EFFECT OF THE HUNGER PROJECT CREDIT PROGRAMME ON PRODUCTIVITY OF SMALLHOLDER MAIZE FARMERS IN THE KWAHU WEST MUNICIPALITY

By

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A Thesis Submitted to the Department of Agricultural Economics, Agribusiness and Extension, Kwame Nkrumah University of Science and Technology, Kumasi In Partial Fulfillment of the Requirements for the Degree

of

Master of Philosophy in Agricultural Economics

FACULTY OF AGRICULTURE

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

AUGUST, 2015

DECLARATION

I, Isaac Tweneboah Asante, do hereby declare that this thesis is my own work towards the Mphil (Agricultural Economics) and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the university, except where due acknowledgement has been made in the text.

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DEDICATION

This work is dedicated to my late father Mr. Jacob Asante Mensah of blessed memory whose dream was to see me climb high the educational ladder. I also dedicate it to all my siblings and Mrs. Emilia Nortey, former Director of Agriculture Kwahu West Municipality for the support and encouragement in my academic pursuit.

ACKNOWLEDGEMENT

I thank the almighty God for his loving kindness and mercies for seeing me through my work. My profound thanks go to my major supervisor, Dr. D. Awunyo-Vitor for his advice, encouragement and immense contribution to the work; without his professional help the research work could not have been completed successfully. I am also grateful to Dr. K. Ohene-Yankyera.

I will also like to extend my appreciation to Mr. Samuel Ofosu of the Hunger Project for his assistance and Mr. John Kassigah of MoFA. Special thanks go to my colleages, students of the Department of Agricultural Economics, Agribusiness and Extension for their help and support; I salute my good friend Edward Tsinigo for his immense contribution to the success of this work.

My sincere appreciation and thanks goes to Mr. Nathaniel Aboagye Budu, Director of Agric Kwahu West Municipality, not forgetting my lovely friend Gifty Ofosua a.k.a Obaa Yaa Sikapa for her encouragement. I also thank all extension workers of MoFA and the Hunger Project and smallholder maize farmers in the Kwahu West Municipality for their cooperation during data collection.

ABSTRACT

This study examined the effect of the Hunger Project Credit Programme on the productivity of smallholder maize farmers in the Kwahu West Municipality of the Eastern Region of Ghana, using the endogenous switching regression model. Cross sectional data was collected for the 2014 cropping season from 170 maize farmers, 85 beneficiaries and 85 non-beneficiaries. The study further sought to find evidence on whether programme participation had effect on farm input utilization using the propensity score matching method. Special attention was also given to the efficient use of resources by beneficiary farmers. The constraints maize farmers faced in accessing credit from the Hunger Project was analysed using the Kendall's coefficient of concordance to test the degree of agreement between the ranked constraints.

The results of the study showed that gender, age, years of formal education, number of livestock owned by the farmer in tropical livestock unit, maize farming experience, previous year's maize income, farmers' perception of the lending procedures of the Hunger Project and farmers' perception of the distance between residence and the epicenter (loan center) were the factors influencing farmers participation (access to credit) in the Hunger Project Credit Programme.

The study also revealed that participation (access to credit) had a significant effect on farm input usage and farm productivity. However, both beneficiary and nonbeneficiary farmers were not efficient in the use of resources. Time of loan delivery, not being given the full amount applied for and proximity to the epicenter (loan center) are the most critical problems farmers are facing in accessing credit from the Hunger Project.

The study therefore recommends that the hunger project should design policies to encourage more Non-beneficiary maize farmers to take advantage of the credit programme to expand their input use and maximize their productivity. Extension education and training should be intensified to train maize farmers in the kwahu west municipality on the application of recommended rate of farm input to improve their resource use efficiency. Project implementers should as much as practicable address the constraints farmers face in participating or accessing credit from The Hunger Project through timely delivery of credit, increased access to credit and an increase in the amount of credit available to meet borrowers' demand.

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LIST OF ACRONYMS

ATT	Average Treatment Effect on the Treated
Ha	Hectare
IMR	Inverse Mills Ratio
KWMA	Kwahu West Municipal Assembly
MDGs	Millennium Development Goals
MFC	Marginal Factor Cost
MMDAs	Metropolitan, Municipal and District Assembly
MoFA	Ministry of Food and Agriculture
MVP	Marginal Value Product
NGO	Non-Governmental Organisation
NNM	Nearest Neighbour Match
OLS	Ordinary Least Square
PSM	Propensity Score Match
RM	Radius Matching
SMM	Stratification Matching Method
SSA	Sub-Saharan Africa
TFP	Total Factor Productivity
THP	The Hunger Project
TLU	Tropical Livestock Unit

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Maize is the major staple crop in Ghana and contributes appreciably to consumer diets. It accounts for 50-60 percent of total cereal production. It is one of the most important crops for Ghana's agricultural sector and for food security (Armah, 2009). The average yield of maize is about 1.7 t/ha in Ghana (MoFA, 2011) compared to world average of 4.9 t/ha (Edgerton, 2009). However, yield as high as 6.0 t/ha is achievable. Maize production in Ghana is therefore characterized by low productivity. The dawdling productivity growth in maize is attributed to low adoption of improved technologies, including improved varieties and management practices, and low use of purchased inputs, especially fertilizer (Ragasa *et al.,* 2013). Increasing maize productivity can boost food accessibility as well as rural incomes: thus the provisions of extension services and credit facilities for resource constrained farmers have dominated the focus of researchers, policy makers and other development partners.

Maize is an important staple crop, which is enjoyed across the country and in many households; virtually every dish in Ghanaian cuisine uses maize. Its meal is made into porridge, kenkey (Fanti or Ga), banku, tuo zaafi, abolo, kooko and tom brown. For industrial use, maize is sometimes used as a starch source for the brewing industry. The livestock feed industries also depend on maize to prepare feed for poultry and other livestock. It is estimated that about 13 percent of maize produce in the country is used for the animal feeding sector mainly poultry (Rasaga *et al*., 2013). However, the poultry industry's demand for maize, used as feed, was estimated to have grown by 10 percent

annually between 2000 and 2009 and would currently surpass 540,000 mt if birds were fed a proper ration (Hurelbrink and Boohene, 2011).

The importance of maize to the economy and as a food security crop cannot be over-emphasised; there is, therefore, the need to initiate agricultural development projects/programs that aims at enhancing its productivity. This will not only lead to increased food availability but also improvement in the standard of living of the populace.

There is an increasing demand for maize for human consumption and use as animal feed in the country; this requires measures for raising the productivity of maize per hectare. This could be achieved through the use of various policies, programs and projects, such as adoption of improved technologies (use of improved maize seeds, fertilizer and agrochemical), use of tractors, irrigation schemes, provision of credit etc. geared towards an increase in maize productivity growth.

The Government of Ghana, in an attempt to enhance agricultural productivity and maize in particular, has introduced four main subsidy and support programs on fertilizer, mechanization, block farms, and marketing since 2007. All these interventions have similar features like other government-run programs that were introduced and then abandoned in the past (Benin *et al*., 2013). The block farms and the marketing program have been abandoned, the fertilizer subsidy is not always available and when available smallholder farmers cannot afford to purchase it.

The Hunger Project (THP) - Ghana is a non-governmental organization with its headquarters based in New York, USA. It currently operates in Africa, Asia and Latin America. It started its operations in Ghana in 1996 and currently operates in five regions namely. Eastern, Ashanti, Greater Accra, Volta and Central Region (The Hunger Project Ghana, 2013). It scaled up its operation to the Eastern Region in 2006. The Hunger Project covers all metropolitan, municipal and district assembly (MMDAs) with the exception of the new Juabeng Municipality. It currently runs thirty-eight epicentres in the Eastern Region.

The underlying aim of such an enterprise is to reduce hunger and poverty through enhancing smallholder farmers' productivity. The food security and agricultural development component of THP seeks to achieve this objective which is one of the Millennium Development Goals (MDGs) through a number of interventions targeting farmers in rural communities. They include provision of input credit such as improved seed, fertilizer, agrochemicals and financial credit. Enhancing the productivity of smallholder farmers through increased access to farm input and credit has great implications for food security and household income.

There is, therefore, the need to access the effect of the Hunger Project Credit Programme on the productivity of smallholder maize farmers in the Kwahu-West Municipality

1.2 Problem Statement

Poverty and hunger remains a predominantly rural problem and agriculture is generally central to rural livelihoods. To bring farming communities out of hunger and poverty,

government and other development partners have focused on project and programmes to improve agricultural production which is the main economic activity of rural households.

The hunger project –Ghana has been supporting maize farmers in the kwahu West Municipality with Agricultural inputs and loans for the past eight years with the sole aim of reducing hunger and poverty through enhancing agricultural productivity. A preliminary study prior to the introduction of the credit programme gave an indication that maize farmers were producing far below the optimum yield of 2.0 mt/ha due to lack of credit facilities, access to fertilizer and other agro-inputs and frequent access to information on improved farming methods (The Hunger Project Ghana, 2013). The hunger project therefore came in to supply solutions to the challenges that contributed to the low productivity.

However, the credit programme is saddled with high default in the repayment of the credit facilities and most farmers had not taken advantage of the credit programme as expected to maximize their production. This raises the question as to whether the credit received by the maize farmers resulted in improved productivity. It has been argued that agricultural credit increase access to production input, technology and improves the allocative efficiency of farmers which ultimately leads to enhance productivity (Feder et al., 19190; Carter 1984 and Dong et al., 2010).

After eight years of programme implementation in the municipality, The Hunger Project is preparing to fold up. It is therefore logical and prudent to conduct an ex-pose evaluation of the credit intervention to ascertain its effect on maize productivity. The

study therefore seeks to examine the effect of the credit received by maize farmers from The Hunger Project on maize productivity in the Kwahu West Municipality.

1.3 Research Question

The overriding research questions that guide this study are:

1. Does program participation have effect on maize farm input usage?
2. What is the effect of The Hunger Project credit programme on the productivity of maize farmers?
3. Does maize farmers' access to credit enhance their resource use efficiency?
4. What constraints do the maize farmers face in accessing credit from The Hunger Project?
5.

1.4 Research Objectives

Main objective

The main research objective is to assess the effect of The Hunger Project's credit programme on productivity of smallholder maize farmers in the Kwahu West Municipality.

