares, and his result is below that of this study.

Also, the total land holding of the farmers ranges from 2.5 to 85 acres, with a mean total landholding of 8.1 acres (3.28 hectares). This finding is not in line with Amanor-Boadu *et al*. (2015) who reported that the average land holding in the UER is around 1.8 hectares. In general, land is an enviable asset with multiple uses to the rural farmer such as for agricultural production, game and settlement. Access to land is often regarded as a social prestige and collateral to farmers in rural societies and larger farm lands may have increased likelihood to access credit, and hence, participate in outgrower schemes for input supports.

Table 4. 1: Summary statistics of explanatory variables used in the regression models

Variable	Obs	Mean	Std. Dev.	Min	Max
Sex (male)	226	0.571	0.496	0.0	1.0
Age (years)	226	41.646	10.281	22.0	70.0
Household head (yes)	226	0.500	0.501	0.0	1.0
Education (years)	226	3.801	5.105	0.0	16.0
Household size (count)	226	7.345	3.222	2.0	21.0
Farming experience (years)	226	15.929	9.110	3.0	42.0
Off-farm work (yes)	226	0.593	0.492	0.0	1.0
House-inputshop distance (km)	226	8.754	5.583	1.0	50.0
House-outputmarket distance (km)	226	8.748	5.593	1.0	50.0
Easiness in access to credit (yes)	225	0.173	0.379	0.0	1.0
Knowledge of credit packages (yes)	225	0.596	0.492	0.0	1.0
Land holding (acres)	217	8.124	11.654	2.5	85.0
Farm size (acres)	217	3.366	2.466	1.0	15.0
Extension contact (yes)	225	0.444	0.498	0.0	1.0
Membership of FBO (yes)	225	0.569	0.496	0.0	1.0
Access to NGO support (yes)	225	0.387	0.488	0.0	1.0
Access to training on credit (yes)	225	0.382	0.487	0.0	1.0
Access to training on GAPs (yes)	225	0.653	0.477	0.0	1.0
Access to training on input application (yes)	225	0.480	0.501	0.0	1.0
Default status (yes)	225	0.031	0.174	0.0	1.0

Source: Author's summary from field data, 2017

4.5 Crop Income

This variable was computed as the total maize crop harvested times the average price (otherwise called total revenue). From Table 4.2, more than half of the farmers (51%) had maize income between GH₵1,001-5,000 while approximately 46% had maize income of GH₵1000 or less. The minimum amount of money obtained from maize production was GH₵ 80 and the maximum amount was GH₵15,000. On the average, farmers obtained GH₵ 1,755 from maize production.

Table 4. 2: Results of Crop Income of Respondents

Variable	Frequency	%	Mean	Std. Dev.	Min	Max
Crop income			1755.13	2014.22	80	15000
Up to GH₵1,000	89	45.88				
GH₵1,001-5,000	99	51.03				
GH₵5,001-10,000	4	2.06				
More than GHS₵10,000	2	1.03				
Total	**194**	**100**				

Source: Author's summary from field data, 2017

4. 7 Outgrower Scheme Participation

The study grouped respondents into two (2) categories; thus, outgrowers and non-outgrowers. Outgrowers are smallholder farmers who are registered and managed by a commercial farmer (also called the nucleus farmer) or other business agents. This group of farmers is offered opportunity with verbal or written contracts by the commercial farmer or the business entity. Non-outgrowers on the other hand, are farmers who are not under any scheme. Nucleus farmer-outgrower schemes are arrangements between farmers, usually smallholders and a commercial farmer (nucleus farmer) for the supply of both production and marketing services (Barret *et al*., 2012; Miyata *et al*., 2009). Outgrowers also receive training and capacity building from agricultural input importers and development partners or NGOs. These farmers can access more secure markets or inputs, technical and financial support by cultivating within the schemes. Herrmann (2017) observed that outgrower schemes have often been claimed to be beneficial for rural development and poverty reduction as they provide farmers with access to finance, modern technologies, technical know-how, and markets. According to the results, the majority (69.5%) of the respondent farmers were in outgrower schemes.

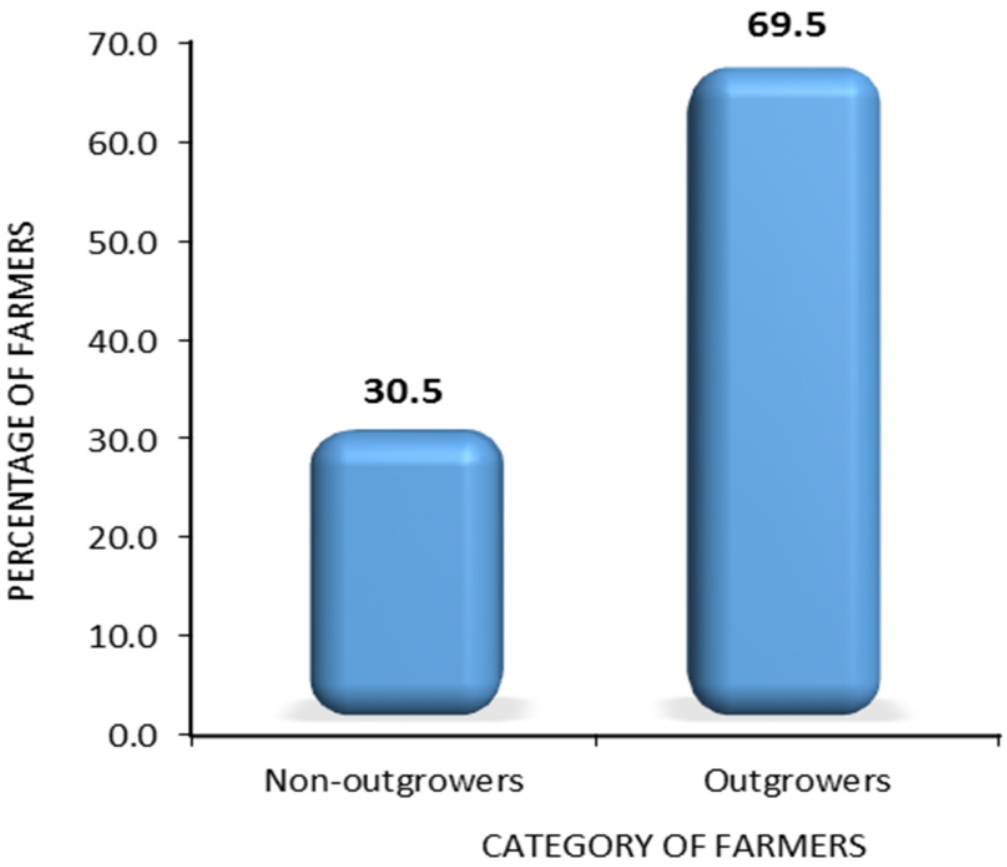

Figure 4. 1. Results of farmers' participation in outgrower schemes
Source: Author's summary from field data, 2017

4.7.1 Rationale for Outgrower Scheme Participation

The study outlined the reasons for farmer participation in outgrower schemes (as shown in Table 4.7). Collectively, most farmers (89.2%) stated easy access to tractor services as a major reason for participating in outgrower schemes followed by easy and reliable access to market (64.2%). Over half (55%) of the sample also indicated that they participate in outgrower schemes to increase their yields (crop efficiency) while 45% and

42.4% stated that they participate in outgrower schemes because of easy access to inputs and credit, respectively.

In fact, the inadequacy of these products and services are major constraints hampering agricultural production and marketing in the UER. These findings are in tandem with Abwino and Rieks (2007), which provided some advantages of outgrower arrangements, such as access to known and reliable markets and large aggregators, provision of inputs and production services, often on credit. Outgrower schemes also introduce new technologies and skills to their members, and assistance from donor partners are also extended to members of outgrower schemes.

Table 4. 3: Reasons for Participating in Outgrower Scheme

Reasons	Frequency	Per cent
Easy access to inputs	68	45.0
Technical advice	15	9.9
Easy and reliable access to market	97	64.2
Easy access to extension	23	15.2
Easy access to credit	64	42.4
Easy access to tractor services	145	89.2
Easy access to training on GAPs	20	13.2
To obtain farm services on time	7	4.6
Increase yield	83	55.0

Source: Author's summary from field data, 2017

4.7.2 Experience with Outgrower Schemes

From the study, the minimum number of years spent by outgrowers in a scheme was 1 and the maximum was 6 years. On average, outgrowers have spent approximately 3 years in the scheme. Moreover, majority of the outgrowers have spent 0-3 years in the scheme. Higher experience with outgrowers was used as a proxy for satisfaction by the farmer such that more years with the scheme implies that the farmer maximizes utility from the products and services provided by the scheme. Besides, outgrower schemes can have significant impact on farmers' productivity and long-run profits. According to Ragasa *et al*. (2017), maize farms for instance under the scheme are more likely to be treated with fertilizer and increase quantity than farms with no schemes. It was hypothesized that improvement in the scheme to address failures in the input accessibility and credit markets, thereby increasing productivity and farm profits, will increase the number of years farmers spend in the scheme.

Table 4. 4: Results of farmers' experience with outgrower scheme

Variable	Frequency	Percentage	Mean	Std. Dev.	Min	Max
Scheme Experience			3.225806	1.246024	1	6
0-3 years	133	58.85				
4-6 years	93	41.15				
Total						

Source: Author's summary from field data, 2017

4.7.3 Farmers' Knowledge of Scheme

Farmers (participants) were asked to report the number of people the scheme holds as a way of measuring their knowledge of the scheme size. This was however, compared with the scheme lists from the nucleus farmers to confirm whether the farmers responses were correct. The results show that one-quarter (25.56%) of the farmers knew the exact number of all members within their schemes and 74.44% did not. It was hypothesized that farmers' knowledge of the scheme size will build trust in the individuals.