Specific objectives

1. To estimate the effect of The Hunger Project credit programme participation on farm input usage;
2. To determine the effect of The Hunger Project credit programme on maize productivity of farmers;
3. To determine and compare the resource use efficiency of credit beneficiaries and non-beneficiaries; and

4. To analyse the constraints maize farmers face in accessing credit from The Hunger Project.

1.5 Scope and Limitation of the Study

The study aims at assessing the effect of The Hunger Project credit programme on the productivity of smallholder maize farmers. The study is limited to maize farmers within the kwahu west municipality. Farm level data was collected from 85 non-beneficiaries of credit and 85 beneficiaries who cultivate an average farm size of 0.573 and 0.94 hectare respectively under mono cropping system of farming.

Farmers in the study area, like most farmers in Ghana, lack or have low levels of formal education and as such record keeping is a challenge. Some of the respondents lacked the ability to give exact answers to questions due to memory lapse. The study was limited to the Kwahu West Municipality due to time and resource constraints to undertake the study on a larger scale.

1.6 Significance of the Study

Increasing agricultural productivity has the potential to increase food accessibility as well as rural incomes. Programmes and projects aimed at enhancing the productivity of farmers have far-reaching implications on rural household welfare. Thus evaluating the impact of The Hunger Project credit programme on maize farm input usage and productivity will serve as a means of measuring the viability of the credit intervention.

There is a widely held notion that credit enables farmers to employ optimal input levels thus enhancing efficient allocation of input. (Feder et al., 1990). The finding will

provide empirical evidence on farmers resource use efficiency particularly resources provided by agricultural credit programme.

The findings will inform project implementers and other development partners on constraints to programme participation. This will go a long way to enhance the implementation of future intervention to increase participation.

The overall significance of the studies is to provide useful information that could help policy makers, researchers and development partners to enact relevant policies aimed at increasing agricultural productivity in the country.

1.7 Organization of the Thesis

The study is structured using five chapters. Chapter One includes the introduction, statement of the problem, research question, objectives, the scope and significance of the study. Chapter Two gives an overview of the theoretical and empirical literature related to the study and the conceptual framework. Chapter Three presents the research methodology with a brief description of the study area, data collection method and analytical techniques. In Chapter Four, results and discussions of the findings are outlined. Finally, Chapter Five constitutes the summary, conclusions and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introductions

Chapter two gives account of theoretical and empirical literature related to the study. The chapter is structured into ten sections; section 2.1 provides some

definitions of credit, section 2.2 discuses factors influencing farmer's access to credit, section 2.3 discuses factors influencing agricultural programme participation, section 2.4 gives an overview of agricultural productivity; definition, concepts and measurements, section 2.5 discuses factors influencing agricultural productivity followed by empirical studies on credit access and agricultural productivity in section 2.6, section 2.7 discuses the impact of agricultural credit programme on productivity, section 2.8 gives an overview of farmers participation in agricultural credit programme and its impact on farm resource use, farmers resource use efficiency particularly resources provided by agricultural credit programme and the theoretical frame work of the study are presented in section 2.9 and 2.10 respectively.

2.1 Definition of Credit

According to Ozowa (2007) "Agricultural credit is define as all loans and advances granted to borrowers to finance and service production activities relating to agriculture, fisheries and forestry and also for processing, marketing, storage and distribution of products resulting from these activities".

Ellis (1992) "defines credit as the sum of money in favor of a person to whom control over it is transferred, and who undertakes to pay it back".

Beckman and Forster (1969), "defined credit as the power or ability to obtain goods or services in exchange for a promise to pay later".

Adegeye and Dittoh (1985) defined credit as "the process of obtaining control over the use of money, goods and services in exchange for a promise to repay at a future date"

2.2 Factors Influencing Farmers Access to Credit

Many factors have been found to theoretically influence farmers' access to credit. Yehuala (2008) classified these factors into demographic factors; socioeconomic factors; institutional factors; and communication factors.

2.2.1 Demographic factors

Akpan, Patrick, Udoka, Offiong, and Okon, (2013) noted that farmers' age positively influence their access to credit. They emphasised that an increase in the farmer's age implies an increase in exposure and probably experience. On the contrary, Chitungo and Munongo (2013) emphasised that, as people are aging, the returns to experience vanish: in other words, they become less productive and their demand for loans falls.

Hussien (2007) opined that the gender of the farmer has an influence on credit access. It is a widely held notion that female farmers cultivate smaller sized farms and on marginal land as compared to their male counterparts and thus are less productive. Moreover, male farmers possess more assets than female farmers and this significantly influences credit access. Chitungo and Munongo (2013) were of the view that gender is positively related to credit access. They concluded that female-headed households are more risk averse than their male counterparts: Moreover, male headed households are driven by their ego to increase production for societal respect and status.

Chitungo and Munongo (2013) were of the view that household size had a positive influence on farmers' access to credit; and an increase in household size is a motivation for the household to increase its productivity, thus the demand for credit increases. Hussien (2007) was of the opinion that family labour, which is a proxy for household size, influences farmers' access to credit.

2.2.2 Socio-economic factors

Socio-economic factors have been found in the literature to influence farmers' credit access. According to Akpan *et al*., (2013), there is a positive and significant correlation between farm size and farmers' access to credit. Increasing farm size is an incentive to seek credit in order to sustain productivity and expand production capacity of the farm. A number of authors have also indicated a positive relationship between farm size and farmers' access to credit (Hussien, 2007; Jeiyol, Akpan, and Tee, 2013)

According to Etonihu, Rahman, and Usman (2013) the educational level of farmers has a positively and significantly relationship to the rate of credit accessibility. They argue that, educated farmers are likely to understand the benefits of credit in modern production and comprehend extension information on sources and utilization of credit. Owuor (2009) also emphasises that literacy and education levels have a significant positive influence on farm households' ability to access credit information. In addition, an increase in the farmer's formal years of education will increase their information base and decision making ability.

Chauke, Motlhatlhana, Pfumayaramba and Anim (2013), noted that farmers' attitude towards risk has a significant influence on farmers demand for credit. They argued that, although risks and uncertainties are not only unique to agricultural production, they are much more conspicuous in farming than most non- farming activities; thus, farmers who perceive taking a loan for their agricultural activity as risky will not demand for a loan even if it is available. Yehuala (2008) also agree with this assertion.

According to Yehuala (2008), the number of livestock a farmer owns negatively affects access to credit from formal sources. Livestock serve as capital resource for the farmer. Farmers who have livestock sell them during the cropping season when the farmer is financially constrained and this will affect their demand for credit.

Sharma and Zeller (1997) made the assertion that off-farm incomes turn to build borrower confidence and it can be a major source of finance to ensure repayment. Diagne (1999) supported the assertion that an increase in off-farm income raises access to credit. On the contrary, other authors have made the assertion that offfarm income reduces household borrowing needs since they can meet their investment needs. This was found to be the case in both Oboh and Kushwaha (2009) in Nigeria, and Tang, Zhengfei and Songqing (2010) in China.

2.2.3 Institutional factors

According to Akpan *et al*., (2013), membership of a social group has a positive and significant relationship with credit access. They argue that membership of a social group will widen farmer's interactive tendencies and exchange of ideas relating to their

businesses. Yehuala (2008) also opined that membership of farmers' groups has an influence on farmers' access to credit.

Chauke *et al*., (2013) noted that the loan repayment period significantly influences farmers' access to credit. They argued that access to credit decreases with an increase in the loan repayment period. Yehuala (2008) confirmed that the repayment period was a critical factor in influencing access to credit. Chauke *et al*., (2013) further noted that the lending procedure of credit institutions influence farmers' access to credit. Most farmers in developing countries are illiterate, thus finds it difficult to read and write loan procedures that are perceived to be cumbersome and this discourages farmers from participating in the credit market.

Yehuala (2008) opined that collateral required by lending institutions has influence on credit access. Resource poor farmers may lack the security to access credit thus prospective borrowers are likely not to apply for credit even when it is available and they may be denied access when they do.

2.2.4 Communication factors

Yehuala (2008) asserted that farmers extension contact influences farmers' access to credit. Hussein (2007) noted that farmers' extension contact increases adoption of technology which, in most cases, will require credit. Extension contact also increases farmers' decision-making ability.

Akpan *et al*., (2013) noted that the distance from the farmer's residence to the credit source has a negative relationship with credit accessibility. This implies that, as a farmer's residence is further away from the credit sources, the probability of accessing credit reduces. This is associated with the high transaction cost of travelling a long distance to access credit. Other authors have found distance between lender and borrower to have a significant influence on credit access (Chauke *et al*., 2013; Etonihu *et al*., 2013; Hussein, 2007).

2.3 Factors Influencing Agricultural Programme Participation

According to Cole (2006), farmers do not participate in agricultural programmes because they lack knowledge about the programme and confidence in themselves. He was also of the view that most farmers do not have the time and interest to participate. Ghimir, Petheram, and Perkins (2009) stress that the lack of confidence is due to lack of education; and, in addition, most farmers do not participate in agricultural programmes because the intention of most programmes is not made clear to them. They further argued that the lack of interest to participate is mostly due to failure of previous programme interventions.

Scheyvens (2003) is of the opinion that knowledge, skills capital and resources are major factors constraining poor farmers from participating in agricultural programmes. The lack of resource constraints on participation is highlighted by Ajayi (2005) who noted that lack of access to productive resources in the form of land, credit, farm inputs, sufficient extension services and suitable technology to be a limiting factor for women's participation in food production and food security programmes globally.

Farmers' participation in agricultural programmes is driven by incentives they are expected to derive from the programme (Ghimir *et al.*, 2009).

Taking a broader view, Aref (2010) asserted that weak government institutions; poor human resource development and reliance on government in rural communities hinder agricultural programme participation. According to Millar and Dittoh (2004), socio-cultural factors and individual beliefs influence farmer participation and learning. For example, in Ghana's social custom, people feel uncomfortable to attend any event without an invitation, thus programme information should be disseminated effectively. Sherif and Sherif (as cited in Ghimir *et al*., 2009) argued that for people to accept or reject a program is dependent on how they are approached.

Nxumalo and Oladele (2013) opined that unavailability of land, lack of funds and limited resources were major constraints against participation. They, however, claim that age, gender and income are factors that influence participation. Farmers' participation is also influenced by the educational level and training acquired. Moreover, cultivated area and gross farm income are significant variables influencing participation (Ganesh and Surendra, 2005). Oladele (2012) also emphasis that participation is basically influenced by age and education level.