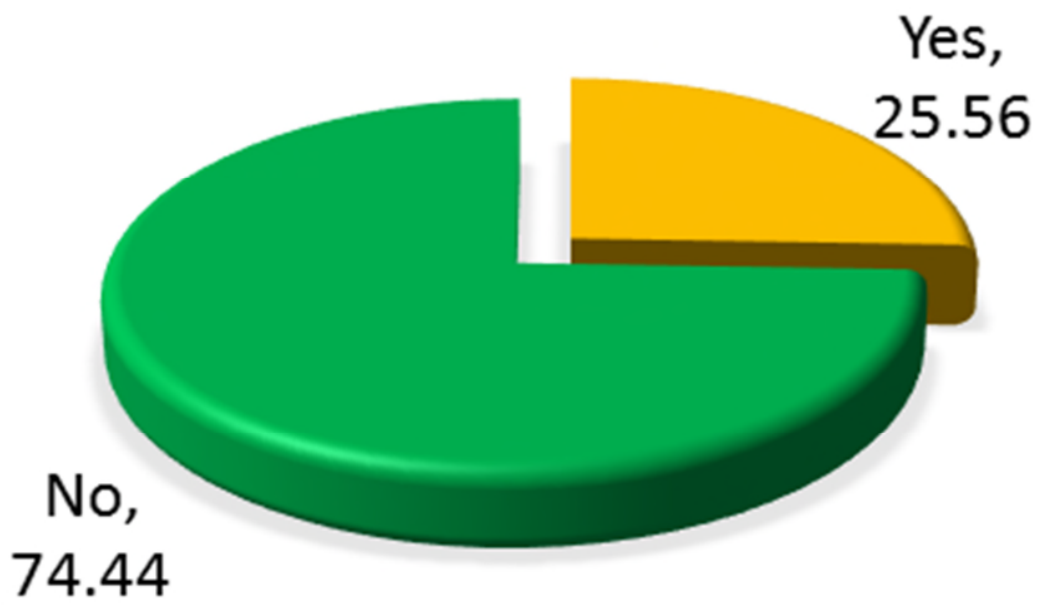

Figure 4. 2. Results of farmers' knowledge of group size
Source: Author's summary from field data, 2017

4.7.4 Source of Information on Outgrower Scheme

The study found that different actors such as input dealers, nucleus farmers, input importers, financial institutions, MoFA, FBOs/colleague farmers, friends/families, radio and TV provide information about outgrower schemes to farmers. The source of information on the outgrower schemes is a critical influencer for participation. As expected, most of the farmers (54.2%) heard about outgrower schemes from nucleus farmers followed by FBOs/farmers (14.67%), NGOs (13.33%) and MoFA (1.33%). The remaining 16.47% were not aware of outgrower scheme and for that matter received no information about the scheme from any source.

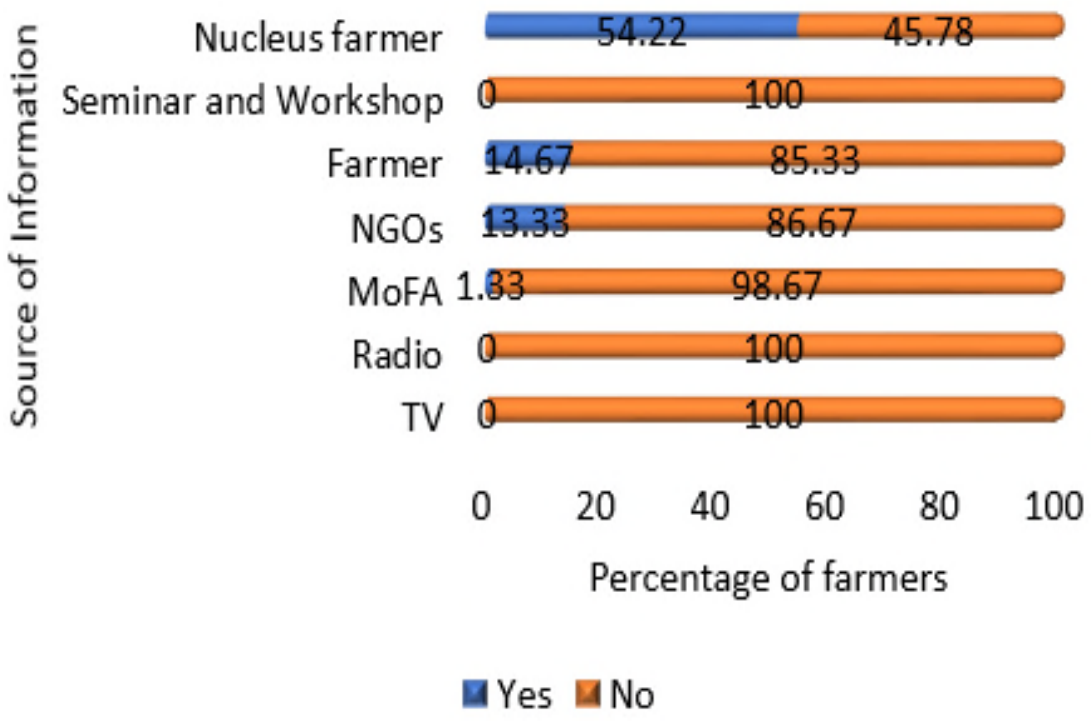

Figure 4. 3. Results of farmers' sources of information about outgrower schemes

Source: Author's summary from field data, 2017

4.7.5 Outgrower Scheme Participation by Sample Characteristics

The study further compared farmers' characteristics with outgrower scheme participation. From Table 4.5, more female farmers (80.41%) significantly participated in outgrower schemes than their male counterparts (59.69%) based on the chi-square test results (χ=11.03; p<0.01). The reason for the high female farmer participation in outgrower schemes compared to males could be due to the fact that female farmers are very disadvantaged in terms of access to farm resources, and also any attempt to encourage agricultural commercialization tends to favour men than women because more resources are required. According to Oya (2012), outgrower schemes have been encouraged for several crops, as a means to promote agricultural commercialization and value chain. Since women are usually deprived of basic resources, outgrower participation is a way for women to engage in commercial-oriented farming, by getting easy and reliable access to farm inputs, technology and markets (Hall *et al*., 2017).

In terms of household head, the chi-square results showed that there were significantly (p-value of 0.015) more non-household heads (76.11%) participating in outgrower schemes than household head (61.58%). There was a statistical significant difference (at 5% level) between off-farm work and farmers' participation in outgrower schemes. In particular, farmers with off-farm work who participated in outgrower schemes (55.97%) were less than non-participant with no off-farm (on-farm) work (86.96%). From the chi-square, FBO members had more outgrower scheme participants than non-FBO members.

Besides, the difference in outgrower scheme participation between FBO members and non-members was significant at 1% level. Access to NGO support was found to have a significant relationship with farmers' participation in outgrower scheme. In particular, a higher percentage (81.61%) of farmers who had access to support from NOGs participated in outgrower schemes compared to the proportion of farmers without access to NGO support who participated in outgrower scheme (60.87%).

Table 4. 5: A comparison of farmers' participation in outgrower schemes by all dummy variables in the regression analyses.

Variable	Participants (%)	Non-participants (%)	Chi-square statistic (p-value)
Sex			**11.03 (0.001)**
Female	80.41	19.59	
Male	59.69	40.31	
Household head			**3.935 (0.015)**
Yes	61.58	38.42	
No	76.11	23.89	
Off-farm work			**24.308 (0.000)**
Yes	55.97	44.03	
No	86.96	13.04	
Ease in accessing credit			**1.421 (0.233)**
Yes	76.92	23.08	
No	67.20	32.80	
Membership of FBO			**36.659 (0.000)**
Yes	85.16	14.84	
No	47.42	52.58	
Access to extension contact			**0.813 (0.367)**
Yes	72.00	28.00	
No	66.40	33.60	

Access to NGO support			**10.709 (0.001)**
Yes	81.61	18.39	
No	60.87	39.13	
Access to training on credit			**1.986 (0.159)**
Yes	74.42	25.58	
No	65.47	34.53	
Access to training on input application			**2.423 (0.120)**
Yes	63.89	36.11	
No	73.50	26.50	

Source: Author's summary from field data, 2017

A critical look at the t-test results, the mean ages of outgrower scheme participants and non outgrower scheme participants was almost similar and statistically insignificant. The mean number of years in formal education for outgrower scheme participants and non-participant was not significant based on the t-test results from Table 4.6.

The t-test results showed that non-participants were more experienced (17.7 years) in farming than outgrower scheme participants (15.1 years). This could be due to the fact that they are usually able to link-up with agricultural projects or interventions than less-experienced farmers because of their high knowledge in farming and networks with key players in the agricultural sector. In particular, the differences in farming experience between outgrower scheme participants and non-participants were statistically significant at 5% level.

Other factors that showed significant relationship with farmers' participation in outgrower schemes were distance from house-to-the nearest inputshop and that from

house-to-the nearest output market. In particular, outgrower scheme participants travel significantly longer distances to source input and output markets compared to non-outgrower scheme participants based on the t-test results in Table 4.6.

Table 4. 6: A comparison of farmers' participation in outgrower schemes by all continuous variables in the regression analyses

Variable	Participant Mean (se)	Non-participants Mean (se)	t-value (p-value)
Age	41.632(0.780)	41.676 (1.364)	0.029 (0.976)
Education	3.529 (0.387)	4.394 (0.674)	1.184 (0.238)
Household size	7.187 (0.242)	7.690 (0.430)	1.090 (0.277)
Farming experience	15.116 (0.690)	17.704 (1.185)	1.996 (0.047)
Land holding	7.742 (1.121)	9.000 (0.432)	0.731 (0.466)
Farm size	3.202 (0.224)	3.742 (0.1934)	0.138 (1.489)
House-input shop distance	9.103 (0.411)	7.993 (0.767)	1.391(0.0829)
House-outputmarket distance	9.109 (0.410)	7.958 (0.771)	1.441 (0.076)

Source: Author's summary from field data, 2017

4.8 Access to Agricultural Credit

According to the study, overall 37.6% obtained credit while 62.4% did not. In Upper East Region, Quaye (2008) also revealed that the majority of farmers, representing 89% do not have access to credit for agricultural production. On the contrary, Ziba (2015) found that the greatest proportion (65%) of farmers in the Upper East Region had access to credit. With regards to the various types of credit, out of the 37.6%, 1.78% obtained cash credit, 24.44% obtained input credit while 11.11% obtained mechanization credit. The inputs obtained were mainly chemical fertilizers (such as NPK, Sulphate, Urea), weedicides and hybrid seeds. The mechanization services accessed were mainly tractors and threshers.

Agricultural credits are more equally recognized as farm input. Credit is a device for facilitating the temporary transfer of purchasing power from one individual or organization to another (Miller and Osuntogun, 1975). In general, agricultural credits provide the basis for increased production and efficiency through specialization of function. Basically, credit exists in two main forms; cash credit and trade credit. Cash credit is also preferentially called a loan while trade credit includes both input credit and mechanization credit.

Farmers' access to credit for agricultural production is usually limited, especially in sub-Saharan Africa. The study obtained data on three (3) types of credits; namely cash credit, input credit and mechanization credit (see figure 4.4). Cash credit here was defined as an amount of money obtained by the farmers in the scheme from a given source (i.e., from

informal or formal sources) to be paid later either in cash or in kind within a stipulated length of time.

On the other hand, input credit includes the provision of fertilizers, weedicides, and seeds to the farmers in the scheme by a lender (i.e., from informal or formal sources) to be paid later either in cash or in kind within a stipulated length of time. Mechanization credit similarly involves the provision of agricultural mechanized services, such as ploughing, planting, harrowing, harvesting, threshing and transportation services to the farmers in the scheme by a lender (i.e., from informal or formal sources) to be paid later either in cash or in kind within a stipulated length of time. Access to inputs and mechanization services is a major reason for participating in outgrower schemes (Ragasa *et al*., 2017).