Telayneh (2010) noted that agricultural programme participation is influenced by a broad category of factors, namely institutional, socio-economic, and structural. Institutional factors include inappropriateness to the needs of farmers; distance of the training centre; and lack of facilities and incompetent facilitators. Socio-cultural factors

can be farmers' unawareness and low expectations; and structural factors include a central planning system and weak local institutional capacity.

Farmers' satisfaction, family size, family labour, agricultural income and farmers training are significant factors influencing farmers` participation (Alam, Kobayashi, Matsumura, and Siddighi, 2012). According to Botlhoko and Oladele (2013), the household size of the farmer plays a significant role in the participation of agricultural projects. Sithole, Lagat, and Masuku. (2014) in their study found a number of factors influencing farmers' participation in agricultural programme, these are household distance to scheme, age, farm size, and membership of an association and access to credit.

2.4 Agricultural Productivity; Definition, Concepts and Measurements

Agricultural productivity is defined as the output produced by a given level of input(s) in agricultural production. It is defined as "the ratio of total farm outputs to total inputs used in agricultural production" (Mundlak, 1992).

According to Adewuyi (2006), to increase agricultural productivity requires any one of the following: (1) output and input increase respectively with output increasing proportionately more than inputs; (2) output increase while inputs remain the same; (3) output and input decreases respectively with input decreasing more; and

(4) input decreases while output remains unchanged.

To increase output, there is the need to increase the quality and quantity of input use, such as use of high yield varieties, mechanization of agricultural processes, use of

fertilizers, the use of agrochemicals (herbicides and pesticides) and irrigation in areas where rainfall is inadequate.

Resource poor farmers in sub-Saharan Africa (SSA) lack access to agricultural credit thus cannot afford the aforementioned improved technologies, which has the potential to drive agricultural productivity. To alleviate poverty and speed up rural development it is imperative to improve productivity of the agricultural sector where the majority of the rural population are employed. Conventionally, productivity is defined as the ratio of output to inputs. Two forms of productivity exist: (1) partial factor productivity; and (2) total factor productivity.

2.4.1 Partial Factor productivity

Partial factor productivity (PFP) is defined as the ratio of output and one of the inputs used in production. Partial factor productivity is commonly measured in terms of either land productivity or labour productivity (Block, 1994). Output and yield growth rates are the commonly used indicators of productivity growth in SSA agriculture (Zepeda, 2001). The major flaw of partial factor productivity indices is that they account for only one input, thus all other inputs used in production are not accounted for. Partial measures of productivity tend to be disingenuous, as there is no apparent indicator of what causes it to change. For example, land productivity could bump up due to an increased use of fertilizer, tractor or output mix. Mathematically partial factor productivity is express as:

$$PFP = \frac{Y}{X_i} \qquad 1$$

Where Y is output and X is input used.

To remedy the aforementioned problems a total measure of productivity, the total factor productivity (TFP) was devised.

2.4.2 Total factor productivity

Total factor productivity (TFP) measures agricultural productivity by comparing an index of agricultural output to an index of total factor inputs. In other words, it is a productivity measure that account for all inputs. According to Bushara (2014) **"**total-factor productivity (TFP) is a variable which accounts for effects in total output not caused by traditionally measured inputs of labor and capital". Changes in TFP are usually attributed to technological innovation or improvements.

Considering the Cobb Douglas production function,

$$Y = A_t L^{\beta_1} k^{\beta_2} \qquad 2$$

Where Y represent total output, L is labour input, K is capital input, β_1 and β_2 are elasticity's of labour and capital respectively and A represent technical change, total factor productivity or the Solow residual (which measure the proportionate change in output per time period when input levels are held constant).

2.5 Factors Influencing Agricultural Productivity

According to Hussain and Perera (2004), crop productivity is influenced by a range of factors and services. These factors are: land and water related factors; climatic factors; agronomic factors; socio-economic factors; and farm management factors.

2.5.1. Land and water related factors

Land and water form the basis of agricultural production, without which there cannot be production. To ensure increase productivity, "the quality of land, source of water, quality and quantity of water, and timing of water application should be critically examined" (Hussain and Perera, 2004). Sakthivadivel and Habib (as cited in Hussain and Perera, 2004) suggest a number of ways and means to improve land and water productivity.

These include encouraging the use of improved crop varieties - varieties that can provide increased yields for each unit of water consumed or the same yield with fewer units of water; Promoting high value crops - promoting crops that consume less water or switching to crops that generate higher economic returns per unit of land and water; Re-allocating water from lower to higher value uses at all levels; Promoting crop diversification and multiple cropping on smallholder farms; Improving water management to provide timely and a reliable supply of water to enable poor smallholder farmers to apply water and non-water inputs at the right time leading to higher productivity per unit of land and water; Promoting small-scale and affordable technologies, for instance, with improved access and with sufficient water control, higher productivity can be achieved; and Optimizing non-water inputs in combination with water, agronomic inputs and practices such as land preparation and use of fertilizers can increase productivity of land and water.

2.5.2 Climatic factors

Climate is fundamental to crop growth. Moisture stimulates seed to germinate, the time of emergence being temperature dependent. The rate of growth of root, stem and leaves depend on the rate of photosynthesis, which in turn depends on light, temperature, moisture and carbon dioxide (White and Howden, 2007). According to (Ayindea, Muchiea, and Olatunjib, 2011) change in climate has a significant effect on agricultural productivity. Battisti and Naylor (2009) opined that raising temperatures have an influence on agricultural productivity, farm incomes and food security. Olesen *et al.,* (2007) noted that in mid and high latitudes, the aptness and output of crops are predicted to increase and extend northwards, particularly for cereals and cool season seed crops. Other authors have made the assertion that most decreases in crop yield are ascribed to low rainfall pattern (Kumar *et al*., 2004; Sivakumar and Brunini, 2005).

2.5.3. Agronomic factors

Fertilizer is considered as a land augmenting substance, which increases the productivity of land. Due to decreasing fertility of the soil in most developing countries, the use of fertilizer has become indispensable. A number of authors (Ajah and Nmadu, 2012; Okoboi, Muwanga and Tumwabze 2012; Obasi, Ukoha, Ukewuihe and Chidiebere, 2013) have the significantly positive effect of fertilizer use on agricultural productivity.

Improve seed is a vital input for increasing agricultural productivity and ensuring food security. Seed security is important in the quest to ensure global food security because availability of high quality seed will lead to increase productivity.

(Morris, Tripp and Dankyi, 1999; Becerra and Abdulai, 2010) concur that improved seed has a significant influence on productivity.

Agrochemicals significantly increase yield by protecting crops from insect damage, competition for water and nutrient from weeds and providing nutrient for crops. In the context of this study agrochemical will be use to refer to herbicides. According to Koirala, Mishra, and Mohanty (2014), there is a positive relationship between herbicide use and agricultural productivity. Another study has found a positive relationship between pesticide use and farm productivity (Oluwatayo, Sekumade and Adesoji, 2008).

Labour is a vital factor without which there cannot be production: labour can either be family or hired labour. It is evident from the literature that farm productivity is significantly influenced by labour input (Obasi *et al*., 2013; Ogundari, 2007).

2.5.4. Socioeconomic factors

Dire, Girei, Salihu, and Yuguda (2013) opined that the level of farmers' education influences productivity. In the literature, education is the number of years of schooling. It is widely accepted that farmers who have had some form of education can easily adopt new technologies and are able to make informed decisions, which ultimately enhance their productivity. Obasi et al., (2013) also stress that education is an important determinant of agriculture productivity. Education will increase the efficiency of the farmer that will lead to better output.

Obasi *et al*., (2013) argued that farm size has a significant influence on productivity. Other studies have shown a significantly positive effect of the variable farm size and productivity (Onwumere and Alamba, 2010; Dire *et al*., 2013).

However, the effect of farm size on productivity in the literature is mixed. While some studies have shown a positive relationship between the two variables, others have indicated a negative relationship between the two variables.

According to Mbam and Edeh (2011) there is an inverse relationship between farm size and farm productivity. This is attributed to factor input intensity on small farms leading to increase marginal productivity of land. Other studies have found a negative relationship between farm size and farm productivity. (Carter, 1984; Masterson, 2007 and Okoye et al., 2008).

According to Kainga, Okorji and Nweze (2014) there is significant positive effect of farmers experience on farm productivity.They argued that the more experienced a farmer is the higher the productivity gain. Okoye *et al*., (2009) noted that experienced farmers were more efficient in their decision-making processes and were more willing to take risks related with the adoption of innovation.

Agricultural credit is a vital ingredient that enhances farm productivity through increased input usage. According to Feder *et al*., (1990), when farmers face binding credit constraints, the quantity and allocation of input departs from their ideal level. Thus, credit contributes marginally to facilitate optimal input use thereby increasing productivity.

Membership of farmers in an association is one factor that is noted in the literature to influence farmers' productivity. Extension agents work more closely with farmers in groups as this more convenient and time saving. Therefore, extension workers in disseminating improved technologies target farmers who are in an association. Onwumere and Alamba (2010) opined that farmers' membership of an association has a significant influence on farm productivity.

2.5.5. Farm management factors

Agricultural productivity is influenced by farm level factors such as adoption of modern production technologies, farm planning and management practices. It is a widely held notion that farmers' adoption of improved technologies is conditional upon extension services, which consequently influences farmer's management practices. Extension is expected to facilitate the process of technology transfer and increasing the knowledge base of farmers and assisting them in improving farm management practices, which subsequently leads to improved productivity (Feder, Murgai, and Quizon 2004). Onwumere and Alamba (2010) noted that farm management systems adopted by the farmer has a significant influence on productivity.

According to Bamidele et al., (2008) improved farm productivity can be attributed to factors including farmer's judiciousness in resource use, and management practices at the farm levels. Evenson and Mwabu (1998) argued that unobserved factors such as farm management abilities significantly impact on crop productivity.

These factor work in a complex way and are interrelated; however, some of these factors may not be under the direct influence of the farmer. Improving access to credit is expected to influence the agronomic and farm management factors of beneficiary farmers.

2.6 Empirical Studies on Credit Access and Agricultural Productivity

The role of farmer support services cannot be overemphasised as small scale agricultural growth cannot be achieved without it. Empirical evidence in the literature shows that extending support services to resource poor farmers has implications on rural household welfare. According to Mushunje and Belete (2001), providing support services to farmers in the form of training and finance through credit is essential to increase farmers' efficiency.

Boucher and Guirkinger (2007) conducted a study on credit constraints and productivity in Peruvian agriculture: they used the endogenous switching regression model with panel data to control for potential problems of selection and unobserved heterogeneity. Their results revealed that relaxing formal credit constraints has the potential to increase productivity by over 25% in the study area.

According to Muturi and Nzomo (2014), an agricultural credit programme has the capacity to enhance the income of farmers who utilize it by more than 100% and this clearly defines the role of credit in the farming sector. Credit not only helps to expand the economies of size but also helps to increase the productivity of farms from the available resources.

Ciaian, Fałkowski, Kancs, and Pokrivcak (2011) concluded in their study that enhancing credit access to farmers increases variable input use and capital investment up to 2.3% and 29% respectively. They also found out that increase access to credit increase total factor productivity by 1.9% for every £1000 of additional credit. Their results suggest that improving credit access result in input intensification on farms. Feder *et al*. (1990) conducted a study on the effect of credit on productivity; they adopted the endogenous switching regression model. They found that credit significantly influences agricultural productivity. The results indicate that increasing credit by one additional yuan of liquidity in the study area lead to a resultant yield of 0.235 yuan of additional gross value of output.

Butler and Cornaggia (2011) studied the relationship between access to finance and productivity, using a triple differences testing approach. Their result revealed that production increases the most over the sample period in areas with comparatively strong access to finance, even in comparison to a control group.

2.7 Impact of Agricultural Credit Programme on Productivity

Owuor (2009) analysed the economic impact of group based credit programmes on smallholder farmers' productive performance and poverty reduction in Kenya .using data collected from 600 farmers and employing propensity score marching and endogenous switching regime methods. His finding revealed that group based credit has significant effect on incomes as well as purchased inputs of smallholder farmers who participated in the programme. He concluded that credit programme participation has significant impact on farm productivity

Laker - Ojok and Kayobyo (2013) conducted a study on impact assessment of opportunity international's agricultural lending program in uganda, malawi, and Ghana. The study revealed that participant households recorded an increase of 2301 kg in average quantities of maize produced in 2012 relative to 2009 levels respectively. The average quantity produced by non-participating household increase by 209 kg. The findings suggest that participating in the agricultural lending program has a resultant impact on productivity.

Pederson at el., (2012) studied the Microeconomic impacts of a state_funded farmer loan program, using the endogenous switching regression model. They found that a percentage increase in credit received by credit constrained farmers under the state program leads to a resultant 0.49 percent increase in gross income and 0.33 percent increase investments in depreciable assets. They establish that there are liquidity effects of credit constraints for a considerable number of resource poor farmers who participated in the state_funded farm loan program.

Kinkingninhoun et al., (2010) found farmers participation in agricultural credit programme to have a positive and significant impact on rice output and yield. Users of credit harvested an additional 70.8 kg (157.2 kg per hectare) of paddy. Diagne (2002) also found significant impacts of agricultural credit on agricultural output and yield.

Kageyama (2003) in assessing the impact of PRONAF (National Programme for the Strengthening of Family Farming) credit programme on agricultural productivity in Brazil for the 2000-2001cropping season. Using data collected in eight Brazilian states on beneficiary and non- beneficiary farmers, PRONAF strongly correlated with

technological variables and agricultural productivity. PRONAF credit was found to have no significant impact on farm income; however had a significant impact on variable input and agricultural productivity.

Nzomo and muturi (2014) studied the Effect of Types of Agricultural Credit Programmes on Productivity of Small Scale Farming Businesses in Kenya. Using a cross sectional data from 123 randomly selected small scale farmers, the result show that agricultural credit does not only increase the economies of size but also improves farm productivity. They further argued that Agricultural credit has the ability to augment the income of farmers who use it by more than 100%.

Javed et al., (2006) conducted a study on Punjab Rural Support Programme (PRSP) in Pakistan. They assessed the effect of the microcredit advanced by the programme on crop productivity. The result shows that credit programme participation improved the productivity of wheat and sugarcane.

Girabi and Mwakaje (2013) investigated the impact of microfinance programme on agricultural productivity of smallholder farmers in Tanzania. Data was randomly collected from 98 credit beneficiaries and non-credit beneficiaries. Their study showed that credit beneficiaries recorded high productivity than non- credit beneficiaries. They argued that credit beneficiaries were comparatively better in accessing markets for agricultural commodities, use of inputs and adoption of improved farming technologies.

Nosiru (2010) argued that participation in microcredit programme has the potential to improve the productivity of farmers, he concluded that there is significant difference

between the productivity of beneficiary and non-beneficiary farmers. He concluded that participating in microcredit programme has the potential to improve the productivity of resource poor farmers and contributing to elevating their livelihoods.

In a study by Onwumere et al., (2012) on the agricultural credit guarantee scheme (ACGA) fund in Nigeria. Using the two variable regression models, the study revealed that the ACGA fund had significant effect on agricultural productivity in Nigeria.

Bardhan and Mookherjee (2011) examined Subsidized Farm Input Programs and Agricultural Performance in west Bengal. Using a panel data from 1982-1995. They found that subsidize program which give farm input (seed, fertilizer and pesticide) in the form of minikits to farmers had significant impact on productivity, contributing to over 40% increase in observed total of 67% .The Integrated Rural Development Program (IRDP) credit provision also had significant impact on farm productivity. They concluded that the IRDP credit provision had relatively minimal impact on farm productivity as compared to the minikit program.

Paris (2014) examined the Nuru Kenya (NK) Agriculture Program. The NK credit programme aims to impact crop yield, food security, and household income by providing beneficiary farmers with a farm input loan, technical training, extension services, and group support structure. Using a sample of 467 participant and 506 nonparticipant, the results for crop yield reveal that participating farmers who adopted the full diversified strategy recorded a yield of 765 kg per acre compared to 693 kg per acre for non-participating farmers who cultivated only maize. He however concluded that there is no statistical difference between participant and non-participant farmers.

Olazabal and Paris (2015) conducted a similar study on the Nuru agricultural programme in Ethiopia. Using data from 485 participating farmers and 478 nonparticipating farmers. The crop yield results revels that participating farmers had 91 percent increase in yield (378 kg/acre at baseline to 724 kg/acre in a follow up survey) Compared to 7 percent increase in yield for non-participating farmers (410 kg/acre at baseline to 441 kg/acre in a follow up survey). The net increase in yield for beneficiary farmers was 84 percent. They concluded that there was a significant difference in yield indicating a positive relationship between increase productivity and agricultural credit intervention.

Baffoe et al., (2015) conducted a study on the relationship between access to credit and agricultural productivity in Ghana. Using data from 109 farm household comprising borrowers and non-borrowers. The result revealed that there is statistical difference in the productivity of borrowers and non-borrowers. They concluded that borrowers were more technically efficient than non-borrowers which are attributed to technical advice provided by the credit institution as part of the loan package.

Elemi et al., (2015) examine the effect of National Special programme for food security (NSPFS) on cassava output in River State, Nigeria. NSPFS provide loan and farm input to rural farming household. Using data from 203 respondent and employing the paired t – test. Beneficiary farmers recorded a mean annual output of 1,394.97kg compared to 844.64 kg for non-beneficiary farmers. The paired t-test result indicated there was significant difference at 95% confidence level between the mean annual outputs of beneficiary and non- beneficiary farmers of the programme.

They concluded that farmer's access to credit and farm input from NSPFS may account for the increase in output for beneficiary farmers.

Shah et al., (2008) examined the impact of agricultural credit on farm productivity in three selected district in Pakistan. Using data collected from borrowers and non-borrowers during the 2007 cropping season. They found positive relationship between agricultural credit and productivity. They concluded that gains in productivity could be attributed to timely access and application of input due to availability of credit.

2.8 Farmers Participation in Agricultural credit Programme and It Impact on Resource Use

Laker-Ojok and Kayobyo (2013) conducted a study on impact assessment of opportunity international's agricultural lending program in uganda, malawi, and Ghana. The study was carried out in two time period. 2009 and 2012. They established that the mean fertilizer applied per acre for participant maize farmers in Ghana increased by 20.5 kg from 63.2 kg in 2009 to 83.7 kg in 2012, compared to non-beneficiaries household recording a decline of 11 kg in average quantity of fertilizer applied per acre in 2012 relative to 2009 levels. They concluded that programme participation resulted in increased use of improved seed, fertilizer and weedicides.

According to Mghenyi (2009), farmers participation in group base credit programme increase demand for fertilizer by 41.94 kilogram per hectare, which indicate an increase of above 40% from pre-participating level. He argued that credit programme thus significantly influence farm resource use. On the contrary, he found out that group credit programme had no significant effect on demand for land for maize cultivation in the short run.

Kinkingninhoun et al., (2010). Studied the impact of use of credit in rice farming on rice productivity and income in Benin. Using the Sustainable Livelihood Framework (SLF), they found credit to increase the area cultivated to rice by 0.15 hectares, the quantity of fertilizer by 38.33 kilometer per hectare and the cost of hired labor increased by 8 925 FCFA . However the use of credit had no significant impact on the demand for seed. They argued that access to credit gives room for credit users to improve their input use (land, fertilizer and labor). Other studies have found significant effect of credit on farm resource use (Bolarinwa and Fakoya 2011; Kudi *et al.*, 2009 and Fall, 2008).

Arif (2001) studied the impact of ADBP Micro Credit programme on Agricultural production in three selected villages in District Attock Pakistan. He found that farmers' access to ADBP micro credit had significant effect on input utilization, thus increasing cropping intensity. He concluded that efficient utilization of credits for input impact on crop production.

According to Bhalla and Singh (2010) input demand elasticity with respect to credit is fairly significant. They found that in the long run, fertilizer, tubewells and tractors use increase by 8-9 percent as a result of a 10 percent increase in credit delivery to farmers in India. They concluded that participation in institutional credit programme is essential for regions with low input and investment in agriculture.

Narayanan (2015) studied The Productivity of Agricultural Credit in India. Using panel data covering the period 1995-96 to 2011-12. He found that over the period, there was a significant increase in all input from a resultant increase in credit to the agricultural sector. A 10 percent increase in credit resulted in a 10.8 percent increase in tractor purchases, 1.7 percent increase in fertilizers (N, P, K) demand and

5.1 percent increase in pesticides use. He concluded that input use is responsive to credit supply.

Devi (2012) evaluated the impact of cooperative loan on the agricultural sector in Andhra Pradesh, India. He argued that agricultural credit does not only impact on productivity but also leads to a significant increase in the utilization of improve seed, fertilizer and pesticide.