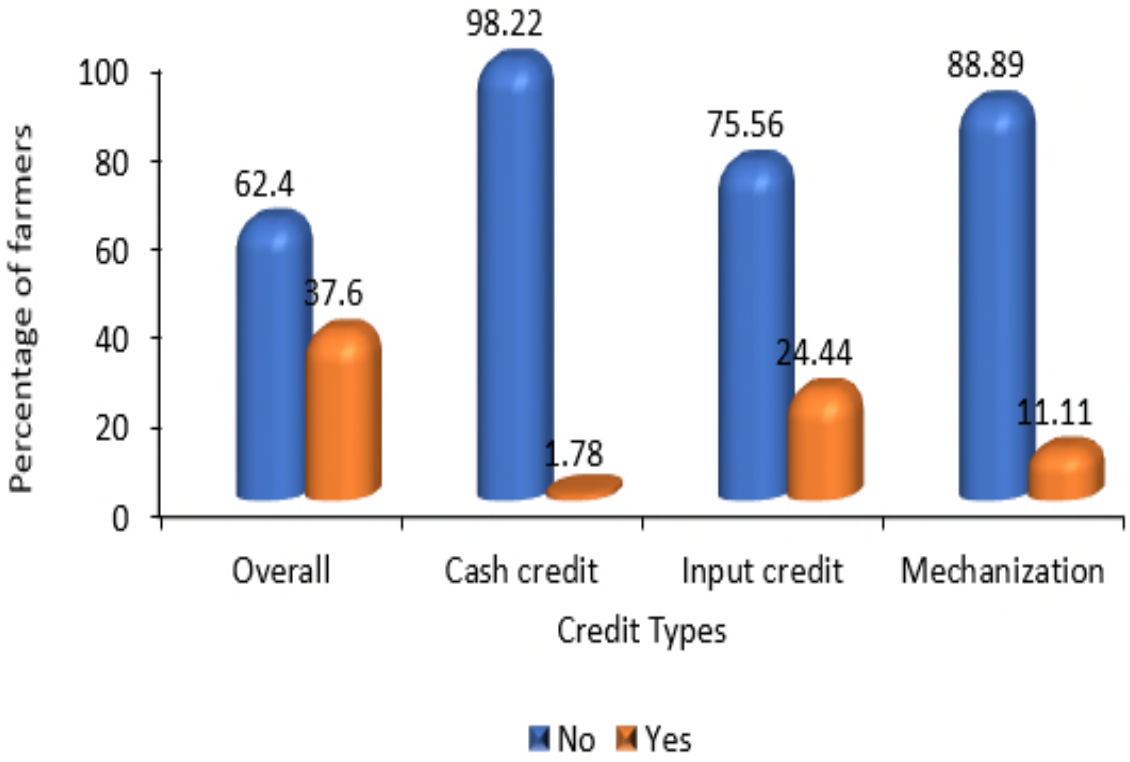

Figure 4. 4. Results of farmers' application and access to credits in outgrower schemes
Source: Author's summary from field data, 2017

4.8.1 Comparison between Credit Applied for and Credit Received

It usually happens that farmers' application for credit may be fully or partially granted. Therefore, the study conducted chi^2 test to examine whether there exist significant differences between credit applied for and credit obtained. From the results, the difference between overall credit applied for and overall credit obtained was not zero. In other words, the proportion of credit applied for was significantly different (p-value<0.01) from credit obtained. We can then say that generally the application of credit

do not necessarily proof a success that the individual farmer will obtain it. Similarly, there existed significant differences between credit applied for and credit obtained with regards to the three types of credits at 1% probability level.

Table 4. 7: Comparing credit applied for by credit received by farmers in the outgrower schemes

Variables	chi-square	P-value
Credit applied-credit obtained	104.1	0.0000
Cash applied-cash obtained	225.0	0.0000
Input Applied-Input obtained	128.1	0.0000
Mechanization Applied-Mechanization Received	112.3	0.0000

Source: Author's summary from field data, 2017

4.9 Empirical results on the factors that influence farmers' participation in outgrower scheme

This section presents the empirical results of factors influencing farmers' participation in outgrower schemes in Table 4.8. In all, nineteen (19) explanatory variables were included in the binary probit model and hypothesized, with a*priori* expectations to be influencing participation. Out of these, ten (10) of the variables were significant whilst the remaining nine were not significant. These variables were sex, farming experience, off-farm work, distance from house-to-the nearest output market, ease in accessing credit, land holding, farm size, membership of FBO, support from NGO and access to training on GAPs. According to the model fitness, the Wald chi-square test value of 88.66 was statistically significant at 1% significant level. This indicates that at least one of the coefficients of the independent variables is significantly different from zero. This further implies the

variables jointly explained the probability of participating in outgrower schemes. The pseudo R^2 was 0.4417, which indicates that overall, the independent variables in the model were able to explain about 44.17% of the probability of participating in outgrower schemes.

Sex of farmers had a negative significant marginal effect (-0.204) on outgrower scheme participation, which indicates that female farmers (women) were 20.4% more likely to participate in outgrower schemes as compared to their male counterparts, other things held constant. Women tend to participate in outgrower schemes more than men because they often lack access to resources for production (Send Ghana, 2014), and for that matter participating in outgrower schemes serves as platforms to access production inputs and other support services easily. The finding is similar to that of Kaaria *et al*. (2016) who found that women had higher likelihood to participate in farmer groups and other cooperatives than men.

Farming experience also had a negative significant influence on maize farmers' participation in outgrower schemes. The marginal effect of -0.134 meant that, a one year increase in farming experience reduces the probability of participating in outgrower scheme by 1.34%, holding other variables constant. In other words, highly-experienced farmers had a lower probability to participate in outgrower schemes. This result met the a*priori* expectation in that more experienced farmers may have higher chances of obtaining more credit from other sources independently compared to less experienced

farmers, hence, would be less likely to participate. This result is in conformity with Musara *et al*. (2011) but contrary to that of Mathebula (2015).

Off-farm work had a negative significant marginal effect (-0.385) at 1% significance level, meaning that farmers who engage in on-farm work were about 38.5% more likely to participate in outgrower schemes as compared to farmers with off-farm work. The reason is that farmers who solely do farming tend to have limited alternatives to earn off-farm income; hence would be more eager to participate in outgrower schemes in order to have access to production resources on credit. Additionally, farmers with off-farm work may tend to have less time to participate in the scheme (Huffman and Evenson, 2006).

House-output market distance was also found to be significant with an expected positive marginal effect (0.147), indicating that a one kilometer increase in the distance between farmers house and the nearest output market would increase the probability of participating in outgrower schemes by 14.7%. This finding is in conformity with that of (Sebatta *et al*., 2015), who found that farmers tend to participate in cooperatives when the distance between their homes and the nearest output market is wider. Smallholder farmers, who are predominantly resource-poor are more vulnerable to market and price distortions and therefore tend to seek contract as a remedy to these challenges. Farmers will be compelled to enter into contract with agribusiness entities to reduce cost if the distance between the farm and the local commodity target market is far. This indicates that collectively, when farmers are in groups or outgrower schemes, they can assemble

and transport their produce into one destination to reduce transportation and marketing cost.

Ease in accessing credit had a negative significant marginal effect value (-0.275) on outgrower scheme participation at 10% significance level. This implies that farmers who do not find it easy in accessing credit were more likely to participate in outgrower schemes by 27.5% as compared to their counterparts, holding all other variables constant. This is generally confirmed by the fact that many farmers in Ghana lack access to credit and hence, will participate in outgrower schemes in order to have easy access to credit (Abdul-Rahman and Donkoh, 2015). Outgrower scheme participation helps farmers to have easy access to credit because of the joint guarantee members enjoy (Akudugu *et al*., 2009); hence, farmers who encounter difficulties in accessing credit will participate.

Land holding was found to have a positive significant marginal effect (0.016) on maize farmers' participation in outgrower schemes, indicating that a one acre increase in land holding increases the probability of participating in outgrower schemes by 1.6%. This result supports the finding of Anang *et al*. (2015), who explained that larger land holding is an incentive for banks and investors to grant credit to land holders and can also be used as reason for farmers accessing production inputs and services on credit to increase their farm size.

The marginal effect of maize farm size was negative and significant with a marginal effect of -0.077. The marginal effect indicates that an increase in maize farm size by one acre reduces the likelihood to participate in outgrower schemes by 7.7%. This finding is

consistent with that of Adong *et al*. (2012) who noted that farmers with larger farm sizes were more likely to participate in FBO interventions. This confirms the expectation that smallholder farmers tend to face greater risk and uncertainty arising from market imperfections, and hence, will have a higher likelihood to participate in outgrower schemes to mitigate these risks.

Perceived access to training on good agronomic practices (GAPs) was significant at 1% level with a negative marginal effect (-0.309) on farmers' participation in outgrower schemes. This implies farmers with no access to training on GAPs were 42.3% more likely to participate in outgrower schemes compared to those without access, holding all other variables. Farmers who perceive that outgrower schemes tend to provide training on GAPs were more likely to participate in it because the scheme can increase their knowledge on farming practices and how to improve agricultural productivity.

The empirical results also demonstrated that farmers who belong to FBOs had 29.5% likelihood to participate in outgrower schemes than their counterparts who are non-members based on the marginal effect estimate, holding all other variables constant. This is true because FBOs are most likely to be adopted and managed by nucleus farmers because they are already existing groups.

Another significant variable positively related to farmers' participation in outgrower schemes was perceived access to NGO support. Thus, the marginal effect of perceived access to NGO support was 0.233, which indicates that farmers who perceived outgrower

schemes to benefit from NGOs are about 23.3% more likely to participate in outgrower schemes, other things held constant.

Table 4. 8: Results of factors that influence farmers' participation in outgrower scheme

Variable	Parameter	Coef.	Std. Err.	Marginal effect	P>z
Sex of farmer	β_1	-0.904**	0.387	-0.204	0.019
Age in years	β_2	-0.009	0.014	-0.002	0.533
Status of household head	β_3	0.181	0.382	0.044	0.635
Education in years	β_4	0.023	0.028	0.006	0.414
household size	β_5	-0.066	0.042	-0.016	0.112
Farming esperience in years	β_6	-0.056***	0.015	-0.013	0.000
Off -farm work	β_7	-1.824***	0.349	-0.385	0.000
Distance to nearest inputshop	β_8	-0.563	0.356	-0.135	0.113
Distance to nearest output market	β_9	0.610*	0.349	0.147	0.081
Ease in accessing credit	β_{10}	-0.904*	0.508	-0.275	0.075
Knowledge of credit packages	β_{11}	0.314	0.289	0.078	0.277
Landholding size	β_{12}	0.069**	0.028	0.016	0.013
Maize farm size	β_{13}	-0.320**	0.142	-0.077	0.024
Extension access	β_{14}	-0.093	0.391	-0.022	0.812
FBO membership	β_{15}	1.131**	0.537	0.295	0.035
Access to NGO support	β_{16}	1.074***	0.394	0.233	0.006
Access to training on credit	β_{17}	0.624	0.392	0.1401	0.111
Access to training GAP	β_{18}	-1.703***	0.610	-0.309	0.005
Access to training on input application	β_{19}	0.574	0.476	0.138	0.228
Constant		3.821***	0.678		0.000

Number of observations=217; Wald chi^2(22)=88.66; P>chi^2=0.0000; Pseudo R^2=0.4417
Legends (***), (**), (*) respectively indicate significance level at 1%, 5% and 10%.
Source: Author's summary from field data, 2017

4.10 Effect of Outgrower Scheme Participation on Credit Amount

Here, the study sought to find out whether participation in outgrower schemes leads to increased amount of credit obtained than without participation. From the results in Table 4.9, participation in outgrower schemes was significant and positive, implying that participation in outgrower schemes increases amount of credit obtained by GH₵379.2 holding other factors constant. This indicates that outgrower schemes tend to alleviate farmers constraint regarding credit amount accessed. The lambda (λ) was not significant. The insignificance of the lambda implies that selectivity bias was absent in the model. This could have produced bias estimates of the variables, including the participation variable if amount of credit obtained was estimated using the OLS approach. In other words, the Heckman estimation approach was used to ascertain the level of selectivity bias which the OLS could not account for.

From the results in Table 9, it could also be observed that ease in accessing credit and land holding were significant, with expected positive signs. In particular, farmers who have experience of easy access to credit received GH₵ 773.885 worth of credit higher than those without experience of easy access to credit, holding other variables constant. Besides, an increase in land holding by one acre would lead to GH₵ 45.339 increase in the amount of credit obtained, ceteris paribus.

Table 4. 9: Heckman two-stage results of the effect of outgrower scheme participation on amount of credit

Variable	Coef.	Std. Err.	P>z
Sex of farmer	41.999	80.773	0.603
Age in years	0.600	3.538	0.865
Education in years	-7.493	7.595	0.324
Farming experience in years	-6.005	4.603	0.192
Off-farm income work	-31.422	81.153	0.699
Ease in accessing credit	773.885***	105.066	0.000
Knowledge of credit packages	-23.493	78.388	0.764
Default status	47.783	199.614	0.811
Landholding	45.339***	2.773	0.000
Extension access	20.355	75.949	0.789
FBO membership	-146.197	98.954	0.140
Support from organization	184.558	180.608	0.307
Outgrower scheme participation	*379.180***	*170.150*	*0.026*
Constant	-208.351	224.458	0.353
Lambda	*-61.734*	*110.932*	*0.578*

Legend (***), (**), (*) respectively indicate significance level at 1%, 5% and 10%.
Number of observation=215, Wald chi^2=482.27, Prob>chi^2=0.0000
Author's summary from field data, 2017

4.11 Effect of Outgrower Scheme Participation on Credit Utilization

The effect of outgrower scheme participation on credit utilization was analyzed with PSM, by computing for the average treatment effect ATE) and the average treatment effect on the treated (ATET).

Estimation of Matching Quality

The distributions of the propensity scores before and after matching for the treated and control groups were assessed using three procedures. The result of the kernel density matching in figure 4.5 showed that the estimation of the propensity scores balances outgrower scheme participants and non-participant quite well after matching as compared to before matching.

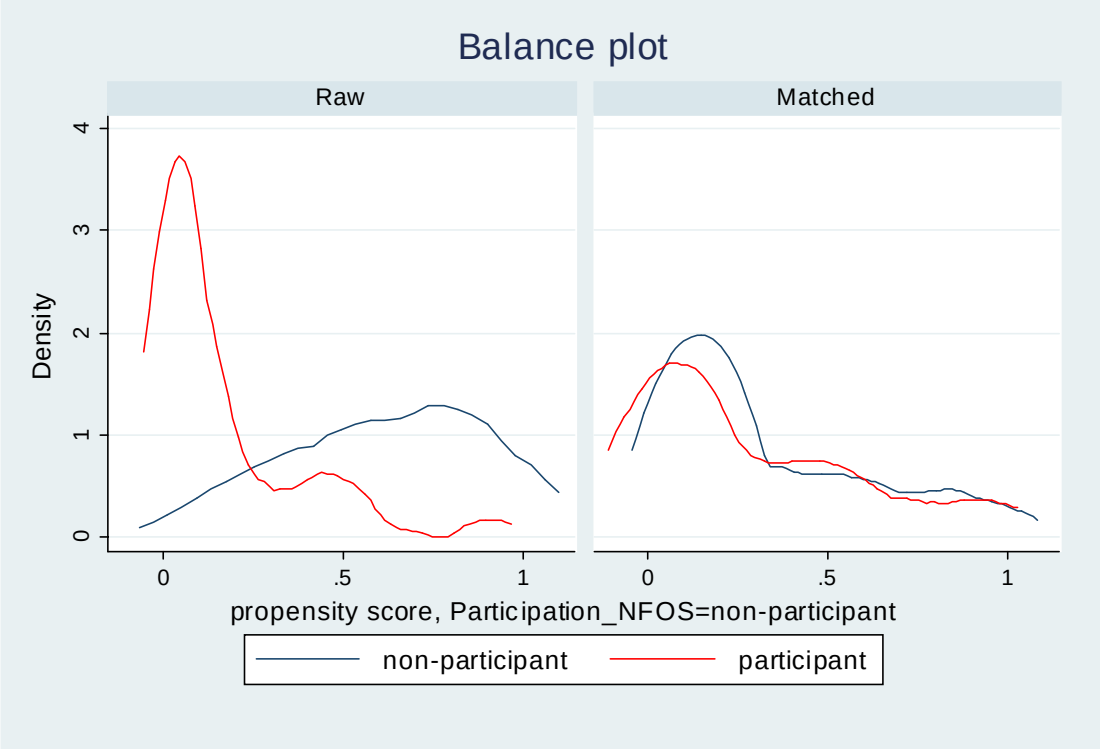

Figure 4. 5: Kernal density plot before and after matching

The results of the propensity score graph before matching in figure 4.6, the propensity scores were widely and unevenly distributed, indicating that there was a wide variation between the propensity scores of the participants and non-participants. While after

matching in figure 4.7, there was an evenly narrowly distributed propensity scores across outgrower scheme participants and non-participants. This justifies the need for estimating the propensity scores because the level of bias was reduced after matching.

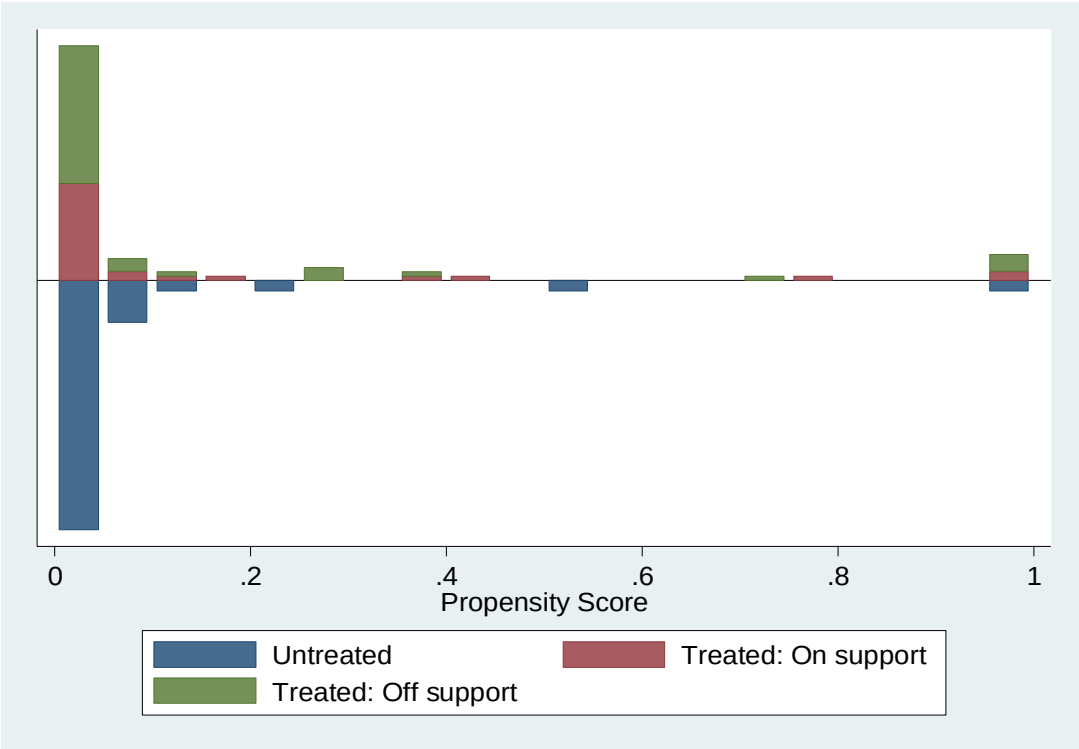

Figure 4. 6: Propensity score graph before matching

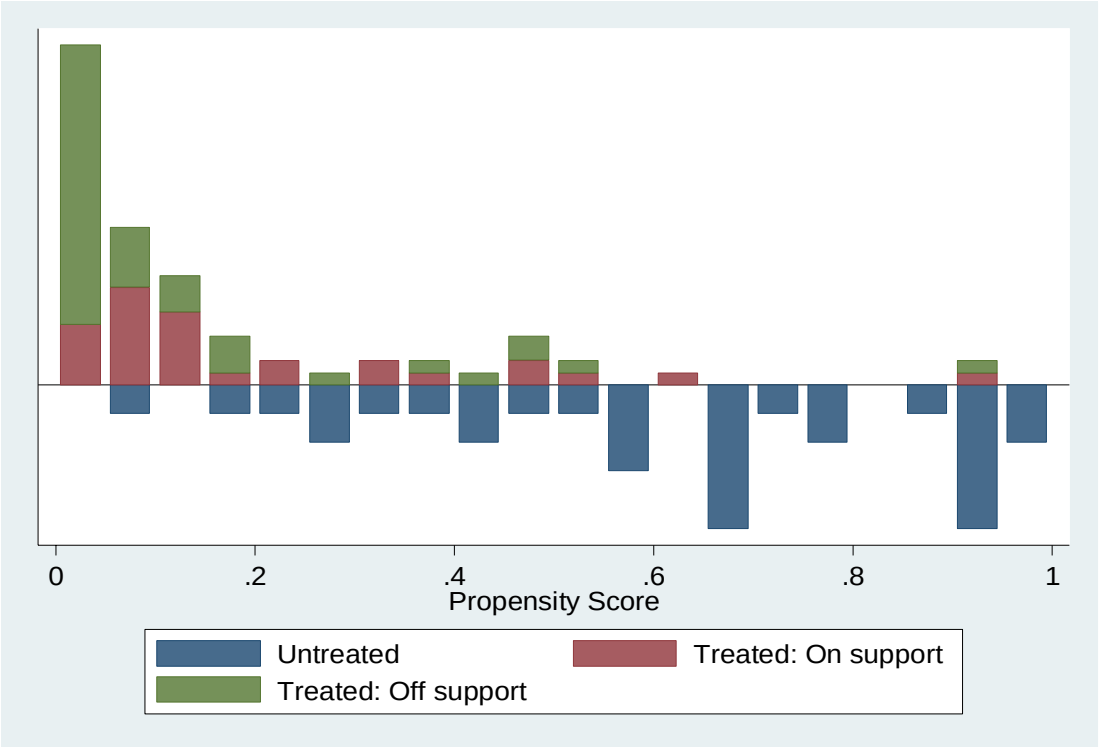

Figure 4. 7: Propensity score graph after matching

In table 4.11, the pstest was used to conduct matching quality before and after matching. Before matching, the pseudo R^2 and the likelihood ratio test were high and highly significant with a higher mean bias level. But after matching, the pseudo R^2 and the likelihood ratio test were low and insignificant and the mean bias level greatly reduced. This justifies that both participants and non-participants have the same distribution in covariates after matching. Hence, matching can be done to identify the effect of outgrower scheme participation on credit utilization.