Hoddinott et al., (2012) analysed the productive safety net programme(PSNP), the other food security programme(OFSP) and the household asset building programme (HABP) which seek to improve agricultural productivity through income transfers. Using the dose–response models, they examine the relative impact of joint transfers from the three programmes and PSNP transfers alone on fertilizer use, agricultural investment, agricultural output and yields, for farmers growing cereals in Ethiopia from 2006 to 2010.The result showed increase fertilizer use and enhanced investment in agriculture among farmers participating in all three programmes.However they found no effect of PSNP programme participation along on farm input use or productivity and partial impact on agricultural investment.

Jehan and Muhammad (2008) studied the effects of agricultural credit on farm productivity and the income of the small farmer in Pakistan. Using data from 120 respondents (6o beneficiaries and 60 non-beneficiaries) and employing the t-test. The result shows that programme beneficiaries had significant improvement in the use of seed, fertilizer and pesticide as compared to non-beneficiary farmers due to efficient utilization of credit leading to increase productivity.

Baffoe et al., (2015) conducted study on the relationship between access to credit and agricultural productivity in Ghana. Using data from 109 farm household comprising borrowers and non-borrowers. The results showed that borrowers had low expenditure on variable input (GHc652.6) than non-borrowers (GHc675.6). The result suggest that non-borrowers use more input than borrowers, this is contrary to studies by Carter (1998) and Feder et al., (1990).

2.9 Farmers Resource Use Efficiency Particularly Resource Provided By Agricultural Credit Programme.

Kibirige (2008) examined the agricultural productivity enhancement program (APEP) in Masindi district Kampala. Using data from 170 maize farmers (81 APEP and 89 non-APEP maize farmers). The allocative efficiency score level for APEP farmers are 0.68, 0.92, and 0.22 for labour, seeds input and animal draught power respectively and that for Non APEP farmers are 0.001, 0.12, 2.42 for labour, seeds input and animal draught power respectively. However both groups of farmers were allocatively inefficient in the use of input as their efficiency ratios were either above or below one.

Alene (2002) investigated the resource use efficiency in maize production under traditional and improve technology in western Ethiopia. Employing a dual stochastic frontier decomposition methodology to measure technical, allocative and economic efficiency of farmers from a sample of 35 maize farmers under traditional technology and 60 maize farmers using a package of improved technology. The result showed that the mean allocative efficiency of farmers using traditional technology is 80% compared

to 82% for farmers using improved technology. The result suggests that farmers using package of improved technologies were more efficient in the use of resources.

Kara et al., (2015) conducted a study on comparative economic analysis of Beneficiaries and Non-beneficiaries of Fadama II Project in Taraba State, Nigeria. Using data sampled from 75 loan beneficiaries and non-beneficiaries of Fadama 11 project, the result on resource use efficiency analysis showed that the efficiency ratio for fertilizer and chemical were above one for Beneficiaries indicating the use of such resource were below economic optimum level while labour, farm size and seed were above the level, with efficiency ratio below one. Moreover farm size, seed, fertilizer and labour were below economic optimum level for Non-beneficiaries while chemical was above the level. They concluded that there is the need for farmers to make adjustment in resources use to increase output.

Atieno (1995) studied the effect of Agricultural credit programmes on farm resource use in Kenya. Employing cross sectional data from Nakuru district in Kenya and using the Cobb-Douglas production function. The study reveals that farmers were not efficient in the use of available resources. He suggested that the provision of programme credit meant to increase farm productivity must be accompanied by measures that ensure farmers use sufficient input levels to enhance their efficiency.

Zongoma et al., (2015) examined the resource use efficiency in maize production among smallholder farmer in borno state Nigeria. Using data from 60 maize farmers .The result also revealed that farmers were not efficient in the use of all the input in production. As farm size, fertilizer, labour, and seed were over utilized with efficiency ratios of 0.01, 0.23, 0.07 and 0.10 respectively.

Sienso, Brempong and Amegashie (2013) in a study assessed the efficiency of maize farmers in the Nkoranza area. Computing marginal value products for labour, fertilizer and seeds, using the OLS estimated coefficients of the translog production function, the marginal value products were equated to the marginal factor cost of inputs. The results revealed that maize farmers in the study area were not efficient in the use of inputs. Labour was over utilized with efficiency ratio 0.18 suggesting there is the need for farmers to reduce the use of the input. On the contrary, fertilizer and seeds were under utilized in the study area, with efficiency ratio of 3.6 and 2.46 respectively. Suggesting there is the need for farmers to increase to use of these inputs.

Kuwornu, Amoah, and Seini (2013) examined the technical efficiency and its determinant in the Eastern region of Ghana. Using a sample of 226 maize farmers in the region. The resource use efficiency results revealed that hired labor and agrochemicals are under-utilized while fertilizer, seed and family labor are over-utilized by maize farmers in the region. They concluded that farmers can optimize output by making adjustment to the quantities of input use.

Akram et al., (2013) examined the economic efficiency of credit beneficiaries and noncredit beneficiaries in agriculture farms. Using data from 152 sampled farmers in the Punjab Province. They found the mean technical efficiency in the region as 0.90 and 0.79 percent for credit and non-credit beneficiaries, respectively. Although credit beneficiaries had high technical efficiency compared to non-credit beneficiaries, the result reveals that both groups of farmers were allocatively inefficient in the use of input, as their efficiency ratio (MVP/MFC) for input were either more than one or less than one.

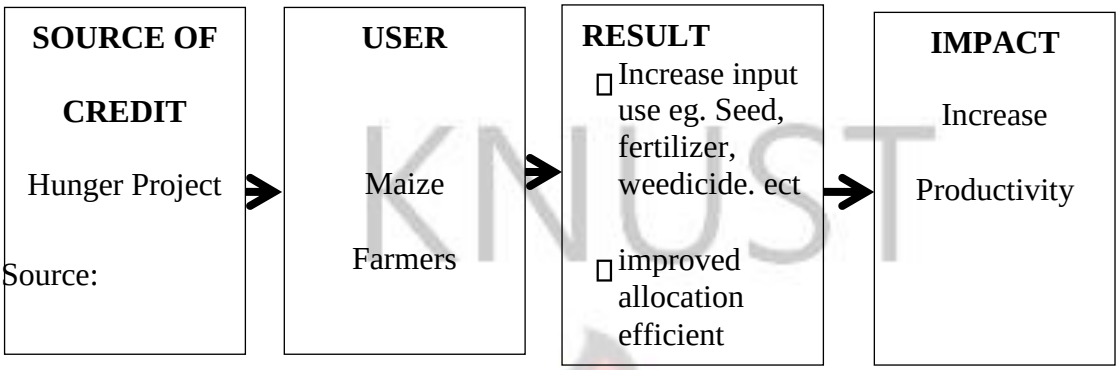
Martey, Wiredu, and Etwire (2015) assessed the impact of programme credit on the technical efficiency of maize producing household in the Northern region of Ghana. Using a cross sectional data from a total of 233 credit beneficiaries and nonbeneficiaries, the result showed that programme credit had positive impact on technical efficiency of beneficiary farmers. They argued that programme credit enhances timely purchase and efficient allocation of factor input to increase output. They concluded that credit programme should target numerous resource poor farmers so as to increase efficiency gain.

2.10 Theoretical framework of the study

2.10.1 Conceptualization of impact path way to productivity improvement During the cropping season resource poor farmers balance their budget when there is high expenditure for input purchase and consumption. With limited access to credit, resource poor farmers' budgets for the cropping season can become a constraint on agricultural production.

Maize farmers' access to programme credit is anticipated to increase access and improve their farm input use. According to Blancard, Boussemart, Briec and Kerstens (2006), improving access to credit increases the use of all inputs in situations where farmers face symmetric credit constraints on all inputs. Also improve access to input through the relaxing of credit constraint enables resource poor farmers to allocate input optimally and improve their resource use efficiency Carter (1998). Consequently, the productivity of maize farmers is expected to improve. According to Olayide and Heady (1982), productivity change over time is condition on changes in the quantities of inputs and technology used.

Figure 2.1 Impact Pathway to Productivity Improvement



Source: Authors construction, 2015

2.10.2 Endogenous Switching Regression Model

The Hunger Project is a non-governmental organization that seeks to increase maize farmers' productivity through credit intervention. The credit package includes provision of input credit in the form of improved seed, fertilizer and herbicide, and financial credit. To estimate the effect of The Hunger Project credit on maize productivity, some econometric challenges arise:

(1) Self Selection bias; this is due to the fact that access to credit (participation) is non- random, farmers self-select themselves to participate in the programme or access credit based on their expectation, objectives and unobservable characteristic that affect the decision to access credit from the hunger project.

(2) Endogeneity: According to Asfaw and Bekele (2010) Unobservable

characteristics of the farmer (farm experience) may affect both the decision to make use of an intervention and the Outcome variable, which will lead to inconsistent estimate of result if unobservable characteristics of farmers are not accounted for.

The econometric problems thus involves both endogeneity and selection bias. According to Feder *et al*., (1990) analytical approaches that pooled sample observation to estimate production function with credit as a production input or supply determinant and other approaches that estimate separate production functions and then proceed to compare the result are flawed. Reasons being that borrowers and non-borrowers are not homogenous; secondly, they noted that the marginal effect of credit may actually be zero for borrowers for whom liquidity is not a binding constraint. Finally, they argue that the supply function is different both in parameter and in variables depending on whether liquidity is a binding constraint. (Dong, Lu and Featherstone 2010; Nuryartono, Zeller and Schwareze, 2005) proposed that the most suitable econometric approach is to adopt the endogenous switching regression model which is a two stage regression model.

First, a probit model is used in the first stage to determine factors influencing farmers' access to credit (participation) from The Hunger Project. The credit supply equation is given as;

$$Z_i^* = X\gamma + \mu, \ \mu \sim N(0, 1) \qquad 3$$

Where the dependent variable Z denote credit access (participation) status which equals one if the farmer access credit from The Hunger Project (beneficiary) and zero otherwise (non-credit beneficiary). X is a set of exogenous variable influencing farmers' access to credit (participation) from The Hunger Project; μ is the error term. The

functions that indicate the credit access (participation) status of the two groups is specified as;

$$Z_i=1 \text{ if } X\gamma \geq \mu \quad (4)$$

$$Z_i=0 \text{ if } X\gamma < \mu \quad (5)$$

The productivity equation for (1) farmers who access credit from The Hunger Project (beneficiaries) and (2) farmers who did not access credit (non-credit beneficiaries) are defined as:

$$Y_{1i}= \beta_1 X_{1i} + \varepsilon_{1i} \quad \text{if } Z_i = 1 \quad (6)$$

$$Y_{2i}= \beta_2 X_{2i} + \varepsilon_{2i} \quad \text{if } Z_i = 0 \quad (7)$$

Where Y_i is the dependent variable (maize output); X_i is a set of explanatory variables influencing maize output, β_1 and β_2 are parameters to be estimated and ε_{1i},ε_{2i} represent the error terms of the two regression equations.

The error terms are assumed to have a trivariate normal distribution with mean vector zero and covariance matrix:

$$\sum = \begin{Bmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{1\mu} \\ \sigma_{12} & \sigma_2^2 & \sigma_{2\mu} \\ \sigma_{1\mu} & \sigma_{2\mu} & \sigma_\mu^2 \end{Bmatrix} \quad (8)$$

Where σ_μ^2 is a variance of the error term in the credit supply equation, (which can be assumed to be equal to 1 since the coefficient are estimable only up to a scale factor) and σ_1^2 and σ_2^2 are variances of the error terms in equation 6 and 7. σ_{12} ,$\sigma_{1\mu}$, and $\sigma_{2\mu}$ are covariance of ε_{1i} and ε_{2i}, ε_{1i} and μ_i, and ε_{2i} and μ_i respectively.

The error terms in equation 6 and 7 are conditional on the credit supply equation and have non-zero expected value as:

$$E[\varepsilon_{1i} / Z_i = 1] = \sigma_{\varepsilon 1\mu} \frac{\emptyset(X\gamma)}{\phi(X\gamma)} = \sigma_{\varepsilon 1\mu}\lambda_{1i} \quad \text{and} \quad E[\varepsilon_{2i} / Z_i = 0] = -\sigma_{\varepsilon 2\mu} \frac{\emptyset(X\gamma)}{1-\phi(X\gamma)} = \sigma_{\varepsilon 2\mu}\lambda_{2i} \quad 9$$

Where Ø (.) is the standard normal probability density function, ϕ (.) the standard normal cumulative function. Estimating the productivity equations with ordinary least square (OLS) will lead to bias parameter estimate and are inconsistent due to endogeneity and selection bias (Maddala, 1983). To obtain unbiased parameter estimate using (OLS), Heckman (1979) propose the inclusion of the inverse mill ratios which is extracted from the credit supply equation (equation 1) into equations 6 & 7.

In the second stage, the inverse mills ratios $\lambda_{1i} = \frac{\emptyset(X\gamma)}{\phi(X\gamma)}$ and $\lambda_{2i} = \frac{\emptyset(X\gamma)}{1-\phi(X\gamma)}$ (which are based on a first stage probit model) are substituted into the second stage regression models as a correction factor.

The productivity equation for the two groups of farmers can be modelled as

$$Y_{1i} = \beta_1 X_{1i} + \lambda_{1i} + \varepsilon_{1i} \qquad \text{if } Z_i = 1 \qquad 10$$

$$Y_{2i} = \beta_2 X_{2i} + \lambda_{2i} + \varepsilon_{2i} \qquad \text{if } Z_i = 0 \qquad 11$$

Concerning functional form of the model, the study adopted the Cobb-Douglas production function as used by Freeman *et al*., (1998).

To estimate the endogenous switching regression model more efficiently and with no strict assumptions, the maximum likelihood method is employed (Lokshin and

Sajaia, 2004). The maximum likelihood method estimates the probit equation and the regression equation simultaneously to yield consistent standard errors. The log likelihood method is specified as

$$\text{Log} \quad L= \sum_{Z=1}\left[log\left\{\Phi\left(\frac{X\gamma+(Y-X\beta_1)\sigma_{1\mu/\sigma_1^2}}{\sqrt{1-\rho_{1\mu}^2}}\right)\right\}-\frac{1}{2}\left\{log\left(2\pi\sigma_{1\mu}\right)-\left(\frac{Y-X\beta_1}{\sigma_1}\right)^2\right\}\right]+ \sum_{Z=0}\left[log\left\{\Phi\left(\frac{X\gamma+(Y-X\beta_0)\sigma_{2\mu/\sigma_2^2}}{\sqrt{1-\rho_{2\mu}^2}}\right)\right\}-\frac{1}{2}\left\{log\left(2\pi\sigma_{2\mu}\right)-\left(\frac{Y-X\beta_2}{\sigma_2}\right)^2\right\}\right] \quad 12$$

Where $\rho_1 = \sigma_{1\mu}/\sigma_\mu\,\sigma_1$ is the correlation coefficient between ε_{1i} and μ_i , and $\rho_2 = \sigma_{2\mu}/\sigma_\mu\,\sigma_2$ is the correlation coefficient between ε_{2i} and μ_i

CHAPTER THREE

THE STUDY AREA AND RESEARCH METHODOLOGY

3.0 Introduction

This chapter gives a vivid account of the methodology employed to address the specific objectives of the study. The first section give an overview of the study area, the second section describes the data types, sources and collection methods, the third section discuses the sample and sampling method and the final section discuses the methods of data analysis.

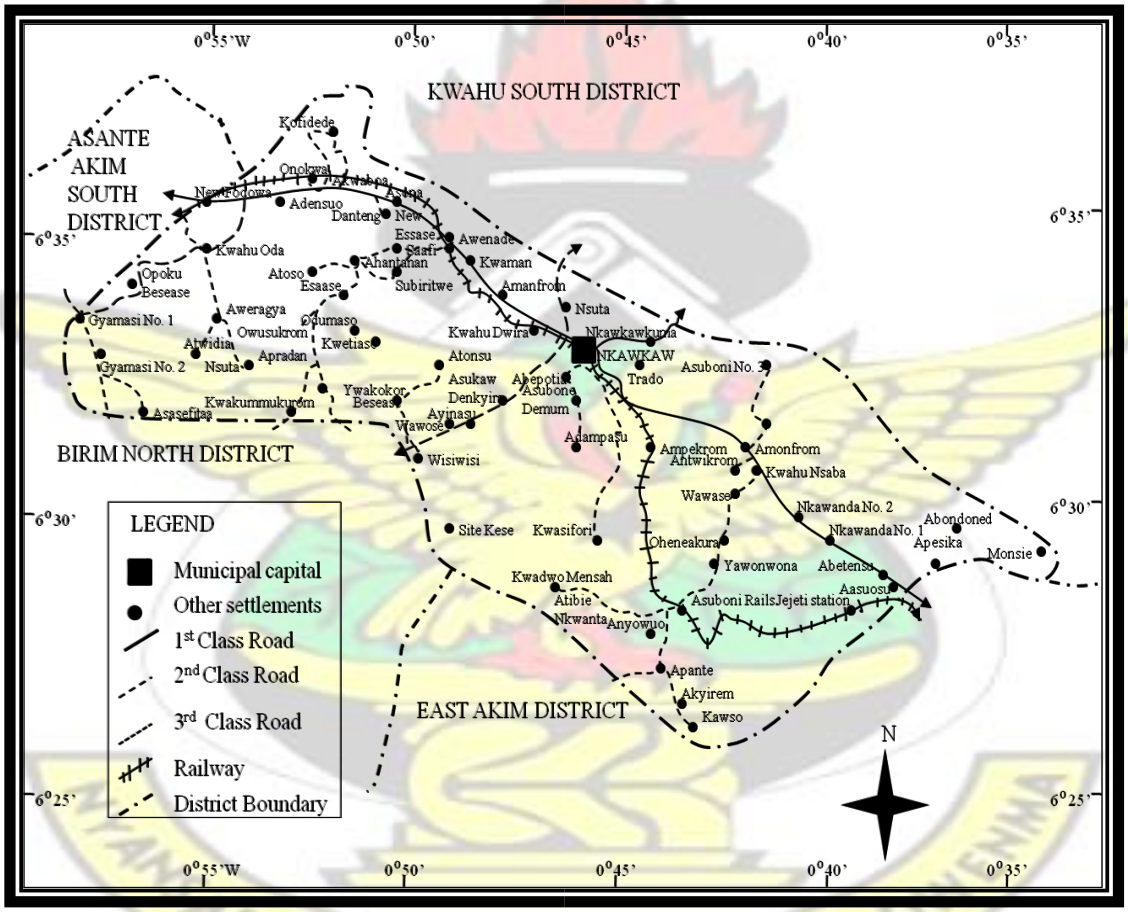
3.1 The Study Area

The Kwahu West Municipal Assembly was carved out of the Kwahu South District Assembly in 2004, and is one of the newly created districts in the Eastern Region of Ghana. The municipality lies between latitudes $6^0$30'North, and 7^0North and longitude $0^0$30' West and 1^0West of the equator, covering an area of about 414 square kilometres North-West of Accra. The Municipal is bounded to the north by the Kwahu South District, to the west by the Asante- Akim South District, to the East by Fanteakwa District and to the South by Birim North and Atiwa Districts.

The Kwahu West Municipality lies within the semi-deciduous forest zone, which belongs to the Antiaris- Chlorophora Association. The vegetation is dense and consists of major economic trees. The 2010 National Population and Housing Census put the Municipality's population at 162,400 with an intercensal growth rate of about 4%. The projected population for the year 2016 is therefore 231,003 (Municipal Development Plan, 2013).

Soils in the municipality fit into a category called forest ochresols and consist of clay loamy soils. These are sub-divided into various groups comprising fine sand loams, clay loams, concretional loams, non-gravel sandy clay loams, sandy loams and iron pan soils. These soils possess the good chemical properties of clay and appreciable amounts of humus making them generally fertile and a great potential for cash and food crop production.

Figure 3.1: Sketched Map of Kwahu West Municipal



Source: Town and Country Planning Department, KWMA, 2010.

3.2 Data Types, Sources and Collection Methods

The study collected both qualitative and quantitative data from primary and secondary sources. A structured questionnaire was prepared to collect quantitative data

for the study. Primary data sources were the sampled beneficiaries and nonbeneficiaries of the project both male and female. Secondary sources were MoFA and The Hunger Project. The questionnaire was pre-tested to assess it reliability, clarity and to avoid duplication during data collection.

3.3 Sample and Sampling Method

The study employed a multi stage sampling technique. Multi-stage sampling was used because it is easier to implement and can create a more representative sample of the population than a single sampling technique. Purposive sampling was employed to select 17 communities where The Hunger Project is operational. Purposive sampling is defined as a method of sampling where the investigator uses his/ her personal judgment to select a sample, which will provide the data needed, based on previous knowledge of the population (Babbie, 2001).