Table 4. 10: Pstest of Covariate Balance Indicators Before and After Matching

Overall	Ps R2	LR chi2	p>chi2	MeanBias	MedBias
Unmatched	0.424	76.88	0	28.7	19.7
Matched	0.288	14.64	0.366	6.9	13.5

Estimation of Participation Effect on Credit Utilization

From Table 4.10, the difference in credit utilization (ATE=173.08) between participants and non-participants of outgrower schemes was not significant. Similarly, the average treatment effect on the treated exhibited insignificant coefficient. In other words, the average difference in credit utilization between participants and non-participants conditioned on the fact that the control group is ignored is not significant.

Table 4. 11: Results from the substantive equation of the Treatment Effect model

Matching scores	Coefficient	Std. Error	p-value
ATE	173.0829	212.3458	0.415
ATET	96.98675	271.8861	0.721

Number of observations=217;
Matches: requested=1
min=1
max=3
Legend (***), (**), (*) respectively indicate significance level at 1%, 5% and 10%.
Author's summary from field data, 2017

4.12 Challenges of credit access and utilization in Outgrower Schemes

The results showed that there was a significantly moderate agreement in the challenges of credit access and utilization by farmers in outgrower schemes (W=0.467, p = 0.000). In all, farmers ranked first, low sales price of produce as their most pressing challenge, which compounds their inability to repay their loans (see Table 4.12). The second most important constraint of farmers' credit access and utilization was late delivery of credit,

particularly inputs. This was followed by high interest rates on credit, low income, high transaction cost, high default rates among scheme members and then limited access to markets. Abwino and Rieks (2007) found that farmers may become indebted because of production problems and excessive advances or delay in buying or transportation of their farm produce. Abwino and Rieks (2007) further elaborated a number of challenges affecting outgrower scheme; including the risk of both market failures and production problems.

Table 4. 12: Results from challenges of credit access and utilization in Outgrower Schemes

Constraints	Mean	Ranking
High interest rates	3.24	3rd
Late delivery of farm inputs	2.60	2nd
Low sales price of farm produce	2.04	1st
Low income	3.81	4th
High default rate on credit	5.25	6th
High transaction cost	5.12	5th
Limited access to markets	5.95	7th

Number of obs.=121; Kendall's W=0.467; df=6; Chi-Square=338.8; P-value=0.000
Author's summary from field data, 2017

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter consists of four sections. Thus Section 5.1 presents a summary of key findings of the study, section 5.2 presents the conclusions of the study while section 5.3 presents the recommendations formulated based on the conclusions in section 5.2 and finally, section 5.4 provides suggestions for future research on agricultural outgrower scheme operations.

5.1 Summary

This study aimed at assessing the effects of agricultural outgrower schemes on credit access and utilization of maize farmers in the upper East region of Ghana. It first identified the factors that influence farmers' participation in outgrower schemes and how participation also influences the amount of credit obtained and credit utilization by farmers. Finally, the challenges faced by farmers in accessing and utilizing credit were elicited and ranked.

Data obtained from 226 respondents through personal interviews using semi-structured questionnaires was used for the analysis. The summarize command in Stata 14 was used to obtained the means, standard deviations, maximum, minimum of all the variables used in the regression models. The t-test was used to examine whether there exist significant

differences between outgrower scheme participation and farmers' socio-economic characteristics.

The significant factors influencing farmers' participation in outgrower schemes were sex, farming experience, off-farm work, distance from house-to-the nearest output market, ease in accessing credit, land holding, farm size, membership of FBO, support from NGO and access to training on GAPs were identified using the Probit regression model.

In the Heckman treatment effect two-stage model, the participation in outgrower scheme variable, experience of easy access to credit and land holding were found to have a significant and positive influence on the amount of credit obtained.

Similarly, the propensity score matching (PSM) was employed to estimate the effect of outgrower scheme participation on credit utilization. It was found that overall, participation in outgrower scheme increases credit utilization. However, the difference was not significant. The average treatment effect on the treated was also not significant.

The Kendall's coefficient of concordance results showed that the most pressing challenge facing farmers in the study area was low sales price of farm produce which evolved from the fact that smallholder farmers are mostly dispersed and making it difficult for business people to aggregate their produce unless under a scheme.

5.2 Conclusion

The main objectives of the research was to examine the determinants of farmers' participation in outgrower schemes and how outgrower scheme participation affect credit access (amount obtained) and utilization. Female farmers, less experienced farmers and farmers with smaller farm sizes, and on-farm work were significant socio-demographic and economic factors influencing outgrower scheme participation. Membership in FBO and support from NGO were also some institutional variables influencing farmers' participation in outgrower schemes.

The study also realized that farmers' participation in outgrower schemes positively influenced the amount of credit obtained (GHS379.18). On the other hand, though participants had increased utilization of credit due to their participation in outgrower schemes, its coefficient was not significant. The study revealed that farmers face some challenges and ranked in order of pressing challenges as; low sales price of farm produce, late delivery of farm inputs, high interest rates, low income, high transaction cost, high default rate, and limited access to market.

5.3 Recommendations

Based on the conclusion, the following recommendations were made:

1. Promoters of outgrower schemes should link up with NGOs to acquire support for its members because NGOs influence farmers' participation in outgrower schemes.
2. Outgrower scheme programs should target women because they are more likely to participate in outgrower schemes.
3. FBOs can be an initial point of entry into outgrower schemes because FBO members were more likely to participate in outgrower schemes, hence FBO sustainability is in sustaining outgrower schemes.
4. Policy-makers and NGOs should promote outgrower schemes through awareness creation, since, participating in outgrower schemes influences and enhances access to bigger credit.
5. Banks and other financial institutions should also provide credit to nucleus farmers to be disbursed to individual smallholder farmers to increase their access to credit.
6. Government and development partners should design and implement sustainable marketing systems to address low sales price of farm produce.

REFERENCES

Abdulai, S., Zakariah, A., & Donkoh, S. A. (2018). Adoption of rice cultivation technologies and its effect on technical efficiency in Sagnarigu District of Ghana. *Cogent Food & Agriculture*, 4(1), 1-14.

Abdulai, Y., & Al-hassan, S. (2016). Effects of Contract Farming on Small-Holder Soybean Farmers' income in the Eastern Corridor of the Northern Region, Ghana. *Journal of Economics and Sustainable Development*, 7 (2), 103-113.

Abdul-Rahman, F. A., & Donkoh, S. A. (2015). Analysis of the Maize Value Chain Development in the Northern Region, the case of the Association of Church Development Programme (ACDEP*). Ghana Journal of Science, Technology and Development*, 3 (1), 47-62.

Abebe, G. K., Bijman, J., Kemp, R., Omta, O., & Tsegaye, A. (2013). Contract farming configuration: Smallholders' preferences for contract design attributes. *Food Policy*, 40, 14-24.

Abwino, E. N., & Rieks, H. (2007). Outgrower system through contract farming: Zambia. GroLink (No. 2007-04). *Agro Eco Report*.

ActionAid (2015). Contact farming and Outgrower schemes. A policy paper. March, 2015. *International Registration number*: 27264198 www.actionaid.org/sites/files/actionaid/contract_farming.pdf

Adejobi, O., & Atobatele, J. T. (2008). An analysis of loan delinquency among small scale farmers in Southwestern Nigeria: application of logit and loan performance indices. *East African Agricultural and Forestry Journal*, *74*(3), 149-157.

Adong, A., Mwaura, F., & Okoboi, G. (2012). What factors determine membership to farmer groups in Uganda? Evidence from the Uganda Census of Agriculture 2008/9. Economic Policy Research Centre (EPRC). Research Series No. 98

Akudugu, M. A. (2012). Estimation of the Determinants of Credit Demand by Farmers and Supply by Rural Banks in Ghana‟s Upper East Region, *Asian Journal of Agriculture and Rural Development, 2*(2), 189-200.

Akudugu, M. A., Egyir, I. S., & Mensah-Bonsu, A. (2009). Women farmers' access to credit from rural banks in Ghana. *Agricultural Finance Review*, 69(3), 284-299.

Amanor, K. S. (2011). From farmer participation to pro-poor seed markets: The political economy of commercial cereal seed networks in Ghana. *IDS Bulletin*, 42(4), 48-58.

Amanor, K. S., & Pabi, O. (2007). Space, time, rhetoric and agricultural change in the transition zone of Ghana. *Human Ecology*, *35*(1), 51-67.

Amanor-Boadu, V., Zereyesus, Y., Ross, K., Ofori-Bah, A., Adams, S., Asiedu-Dartey, J., ... & Salin, M. (2015). Agricultural Production Survey for the Northern

Regions of Ghana: 2013-2014 Results. Final Report. METSS/USAID Ghana.

Anang B.T., Sipiläinen T., Backman S., & Kola J. (2015). Factors influencing smallholder farmers' access to agricultural microcredit in Northern Ghana. *African Journal of Agricultural Research*,10(24), 2460-2469.

Aryeetey, E., & Hyuha, R. (1991). The Informal Financial Sector and Markets in Africa: An Empirical Study. Economic Reform in Sub-Saharan Africa. In A world Bank Symposium, Washington DC. The World Bank

Azumah, S. B., Donkoh, S. A., & Ehiakpor, D. S. (2016). Examining the determinants and effects of Contract Farming on Farm Income in the Northern Region of Ghana. Ghana Journal of Science, Technology and Development, 4(1), 1-10.

Baffoe, G., Matsuda, H., Nagao, M., & Akiyama, T. (2014). The dynamics of rural credit and its impacts on agricultural productivity: an empirical study in rural Ghana. OIDA International Journal of Sustainable Development, 7 (5), 20-32

Banful, A. B. (2011). Old problems in the new solutions? Politically motivated allocation of program benefits and the "new" fertilizer subsidies. World Development, 39 (7), 1166-1176.

Barrett, C., Bachke, M., Bellemare, M., Michelson, H., Narayanan, S. and Walker, T. (2012), "Smallholder participation in contract farming: comparative evidence from five countries", World Development, 40 (3), 715-730.

Baumann, P. (2000). "Equity and Efficiency in Contract Farming Schemes: The Experience of Agricultural Tree Crops." London: Overseas Development Institute, Working Paper No. 139.

Bawumia, M. (2010). Monetary policy and financial sector reform in Africa: Ghana's experience. *La Vergne*, TN: Lightning Source.

Bellemare, M. F. (2012). As you sow, so shall you reap: The welfare impacts of contract farming. *World Development*, *40*(7), 1418-1434.

Bijman, J. (2008). Contract farming in developing countries. *An overview of the literature, Wageningen University, Department of Business Administration (Working Paper)*. www.library.wur.nl

Binswanger-Mkhize, H., & McCalla, A. F. (2010). The changing context and prospects for agricultural and rural development in Africa. *Handbook of agricultural economics*, *4*, 3571-3712.

Biyase, M., & Fisher, B. (2017). Determinants of Access to Formal Credit by the Poor Households. *Studia Universitatis Babes-Bolyai Oeconomica*, 62(1), 50-60.

Braimoh, A. K., & Vlek, P. L. G. (2006). Soil quality and other factors influencing maize yield in northern Ghana. *Soil use and management*, *22*(2), 165-171.

Breisinger, C., X. Diao, J. Thurlow, B. Yu, and S. Kolavalli. (2008). Accelerating Growth and Structural Transformation: Ghana's Options for Reaching Middle-Income-Country Status. IFPRI Discussion Paper 750. Washington, DC: International Food Policy Research Institute.

Brempong-Asuming, V. (2003). Economic and Agricultural Policy Reforms and their effects *Bulletin No. 145*, F.A.O, Rome, 161.

Byerlee, D., De Janvry, A., & Sadoulet, E. (2009). Agriculture for development: Toward a new paradigm. *Annu. Rev. Resour. Econ.*, 1(1), 15-31.

Casuga, M. S., Paguia, F. L., Garabiag, K. A., Santos, M. T. J., Atienza, C. S., Garay, A. R., ... & Guce, G. M. (2008). Financial Access and Inclusion in the Agricultural Value Chain. APRACA IFAD, Janvier.

Chandio, A. A., Jiang, Y., Wei, F., Rehman, A., & Liu, D. (2017). Famers' access to credit: Does collateral matter or cash flow matter?—Evidence from Sindh, Pakistan. *Cogent Economics & Finance*, 5(1), 1369383.

Chauke, P. K., Motlhatlhana, M. L., Pfumayaramba, T. K., & Anim, F. D. K. (2013). Factors influencing access to credit: A case study of smallholder farmers in the Capricorn district of South Africa. *African Journal of Agricultural Research*, 8(7), 582-585.

Chavas, J., P. (2001). Structural Change in Agricultural Production: Economics, Technology and Policy. *Gardner, B. L., Rausser, G. C. (eds). Handbook of Agricultural Economics,* (1), 263-285.

Cochran, William G. (1977). "The estimation of sample size." . Sampling techniques no. 3:72-90.

Creswell, J. W. (2003). Research design: Qualitative, quantitative, and mixed methods design. Sage, London. Book.

Da Silva, C. A., & Ranking, M. (2013). Contract farming for inclusive market access. Food and Agriculture Organization of the United Nations (FAO), Rome, Italy, ISBN: ISBN 978-92-5-108061-0, Pages: 227

Danso-Abbeam, G., Cobbina, M. T., & Antwi, R. A. (2016). Agricultural credit utilization among farmers in Bole district of Northern region, Ghana. *Russian Journal of Agricultural and Socio-Economic Sciences*, 51(3), 70-80.

De Schutter, O. (2011). How not to think of land-grabbing: three critiques of large-scale investments in farmland. *The Journal of Peasant Studies*, 38(2), 249-279.

Delgado, C., L. (1999). Sources of Growth in Smallholder Agriculture in Sub-Saharan Africa: The Role of Vertical Integration of Smallholder Farmers with Processors and Marketers of High-value Added Items. *Agrekon,* 38(1), 165-189.

Denkyirah, E. K., Adu, D. T., Aziz, A. A., Denkyirah, E. K., & Okoffo, E. D. (2016). Analysis of the factors influencing smallholder rice farmers' access to credit in the upper east region of Ghana. *Asian Journal of Agricultural Extension, Economics & Sociology*, 10(4), 1-11.

Diagne, A., & Demont, M. (2007). Taking a new look at empirical models of adoption: Average treatment effect estimation of adoption rates and their determinants. *Agricultural Economics*, 37(2-3), 201-210.

Dittoh, S. (2006). Effective aid for small farmers in Sub-Saharan Africa: southern civil society perspective. *Ghana Case Study*.

Dorward, A., Kydd, J., Morrison, J., & Urey, I. (2004). A policy agenda for pro-poor agricultural growth. *World development*, 32(1), 73-89.

Eaton, C., & Shepherd, A. (2001). Contract farming: partnerships for growth. *Agricultural Services Bulletin* No. 145. Rome, Food & Agriculture Organization (FAO).

Elias, S., Ahmad, I., M., & Patil B.L. (2015). The Determinants of access to agricultural credit for small and marginal farmers' in Dharwad district, Karnataka, India. *Research Journal of Agriculture and Forestry Sciences*. 3(5), 1-5

Etonihu, K. I., Rahman, S. A., & Usman, S. (2013). Determinants of access to agricultural credit among crop farmers in a farming community of Nasarawa

State, Nigeria. *Journal of Development and Agricultural Economics*, 5(5), 192-196.

Ettah, O. I. (2015). Effect of Credit Acquisition and Repayment on Agricultural Production in Cross River State, Nigeria (Doctoral dissertation). University of Nigeria,Nsukka

Etwire, P. M., Atokple, I. D., Buah, S. S., Abdulai, A. L., Karikari, A. S., & Asungre, P. (2013). Analysis of the seed system in Ghana. *International Journal of Advance Agricultural Research*, 1(1), 7-13.

Food and Agriculture Organisation of the United Nations (FAO). (2012). *Guiding principles for responsible contract farming operations.* Rome: FAO Report 2012.

Ghana Statistical (GSS) (2014): Ghana Living Standards Survey Round 6 (GLSS 6), Main Report, pp 102, Accra, Ghana.

Ghana Statistical Service (GSS) (2017). Annual Gross Domestic Production (GDP) Report, Ghana Statistical Service, Accra. www.statsghana.gov.gh/.../GDP/GDP2018/2017%20Quarter%204%20and%20annual

Glover, D., & Kusterer, K. (1990). Small farmers, big business. *Contract Farming and Rural Development. San Martin's Press. New York.*

Greene, W. H. (2003). Econometric analysis. Pearson Education India.

GSS (2012). 2010 Population and Housing Census. District Analytical ReportUpper East Region. Ghana Statistical Service (GSS).

Guyver, P., & MacCarthy, M. (2011). The Ghana grains partnership. *International Journal of Agricultural Sustainability*, 9(1), 35-41.

Hall R., Scoones I., & Tsikata D., (2017). Plantations, outgrowers and commercial farming in Africa: agricultural commercialisation and implications for agrarian change. *The journal of Peasant studies.* 44(3), 515-537.

Hananu, B., Abdul-Hanan, A., & Zakaria, H. (2015). Factors influencing agricultural credit demand in Northern Ghana. African Journal of Agricultural Research, 10(7), 645-652.

Heckman, J.J. (1979): The Common Structure of Statistical models of Truncated, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models. *Annals of Economic and Social Measurement:* 5 (4), 475-492.

Herrmann, R. T. (2017). Large-scale Agricultural investments and smallholder welfare: a comparison of wage labor and outgrower channels in Tanzania. *World Development*, 90, 294-310.

Herrmann, R. T. (2017). Large-scale agricultural investments and smallholder welfare: A comparison of wage labor and outgrower channels in Tanzania. *World Development*, 90, 294-310.

Houssou, N., Chapoto, A., & Asante-Addo, C. (2016). Farm transition and indigenous growth: The rise to medium-and large-scale farming in Ghana. *Intl Food Policy Res Inst*. 1499.

Hudson, D. (2000). *Contracting in Agriculture: A Primer for Leaders*. Research Report 2000–007. Department of Agricultural Economics. Mississippi: Mississippi State University.

Huffman, W. E., & Evenson, R. E. (2006). Do formula or competitive grant funds have greater impacts on state agricultural productivity?. *American Journal of Agricultural Economics*, 88(4), 783-798.

Hussain, A., & Thapa, G. B. (2016). Fungibility of smallholder agricultural credit: empirical evidence from Pakistan. *The European Journal of Development Research*, 28(5), 826-846.

Idiong, I. C. (2007). Estimation of farm level technical efficiency in smallscale swamp rice production in cross river state of Nigeria: a stochastic frontier approach. *World Journal of Agricultural Sciences*, 3(5), 653-658.

IFAD. (2012). Enabling Poor Rural People to Overcome Poverty. Annual Report 2012. International Fund for Agricultural Development (IFAD), Rome, Italy.

Iliyasu, Y., Orifah, O., & Ahungwa, T. (2014). Assessment of Rural Farmers' Access to Credit in Jigawa State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 21(4): 1-12

Institute of Statistical, Social and Economic Research (ISSER) (2011). The State of the Ghanaian Economy in 2010, ISSER, University of Ghana. 28, 128-130.

International Finance Cooperation (IFC). (2014). *Innovative agricultural SME finance models.* Washington, DC: IFC Report, 2014.

Isitor, S. U., Babalola, D. A., & Obaniyi, K. S. (2014). An analysis of credit utilization and farm income of arable crop farmers in Kwara State, Nigeria. *Global Journal of Science Frontier Research*, 14(10), 26-34.

Iyanda, J. O., Afolami, C. A., Obayelu, A. E., & Ladebo, O. J. (2014). Social capital and access to credit among cassava farming households in Ogun State, Nigeria. *Journal of Agriculture and Environmental Sciences*, 3(2), 175-196.

Jones, S., & Gibbon, P. (2011). Developing agricultural markets in sub-Saharan Africa: organic cocoa in rural Uganda. *Journal of Development Studies*, 47(10), 1595-1618.

Kaaria, S., Osorio, M., Wagner, S., & Gallina, A. (2016). Rural women's participation in producer organizations: An analysis of the barriers that women face and strategies to foster equitable and effective participation. *Journal of Gender, Agriculture and Food Security*, 1(2), 148-167.

Kaminski, J., Headey, D., & Bernard, T. (2009). *Institutional reform in the Burkinabè cotton sector and its impacts on incomes and food security: 1996-2006. Intl Food Policy Res Inst*. 920.

Katchova, A. L. (2005). Factors affecting farm credit use. *Agricultural Finance Review*, 65(2), 17-29.

Key, N. & Runsten, D. (1999). Contract Farming, Smallholders and Rural Development in Latin America: The Organization of Agro-processing Firms and the Scale of Outgrower Production. *World Development*, 27 (2). 381-401.

Kosgey, Y. K. K. (2013). Agricultural credit access by grain growers in Uasin-Gishu County, Kenya. *IOSR J. Econ. Fin*, *2*(3), 36-52.

Labaree, R. V. (2009). Research Guides: Organizing Your Social Sciences Research Paper: Types of Research Designs. Book.

Legendre, P. (2005). Species associations: the Kendall coefficient of concordance revisited. *Journal of agricultural, biological, and environmental statistics*, 10(2), 226.

Lejárraga, I. (2010). Roaring Tiger or Purring Pussycat? A Growth Diagnostic Study of Ghana. In annual meeting of the American Economic Association, Atlanta, January, (Vol. 4).

Loggoh, B. (2013). *The Contribution of Outgrower Scheme to Farmers Livelihood: A Case of Oil Palm Farmers in the Kwaebibirem District of Ghana* (Doctoral dissertation, University of Ghana).