The purposive sampling technique was employed to select communities where The Hunger Project is operational; The Hunger Project is not operational in all communities within the municipality, so the purposive sampling method is deem the appropriate technique for selection of communities because of the researchers' interest.

The purposive selection of maize farmers formed the respective sampling frame in each chosen community. The second sampling stage employed the stratified sampling technique to group farmers into beneficiaries and non-beneficiaries. In the third stage, the simple random sampling technique was finally used to select the respondents from the stratum. The formula for calculating the sample size given by

Bartlett et al. (2001) is specified as:

$$n = \frac{s^2 x y}{E_2} \qquad 13$$

Where

n= sample size,

x= the proportion of the population who received credit,

y = the proportion of the population who did not access credit,

S = the number of standard deviation for a chosen confidence interval, and E=

the allowable margin of error.

It is estimated that only 9% of farmers within the municipality have access to credit facility (The Hunger Project Ghana, 2013). Choosing a confidence level of 95% and 5% margin of error:

$$n = \frac{1.96^2(0.09)(0.91)}{0.05^2} = 126 \qquad 14$$

The sample size (n) is equal to 126. The sample size was increased by 35% to ensure equal distribution of respondents within the 17 communities. In all, 170 respondents were interviewed, comprising of 5 beneficiaries and 5 non-beneficiaries of the credit programme from each stratum. In all 85 beneficiary and 85 non-beneficiary maize farmers were selected.

3.4 Methods of Data Analysis

Objective One: To estimate the effect of The Hunger Project Credit Programme participation on farm input usage, the propensity score matching (PSM) technique was employed.

3.4.1 Theoretical Model: Propensity Score Matching (PSM)

Matching is a non-parametric technique use to evaluate the average effect of a particular programme (Caliendo and Kopeinig, 2008). The PSM is employed to deal with the problem of self selection bias. This is due to the fact that participation in the credit programme is non- random, farmers self select themselves to participate in the programme based on their expectation and observable characteristic.

The method compares (matches) the outcome of programme participants with nonparticipant based on similarities in observed characteristics. Let's consider two groups of farmers' indexed by (D) participation. Let $D_i = 1$ if the farmer participated in the programme (had access to credit) and $D_i = 0$ otherwise. Likewise, let Y_{1i} and Y_{2i} denote potential outcome of input use for participants and non-participants respectively. Then $Y_{1i} - Y_{2i}$ is the impact of The Hunger Project credit on the farmer input use, generally called the treatment effect. The primary evaluation problem arises because only one of the potential outcomes $E(Y_{1i} / D_i = 1)$ is observed for each individual i. The unobserved outcome $E(Y_{2i} / D_i = 1)$ is referred to as the counterfactual outcome. Hence estimating the treatment effect for every individual is not possible. The major evaluation parameter of interest is the average treatment

effect on the treated, it is specified as:

$$ATT = E(Y_{1i} - Y_{2i} / D_i = 1) = E(Y_{1i} / D_i = 1) - E(Y_{2i} / D_i = 1) \quad 15$$

According to Rosenbaum and Rubin (1983), the propensity score can be evaluated as

$$P(X) = P(D_i = 1 / X) \quad 16$$

Based on these assumptions, (a) conditional independence assumption: $Y_{1i}, Y_{2i} \perp D / X$ ie potential (non-treatment) outcomes are independent of participation status (Rubin 1977), thus after adjusting for observable difference, the mean of the potential outcome is the same for D = 1 and D = 0, this implies $E(Y_{2i} / D = 1, P(X)) = E(Y_{2i} / D = 0, P(X))$.This allows using matched non-participating farmers to measure how the group of participating farmers would have performed if they had not participated. (b) Overlap assumption: $0 < P(X) < 1$, thus for all X there is a positive probability of either participating (D=1) or not participating (D=0). This implies that each participant has a counterpart in the non-participant group (Dehejia and Wahba, 2002).

The average treatment effect (ATT) can now be estimated as

$$= E(Y_{1i} - Y_{2i} / D_i = 1)$$

$$= E[E(Y_{1i} - Y_{2i} / D_i = 1, P(X))]$$

$$= E[E(Y_{1i} / D_i = 1, P(X)) - E(Y_{2i} / D_i = 0, P(X))] \quad 17$$

The propensity score matching has two steps: first the propensity score (pscore) for each individual is calculated using a probit model for programme participation (access to credit); the second step in the execution of the PSM method is to decide on a

matching estimator. The nearest neighbour matching algorithm is employed to match each programme participant to a similar non-participant using propensity score values in order to estimate the ATT. To check the robustness of the result, an alternative matching algorithm radius matching and stratification matching were employed.

3.4.2 The empirical probit model The

empirical model was specified as:

$$PARTI(D) = \beta_0 + \beta_1 Gen + \beta_2 Age + \beta_3 Yrsch + \beta_4 HHsiz + \beta_5 Nfi + \beta_6 Livestok + \beta_7 Fbo + \beta_8 Famexpe + \beta_9 Pyfi + \beta_{10} Fatr + \beta_{11} Fmprp + \beta_{12} Farplp + \beta_{13} Proxepi + \mu_i \quad (18)$$

The choice of the explanatory variables included in D is guided by previous empirical literature on determinant of a farmer's participation in credit programme or credit access.

Dependent Variable

PARTI (D) is a dummy variable indicating 1 if the respondent participated or had access to credit and 0 otherwise.

Explanatory Variable

Gender (Gen): Gender classification is important in this type of analysis since men and women have different economic activities. In situation where they are engaged in the same economic activities, it is at a varying scale of operation, which has different implications for their use of credit. The gender of the respondent is specified as a

dummy variable that takes the value 1 if the respondent is male and 0 otherwise. It is hypothesis that male farmers are more likely to access credit from The Hunger Project as compared to their female counterpart.

Age of respondent (Age): It is a continuous variable, defined as the age of respondent at the time of interview measured in years. The variable is expected to have an influence on a farmer's decision to access credit from The Hunger Project; given the nature of the credit programme, young farmers are expected to take advantage to expend their scale of operation.

Years of formal schooling (Yrsch): It is the number of years of formal education that a farmer has had. Farmers who have more years of formal education are expected to accumulate knowledge. According to Musebe *et al.,* (1993), as the farmer acquires more formal education, the probability of accessing credit increases. Therefore, it is hypothesised that education will have a positive relationship with the decision to access credit from The Hunger Project.

Household size (HHsiz): It is measured as the number of dependents being taken care of by the respondent. The size of the household is expected to positively influence the likelihood of participating in a credit programme. Chen and Chivakul (2008) found family size to be a significant variable that influenced access to credit for households in Bosnia and Herzegovina.

Non-farm income (Nfi): This is specified as a dummy variable which takes the form 1 if the respondent has a non-farm income source or 0 otherwise. According to Bhoj, Bardhan and Kumar (2013), non-farm income had a negative influence on probability of membership in credit programmes, indicating that households which are more dependent upon agriculture for their livelihood are more likely to participate in a credit programme.

Livestock ownership (Livstock): The variable is defined as the total number of livestock owned by the farmer measured in tropical livestock unit (TLU). Livestock is considered an asset that can be sold to generate income for the farmer in time of credit constraint. Thus, the more livestock the farmer owns the less likely the farmer will access credit. It is hypothesised that the variable will have a negative effect on farmers' participation in the credit programme.

Membership in farmer based organization (Fbo): Farmers who are members of a farmer based organization have easy access to information and also their membership serve as collateral when they need credit. The variable is specified as a dummy variable and takes the value 1 if the farmer is a member of a farmer based organization and 0 otherwise. It is hypothesised that farmers who belong to a FBO are more likely to participate in credit programmes than their counterparts who do not.

Maize farm experience (Famexpe): Agricultural credit, like any other credit facility, is to be paid back within a period of time. Credit default has its own challenges; some farmers tune to lose their asset due to confiscation of asset by lenders and sometimes

face court action. The experience of farmers in the credit programme cannot be downplayed. The variable is specified as the number of years of farming maize. It is hypothesised to have a positive relationship with participation or credit access.

Previous year's maize farm income (PYFI): The value of farm product is an important factor that determines participation in a credit programme because it is a major source of their income. When the value of farm product is low, the farmer has limited resources, which will influence the decision to access more credit. Alternatively, with a higher income from previous farm product the farmer may be in the position to finance his farming operations the subsequent year and may not need credit. This variable is specified as total value of farm product sales from the previous year's harvest; the variable is use as a proxy for farmers' wealth. It is hypothesised to have a negative relationship with the decision to access credit.

Farmers' attitude towards risk (FATR): Smallholder farmers are risk-averse and will not make use of credit when it is available. This is due to fear of uncertainty associated with crop production in sub-Saharan Africa (pest and disease infestation, drought etc), which may affect loan repayment ability. The variable is a dummy variable that takes the value "1" if a farmer fears the risk of taking a loan and "0" otherwise. It is assumed that farmers who are risk-averse will not participate in credit programme and this will have a negative influence on their access to a loan from The Hunger Project.

Farmers' perception of loan repayment period (FMPRP): There is a time lag before any agriculture investment becomes apparent. This may affect farmers' access to credit if time of loan repayment is not convenient to the farmer. This variable indicates

farmers' perception of the loan repayment period. It is specified as a dummy variable which takes a value "1" for those who perceive it as a constraint and "0" otherwise. The variable is expected to have a negative relationship with

participation (access to credit).

Farmers' perception of lending procedure (FARPLP): farmers go through lay down procedures in order to access a loan from a financial organization. The operational modality of a financial institution determines whether farmers will make use of their service or not. If farmers perceive the lending procedure to be cumbersome, this will negatively affect farmers' participation in the credit programme. The variable is specified as a dummy variable with value "1" if farmers perceive the lending procedure as cumbersome and "0" otherwise.

Proximity to loan centre (Epicentre) (proxepi): The distance between the farmer and the loan centre (Epicentre) is expected to influence farmers' access to credit from The Hunger Project since farmers who live far from the epicentre need to commute a long distance for information and other services increasing their transaction costs. The variable is specified as a dummy variable which takes the value "1" if the farmer perceives the distance from his/her house to the epicentre to be too far and "0" otherwise. It is hypothesised that farmers who perceive the distance between their house and the epicentre to be too far are less likely to participate in the credit programme.