Loureiro, M. L., & Umberger, W. J. (2007). A choice experiment model for beef: What US consumer responses tell us about relative preferences for food safety, country-of-origin labeling and traceability. *Food policy*, 32(4), 496-514.

Maddala, G. S. (1983). Limited-dependent and qualitative variables in econometrics (No. 3). Cambridge university press.

Masakure, O., & Henson, S. (2005). Why do small-scale producers choose to produce under contract? Lessons from nontraditional vegetable exports from Zimbabwe. *World Development*, 33(10), 1721-1733.

Masten, S.E. (2000). Transaction-Cost Economics and the Organization of Agricultural Transactions. *Baye et al. (Eds) Industrial Organization Advances in Applied Microconomics*. Emerald Group, Bingley.

Mathebula, J. H. (2015). Determinants of household participation in agricultural production in Shatale Region of the Bushbuckridge local Municipality, Mpumalanga Province (Doctoral dissertation, University of Limpopo).

Mattthew, A. O., & Uchechukwu, A. A. (2014). Rural farmers sources and use of credit in Nsukka local government area of Enugu State, Nigeria. Asian Journal of Agricultural Research, 8(4), 195-203.

Miller, L.F. and Osuntogun (1975). "Present and potential use of credit by small maize and rice farmers in western and Kwara States Nigeria" Technical Report AETR /75.3 Department of Agric Economics and Extension, University of Ibadan, Nigeria.

Ministry of Food and Agriculture (MoFA) (2010). Statistics, Research, and Information Directorate (SRID), Accra- Ghana. 2010 Agricultural Data.

Ministry of Food and Agriculture (MOFA). (2011). *Medium Term Agriculture Sector Development Plan (METASIP). 2011-2015*. Ministry of Food and Agriculture, Accra.

Ministry of Food and Agriculture (MOFA). (2016). Agriculture in Ghana: Facts and Figures (2015): Accra-Ghana.

Miyata, S., Minot, N., & Hu, D. (2009). Impact of contract farming on income: linking small farmers, packers, and supermarkets in China. *World development*, 37(11), 1781-1790.

Moyo, M. (2014). Effectiveneness of a contract farming arrangement: a case study of tobacco farmers in Mazowe district in Zimbabwe (Doctoral dissertation, Stellenbosch: Stellenbosch University).

Musara J.P., Zivenge E., ChagwizaG., Chimvuramahwe J., & Dube P., (2011). Determinants Of Smallholder Cotton Contract Farming Participation In A

Recovering Economy: Empirical Results Frompatchway District, Zimbabwe. *Journal of Sustainable Development in Africa*, 13 (4), 1-3.

Nagarajan, G., & Meyer, R. L. (1995). Collateral for Loans: When Does it Matter?. Ohio State University. Department of Agricultural Economics and Rural Sociology. ESO (Economics and Sociology Occasional Paper). No. 2207. http://hdl.handle.net/1811/66599

National Development Planning Commission (NDPC). (2010). Medium-Term National Development Policy Framework: Ghana Shared Growth And Development Agenda (GSGDA), 2010-2013. 1:

Njogu, G. K., Njeru, A., & Olweny, T. (2017). Influence of Technology Adoption on Credit Access among Small Holder Farmers: A Double-Hurdle Analysis. *Africa International Journal of Management Education and Governance* (AIJMEG), 2 (3) 60-72.

Nouman, M., Siddiqi, M. F., Asim, S. M., & Hussain, Z. (2013). Impact of socio-economic characteristics of farmers on access to agricultural credit.*Sarhad Journal of Agriculture*, *29*(3), 469-476.

Nwaru, J. C., & Onuoha, R. E. (2010). Credit use and technical change in smallholder food crop production in Imo State of Nigeria. *New York Science Journa*l, 3(11), 144-151.

Odu O.O., Okoruwa V.O., Adenegan K.O. and Olajide A.O. (2014). Determinants of Rice Farmer's Access to Credit in Niger State, Nigeria. *Journal of Rural Economics and Development*, 20(18): 221 – 229.

Okojie, V. (2010). Innovative financing for university libraries in sub-Saharan Africa. *Library management*, 31(6), 404-419.

Olomola, A., & Gyimah-Brempong, K. (2014). Loan demand and rationing among small-scale farmers in Nigeria. International Food Policy Research Institute (IFPRI) Discussion Paper 01403.

Olubiyo, S. O. (2009). The changing phase of farm credit delivery in Nigeria: a review of nature, characteristics and accessibility. *Savings and Development*, 33 (2), 133-151.

Opoku-Mensah, S. (2012). Logistic Analysis of factors motivating smallholder farmers to engage in Contract farming arrangements with processing firms in Ghana. *J Biolo, Agri healthcare*, *2*, 58-73.

Osei-Assibey, E. (2009). Financial exclusion: what drives supply and demand for basic financial services in Ghana?. *Savings and development*, 33 (3), 207-238.

Owusu-Antwi, G., & Antwi, J. (2010). The analysis of the rural credit market in Ghana. *The International Business & Economics Research Journal*, 9(8), 45-56.

Oya, C. (2012). Contract farming in sub-Saharan Africa: a survey of approaches, debates and issues. *Journal of Agrarian Change*, 12(1), 1-33.

Pasour, E. C. (1998). The potential impact of increased vertical integration on North Carolina grain farmers. *North Carolina State University, Raleigh*.

Poulton, C. Dorward, A., Kydd, J. (1998). *Smallholder cash crop production under market liberalisation: A new institutional economics perspective*. CAB Internat.

Prorustica (2013). Masara N'Arziki 2008–2013: A Review Summary . Suffolk, UK

Prowse, M., (2012). Contract Farming in Developing Countries – *A Review*, February, p.13.http://www.afd.fr/webdav/shared/PUBLICATIONS/RE-CHERCHE/Scientifiques/A-savoir/12-VA-A-Savoir.pdf

Quaye, W. (2008). Food security situation in northern Ghana, coping strategies and related constraints. African journal of agricultural research, 3(5), 334-342.

Ragasa, C., Lambrecht I., & Kufoalor D. S., (2017). Limitations of Contract Farming as a Pro-poor Strategy The Case of Maize Outgrower Schemes in Upper West Ghana. Development Strategy and Governance Division. IFPRI discussion paper.

Rahji, M. A. Y., & Fakayode, S. B. (2009). A multinomial logit analysis of agricultural credit rationing by commercial banks in Nigeria. *International Research Journal of Finance and Economics*, 24(91), 97-103.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55.

Sambuo, D. (2013). Tobacco contract farming participation and income in Urambo; Heckma's selection model. *Journal of Economics and Sustainable Development*, 5 (28), 230-237.

Sampoa Apam, L. (2012). An assessment of the impact of Small Scale irrigation schemes on livelihoods and poverty reduction in the Upper East Region (Doctoral dissertation).

Saqib, S. E., Kuwornu, J. K., Panezia, S., & Ali, U. (2018). Factors determining subsistence farmers' access to agricultural credit in flood-prone areas of Pakistan. *Kasetsart Journal of Social Sciences*, 39(2), 262-268.

Sebatta, C., Mugisha, J., Katungi, E., Apolo, K., Kasharu, A. K., & Kyomugisha, H. (2015). Adding Value at the Farm: The Case of Smallholder Potato Farmers in the Highlands of Uganda. *Asian Journal of Agricultural Extension, Economics & Sociology*, 4(3), 210-223.

Sekyi, S. (2017). Rural Households' Credit Access and Loan Amount in Wa Municipality, Ghana. *International Journal of Economics and Financial Issues*, 7(1), 506-514.

SEND Ghana, (2014). Women and Smallholder Agriculture in Ghana. Policy Brief No. 4. www.sendwestafrica.org/.../Women%20and%20Smallholder%20Agriculture%20in%2.

Shumba, E. M., Roberntz, P., & Kuona, M. (2011). Assessment of sugarcane outgrower schemes for bio-fuel production in Zambia and Zimbabwe. World Wide Fund (WWF) for Nature. Harare, Zimbabwe, 1-19.

Simmons, P. (2002). Overview of smallholder contract farming in developing countries. Armidale, Australia: Graduate School of Agricultural and Resource Economics, University of New England.

Smalley, R. (2013). Plantations, contract farming and commercial farming areas in Africa: A comparative review. Land and Agricultural Commercialisation in Africa (LACA) Working Paper 055. www.future-agricultures.org

Steel, W. F. and Andah, D. O. (2003) Rural and Micro Finance Regulation in Ghana: Implications for Development and Performance of the industry; Africa Region Working Paper Series No. 49; World Bank.

Stringfellow, R. (1996). Smallholder outgrower schemes in Zambia. Research Report completed under ODA Crops Post-Harvest Programme, Project No. A0439 http://r4d.dfid.gov.uk/Output/55540/Default.aspx

Swain, B. B. (2012). Determinants of Farmers' Participation in Contract Farming: The Cases of Gherkin and Paddy Seed in Andhra Pradesh, India. *Millennial Asia*, 3(2), 169-185.

Swinnen, J. F. M. (2007). Global Supply Chains, Standards and the Poor: How the Globalization of Food Systems and Standards Affects Rural Development and Poverty (Wallingford, UK: CABI).

Tiffin, R., & Irz, X. (2006). Is agriculture the engine of growth?. *Agricultural Economics*, 35(1), 79-89.

UNCTAD (2009). *World Investment Report 2009 on Transnational Corporations, Agricultural Production and Development*, UNCTAD/DIAE, Geneva, 2009.

USAID-ADVANCE (2014). Agriculture Development and Value Chain Enhancement Feed the Future Activity. A USAID Feed The Future Initiative. Final Report.

Vaeth, S., & Kirk, M. (2011). Linkages between investors and the local population: Evidence from the oil palm sector in Ghana. In *Annual World Bank Conference on Land and Poverty* (18-20).

Varajidas, B. B. (2005). Contract farming's credit schemes as an alternative credit source for the smallholders: A case study from Mozambique (Master's thesis, University of OSLO).

Vellema, S. (2000). Technology and Control in Philippine Contract Farming: The Cases of Asparagus Production and Maize Seed Production. *International Journal of the Sociology of Agriculture and Food*, 8(1): 25–34

Vermeulen & Goad (2006). '*Towards Better Practice in Smallholder Oil Production'.Natural Resource Issues Series (5)*. International Institute for Environmental Development. London, UK.

Warning, M. and Nigel, K. (2002). "The Social Performance and Distributional Consequences of Contract Farming: An Equilibrium Analysis of the Arachide de Bouche Program in Senegal," *World Development*, 30(2), 255–63.

Wolf, S., Hueth, B., & Ligon, E. (2001). Policing mechanisms in agricultural contracts. *Rural Sociology*, 66(3), 359-381.

Wood, T. N. (2013). *Agricultural development in the northern savannah of Ghana* (Doctoral dissertation, The University of Nebraska-Lincoln).

Wooded, J.J. (2003). Potential of contract as a mechanism for commercialization of Smallholder agriculture. The Zimbabwe Case Study. Harare. Retrieved from www.fao.org.

World Bank. (2007). *World Development Report 2008: Agriculture for Development*. World Bank, Washington D.C.

Yaron, J., & Mundial, B. (1992). *Rural finance in developing countries* (Vol. 875). World Bank.

Ziba, D. (2015). The impact of irrigation schemes on farmers' income and livelihoods in the Upper East region of Ghana (Doctoral dissertation, University of Ghana, Legon).

APPENDICES

APPENDIX 2: SURVEY QUESTIONNAIRE

FARMER ASSESSMENT QUESTIONNAIRE

ASSESSING THE EFFECTS OF AGRICULTURAL OUTGROWER SCHEMES ON CREDIT ACCESS AND UTILIZATION IN THE UPPER EAST REGION

UNIVERSITY FOR DEVELOPMENT STUDIES – GRADUATE SCHOOL

Hello, my name is ……..., and l am collecting data on behalf of JOSHUA DIEDONG, a Masters Student on the topic "**ASSESSING THE EFFECTS OF AGRICULTURAL OUTGROWER SCHEMES ON CREDIT ACCESS AND UTILIZATION IN THE UPPER EAST REGION**". This is expected to strengthen credit access and utilization among smallholder farmers. Please note that your selection is random and any information you provide me will be treated strictly confidential and use for academic purposes only.

Table 1: Location Characteristics

District ……..	Date……/……/……/
Community Name…….	*Mobile contact* if any……
Name of farmer…….……..	

SECTION 1 A: FARMER'S SOCIO-DEMOGRAPHIC DATA

Table: 2 Respondents' socio-demographic characteristics

(1) Sex of respondent:	1) Male ☐ 2) Female ☐
(2) What is your age?	
(3) Are you the head of the household?	1) Yes ☐ 2) No ☐
(4) Marital status of respondent:	1) Single ☐ 2) Married ☐ 3) divorced ☐ 4) widowed d ☐
(5) How many people are in this household?	
(6) How many people are 18 years or above in this household?	
(7) How many years did you spend in school?	
(8) If yes, which level of highest education?	None [ ] Primary school [ ] JHS [ ] SHS [ ] Tertiary [ ]
(9) Residence:	1)Native ☐ 2) Foreign ☐

(10) Is farming your main occupation? Yes [ ] No [ ]

(11) How many years have you been in crop farming?.....

(12) What other income-generating activities do you engage in? …(table 3 below)

Table 3: Other Occupation of Respondents

Other income-generating activities NB: tick as many as are applicable
a. Salaried worker ☐
b. Self-employment ☐
c. Wage employment ☐
d. Student ☐
e. Not Working ☐

PART I: FARMERS' PARTICIPATION IN OUTGROWER SCHEMES

1) Have you ever heard about nucleus farmer-outgrower farmers' scheme? 1. Yes [2. No [ ]

2) Are you a member of any outgrower scheme? 1. Yes [ ] 2 No [ ] (**if no, skip to 10**)

3) ***If yes***, what was your motive for joining the scheme? (state at least three)

……

……

……

4) If yes, for how many years have you joined the scheme?

……

5) Do you have an idea of how many people have joined your scheme? 1 Yes ( )
2 No ( )

6) ***If yes***, how many people are in your scheme? .....

7) Where did you hear of the scheme? Choose options from table (4) below:

Table 4: Source of Awareness on Out grower scheme

MEANS	**RESPONSE**
7.1 TV station	YES ☐ NO ☐
7.2 Radio	YES ☐ NO ☐
7.3 MOFA	YES ☐ NO ☐
7.4 NGOs	YES ☐ NO ☐
7.5 Farmers	YES ☐ NO ☐
7.6 Friends/family	YES ☐ NO ☐
7.7 Seminars/Workshops	YES ☐ NO ☐
7.8 Nucleus farmer	YES ☐ NO ☐

8) What is your relationship with the nucleus farmer?.....

9) On what basis were you selected onto the scheme? a .Farm size [ ] b .Good relationship with nucleus farmer [ ] Experience in farming [ ] Others (specify)…….

10) ***If no***, what were your reasons for **not** joining the scheme? (state at least three)

1.……
…

2.……

3.……

11) What is the distance from your house to the nearest input shop?

.....km^2.

12) What is the distance from your house to the nearest market where you can sell your produce? .....km^2

PART II A: AGRICULTURE CREDIT ACCESSIBILITY

1. Have you applied for credit support in the last 12 months?1 Yes ( ) 2 No ( )
2. If yes, what type of credit?

a) Cash credit (loan) [ ] b) Input credit [ ] c) Mechanization [ ]

3. From which source?. 1. BANK [ ] 2. Nucleus farmer [ ] 3. Money lender [ ] 4. Credit union [ ] 5. Friends [ ] 6. Relative [ ] 7. Other (s)……..
4. Were you given the total credit (s) you applied for? 1. Yes [ ] 2. No [ ]
5. Which type of credit did you obtain? 1. Cash [ ] 2. Input [ ] 3. Mechanization [ ]
6. Were you given the credit **on time** at the beginning of the farming season?1 Yes [ ] 2 No [
7. **If cash credit,** how much did you apply for? GH₵……..
8. Were you given the credit you applied for? 1. Yes [ ] 2. No [ ]
9. If yes, how much were you given? GH₵.....
10. How much was due for repayment? GH₵ ……..
11. How much was paid at the end of the schedule period? .....
12. If input, how many did you obtain? (Fill in Table 5.)

Table 5: Characteristics of Input credit

Input	Qty	Unit price	13. How many bags (100kg) of maize were **given out or sold** for repayment of input credit?	Prevailing unit price (GHS) of produce (maize)
12.1 Chemical fertilizer (NPK 50kg)				
12.2 Sulphate of Ammonia (50 kg)				
12.3 Seed (kg)				
12.4 Weedicide (litres)				
12.5 Pesticide (litres)				

14. **If mechanization credit**, how many services did you obtain? (Fill in Table 6.)

Table 6: Characteristics of Mechanization credit

Activity	14.1 Frequency	Unit price	15. How many bags (100kg) of maize were sold or	Prevailing unit price (GHS) of

			given out for repayment of mechanization credit?	produce (maize)
a. Ploughing				
b. harrowing				
c. c. Transportation				
d. Others				

16. In general, do you have easy access to credit? 1 Yes ( ) 2 No ( )

17. Do you have knowledge of the credit packages for farmers by? a. outgrower schemes YES [ ]. NO [ ] b. financial institutions YES [ ] NO [ ]

18. What is the distance from your house to the nearest bank? (km) ……..

19. Have you ever defaulted in a bank loan?1 Yes ( ) 2 No ( ) ; Give reasons ……

PART II B: CREDIT UTILIZATION

20. On what name in terms of type of crop did you apply for the credit? 1. Maize [ ] 2. Rice [ ] 3. Soybean [ ] 4. Others (please specify) ……

21. Did you use the credit for the intended purpose? 1. Yes [ ] 2 No [ ]

22. If no, in terms of crop, where did you divert the credit? ……..……

23. Why did you divert the credit?

……..……

……

24. How much of the credit was used for the intended purpose?

…….

25. Apart from the credit, did you receive any other support from the scheme?1 Yes ( ) 2 No (If yes, what kind of support(s) did you receive? (list them)

……

……

SECTION 2 C: FARM INPUT EMPLOYED

a. SCHEME MEMBERS

26. Within the scheme how much of the following inputs did you get? (*please indicate them*)

Table 7: Characteristics of Input Used by scheme members for 2016/2017 cropping season

a. Accessed from scheme			**b. Outside the scheme**	
AGRIC. Inputs	**QTY/No.**	**Unit Cost**	**QTY/No.**	**Unit Cost**

i.Chemical fertilizer (NPK)				
i.Chemical fertilizer (S/A)				
i.Seed (kg)				
.Herbicides (litres)				
.Tractor plough services (no.)				
i.Harvesting services (no.)				
i.Threshing (bags)				

B) NON-SCHEME MEMBERS

27. Did you obtain input credit for your farm in the 2016/2017 cropping season?

1. Yes [ ] 2. No [ ]

28. How much of the following inputs did you purchase? (*please indicate them*)

Table 8: Characteristics of Input Used by Non-scheme members in production in the 2016/2017 cropping season

AGRIC. inputs	**QTY/ Number**	**Unit Cost**
i. Chemical fertilizer (NPK)		
ii. Chemical fertilizer (S/A)		
iii. Seed (kg)		
iv. Herbicides (litres)		
v. Tractor plough services (no.)		

vi. Harvesting services (no.)		
vii. Threshing (bags)		

30. Did you employ labour for the following activities on farm? Yes [ ] No [ ]

31. If yes, quantify the activities on table. 9 below

Table 9: Labour Used in production in the 2016/2017 cropping season

AGRIC. inputs	**# family labour (Adult male 18 and above years**	**# hired labour (Adult females 18 and above years**	***Cost***
31.1 Land preparation			
31.2 Ploughing			
31.3 Herbicide spraying			
31.4 Fertilizer application			
31.5 Sowing			
31.6 Weeding			
31.7 Harvesting			

SECTION 2D: LAND CHARACTERISTICS AND CROPS

(32) How many acres of land do you own? .....

(33) What was the size of your maize farm in the 2016/2017 cropping season?

(acres)……..

(34) How many bags (100kg) of maize did you harvest in the 2016/2017 season?

…….

(35) How many bags (100kg) of maize harvested were sold?

……..

(36) What was the price for 1 bag (100kg) of maize sold? …….

SECTION 3F: ACCESS TO SOCIAL NETWORKS AND PUBLIC SUPPORT

(37) Did you receive any extension service in the last 12 months? 1 Yes ( )

2 No ( )

(38) How many times did an extension worker visit your farm?

(39) Are you a member of an FBO? 1 Yes ( ) 2 No ( )

(40) Do you operate a group account? Yes [ ] No [ ]

(41) Did you receive any support from other organizations/NGOs? 1 Yes ( ) 2 No ( )

(42) If yes to (41) above please list

them…….

(43) Did you receive any training on the use of credit? 1. Yes [ ] 2. No [ ]

(44) From whom?

A. Scheme [ ] B. NGO [ ] C. Others (please

specify)……

(45) Did you receive any training on good agronomic practices (GAPs)? 1. Yes [ ] 2. No [ ]

(46) From whom?

A. Scheme [ ] B. extension agent [ ] C. NGO [ ] D. Others (please specify)……

(47). Did you receive any training on input application ? 1. Yes [ ] 2 No [ ]

If yes from whom? ……..

PART III: CHALLENGES OF OUTGROWER SCHEMES

48. Please rank the following constraints of the scheme you are participating in.

Table 10: Ranking of challenges of Outgrower scheme among farmers

Challenges	Rank (1-7) 1 means highest
48.1 High interest on credit	
48.2 Late delivery of input/credit	
48.3 Low purchase price of produce	
48.4 Low income	
48.5 High default rates of credit	
48.6 High transaction cost	
48.7 Others (please specify)	

49. What other benefits do you obtain from being a member of the outgrower scheme?

…….....

THANK YOU