Objective Two: To analyse the effect of the hunger project credit on maize productivity, the endogenous switching regression model was adopted.

The endogenous switching regression model is employed to deal with the problem of Self Selection bias and endogeneity.

3.4.3 Empirical Model Endogenous Switching Regression Model

In the first stage, a probit model is use to determine the factors influencing farmers' access to credit from The Hunger Project. The probit model is as specified earlier in Objective One.

In the second stage, maize output measured in kilograms (kg) was regressed on a set of farm level characteristics (farm input) with an additional regressor, the Inverse Mill's Ratio (IMR) or Lambda (the residuals produced by the first-stage estimate of the probit model) included as a control variable in the productivity equation of the two groups. The total factor productivity measure was adopted for the study.

3.4.4 Productivity Equation: $\ln Mprd_{1i} = \beta_{01} + \beta_1 \ln Fsiz_{1i} + \beta_2 \ln Herbi_{1i} + \beta_3 \ln Fert_{1i} + \beta_4 \ln Sdqty_{1i} + \beta_5 \ln Labr_{1i} + \beta_6 \ln Ext_{1i} + \beta_{1i} + \varepsilon_{1i}$

if Z=1 19

And

$\ln Mprd_{0i} = \beta_{02} + \beta_1 \ln Fsiz_{0i} + \beta_2 \ln Herbi_{0i} + \beta_3 \ln Fert_{0i} + \beta_4 \ln Sdqty_{0i} + \beta_5 \ln Labr_{0i} + \beta_6 \ln Ext_{0i} + \beta_{2i} + \varepsilon_{2i}$

if Z=0 20

3.4.5 Variable Description

The dependent variable $Mprd_i$ is the maize output for the ith farmer measured in kg. The explanatory variables known to influence maize output are as follows: $Fsiz_i$ is the total land under maize cultivation and is measured in hectares. It is hypothesised that there is a positive relationship between farm size and maize output. $Herbi_i$ is the total number of herbicide used by the ith farmer per hectare of land and it is measured in litres. It is expected that increasing herbicide use increases maize output. $Fert_i$ is the

quantity of inorganic fertilizer used by the ith farmer, it is measured in kilograms (kg). It is hypothesised that increased use of fertilizer would lead to increased in maize output. $Sdqty_i$ is the quantity of seed maize planted by the ith farmer, it is measured in kg. It is hypothesis that the variable is positively correlated with maize output. $Labr_i$ is the number of workers employed by the i^{th} farmer and is measured in number of person days. It is expected that this variable is positively related to maize output. The extension variable indicates the number of extension visits per season; it is measured by the number of days. Farmers who have access to extension services tend to adopt improved technologies which improves maize output. The variable number of extension visits is hypothesis to positively influence maize output.

Objective Three: To determine and compare the resource use efficiency of credit beneficiaries and non-beneficiaries.

3.4.6 Analysis of resource use efficiency of farmers

The resource use efficiency of the two groups was assessed by comparing marginal value product (MVP) with respective marginal factor cost of the resources. The marginal physical product (MPP) was estimated from the parameters of the CobbDouglas production function and the arithmetic mean levels of the output and input. In accordance with Goni *et al*., (2007) the resource use efficiency was calculated as;

r= MVP/MFC

Where,

r= Efficiency ratio

MVP= Marginal value product of a variable input.

MFC= Marginal factor cost (Price per unit input)

The MVP value was estimated by multiplying the MPP of each input by the price of the output. MVP= $MPP_{Xi} \times P_y$ (Unit price of output), but $MPP_{Xi} = dY/dX_i = b_i(\overline{Y}/\overline{X}_i)$ Where; b_i = Estimated regression coefficient of input X_i; $\overline{Y}$ = Arithmetic mean value of output; $\overline{X}_i$ = Arithmetic mean value of input employed. The current market price of input was used as the Marginal Factor Cost (MFC).

MFC= P_{Xi} Where, P_{Xi} = Unit price of input X_i .

The decision rule;

When the ratio is, r < 1, it shows over utilization of that resource hence the use of such input must be decreased in order to improve resource use efficiency of the input by the farmers. When the ratio is, r >1, it indicates underutilization of that resource hence the use of such input must be increased in order to improve resource use efficiency of the input by the farmers. When r=1, it indicates efficient use of that resource by the farmers.

Objective Four: To analyse the constraints maize farmers face in accessing credit from The Hunger Project.

3.4.7 Analysis of farmers' constraints using the Kendall's coefficient of concordance

The Kendall's coefficient of concordance was employed to measure the degree of agreement between the rankings of constraints maize farmers' face in accessing credit or participating in The Hunger Project credit programme.

The Kendall's coefficient of concordance (W) has been computed as:

$$W = \frac{12S}{m^2(n^3 - n) - mT} \qquad (21)$$

S= Sum of square statistics over the row sum of ranks.

T= The correction factor for tie ranks m=Number of maize farmers. n=Number of constraints ranked by respondents.

If the test statistic W is 1, then all the survey respondents have been unanimous, and each respondent has assigned the same order to the list of concerns. If W is 0, then there is no overall trend of agreement among the respondents, and their responses may be regarded as essentially random. Intermediate values of W indicate a greater or lesser degree of unanimity among the various responses (Legendre, 2005).

3.4.8 Hypotheses and significance of test for Kendall's coefficient of concordance

Null hypothesis (Ho): there is no agreement between the rankings of the constraints.

Alternative hypothesis (H1): There is agreement between the rankings of the constraints

The coefficient of concordance (W) was tested for significance in terms of the F-

Distribution. The F-ratio is given by $\frac{(m-1)W}{1-W}$

Numerator degree of freedom $(n-1)-(2/m)$

Denominator degree of freedom $(m-1)-((n-1)-(2/m))$

3.4.9 Decision rule

If F-calculated > F-tabulated, reject null hypothesis and conclude that there is agreement among respondents on the constraints and vice versa.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents the results and discussion of the study. It is divided into five sections. The first section presents the descriptive statistics of the variables used in the study. The second section deals with the PSM result. The result of the endogenous switching regression model estimating the effect of the hunger project credit programme on productivity of smallholder maize farmers is presented in the third section. The

fourth section presents the results of resource use efficiency of the maize farmers. Finally, the fifth section presents the results of the constraints maize farmers' face in accessing credit from the Hunger Project.

4.1 Descriptive Statistics of Socioeconomic and Demographic Factors Used in the Study

Table 4.1 shows that male respondents formed 77.9% of the survey population while female respondents formed 22.1%. Table 4.1 also shows that 83.5% of beneficiaries and 70.6% of non-beneficiaries were male, while 16.5% of beneficiaries and 29.4% non-beneficiaries were female. This indicates that maize production in the study area is dominated by the male population.

The result revealed that 27.6% of respondents do not own livestock, while 72.4% are owners of livestock. Sixty eight point two percent of beneficiaries and 76.5% of non-beneficiaries own livestock respectively. The results indicate that project non-beneficiaries own more livestock than beneficiaries. The result of the survey indicates that only 49.4% of the respondents are engaged in off-farm income generating activity, while 50.6% are not engaged in off-farm income generating activity. Moreover, 29.4% of beneficiaries and 69.4% of non-beneficiaries are engaged in off farm income generation activity; while 70.6% of beneficiaries and

30.6% of non-beneficiaries are not engaged in off-farm income generation activity. This indicates that project non-beneficiaries have other income generation sources and thus may not participate in the credit programme. Furthermore, 40% of respondents were members of a maize farmer based organization, while 60% were not. Subsequently 45.1% of beneficiaries and 34.1% of non-beneficiaries were members of farmer based

organizations, while 54.9% of beneficiaries and 56.9% of nonbeneficiaries were not members of maize farmer based organization. The results indicate that most smallholder maize farmers in the survey area are not members of maize farmer base organization.

Table 4.1: Descriptive Statistics of Socioeconomic and Demographic Variables used in the Study (Discrete Variables)

		Beneficiaries		Non-Beneficiaries		Pooled	
Variable		Frequency	%	Frequency	%	Frequency	%
Gender	Male	71	83.5	60	70.6	131	77.9
	Female	14	16.5	25	29.4	39	22.1
Livestock owned	No	27	31.8	20	23.5	47	27.6
	Yes	58	68.2	65	76.5	123	72.4
Off-farm activity	No	60	70.6	26	30.6	86	50.6
	Yes	25	29.4	59	69.4	84	49.4
Membership of farmer organization	No	46	54.9	56	56.9	102	60
	Yes	39	45.1	29	34.1	68	40

Source: Field survey (2015).

The average age of project beneficiaries was 49.46 years and the minimum and maximum age of beneficiaries are between 25-69 years. While non-beneficiaries reported an average age of 59.95 years with a minimum and maximum age between 22-80 years. The results indicate that most maize farmers in the study area are in their middle age; however project beneficiaries are seemingly younger than nonbeneficiaries (Table 4.2). The survey result also shows that the mean household size of beneficiaries was 7.35 and the minimum and maximum household size were 1 and 13 respectively, while that of non-beneficiaries was 1 and 16 respectively with a mean household size of 6.88. The results in Table 4.2 also shows that the average years of formal schooling for beneficiaries was 6.55 with a maximum years of schooling to be 14 years, while non-beneficiaries have 18 years of maximum schooling years and an average years of

schooling to be 8.68. The implication of the result is that nonbeneficiaries had more years of formal schooling than beneficiaries.

Table 4.2: Descriptive Statistics of Socioeconomic and Demographic Variables used in the Study (Continuous variables)

	Beneficiaries				Non – Beneficiaries			
Variable	Min	Max	Mean	St .Dev	Min	Max	Mean	St.Dev
Age	25	69	49.46	9.11	22	80	52.95	11.35
Household size	1	13	7.35	2.79	1	16	6.88	3.02
Years of formal schooling	0	14	6.55	4.86	0	18	8.68	4.36
Number of livestock owned in tropical livestock unit(TLU)	0.08	2.39	0.76	0.55	0.12	6.48	1.31	1.14
Farm experience	5	42	20.87	9.73	2	40	15.04	9.33
Previous year maize income	0	1500	208.79	244.73	0	2760	355.25	430.64

Source: Field survey (2015).

The average number of livestock owned by beneficiaries was 0.76 TLU and the minimum and maximum livestock owned were 0.08 TLU and 2.39 TLU respectively, while the mean livestock owned by non-beneficiaries was 1.31 TLU and the minimum and maximum livestock owned were 0.12 TLU and 6.48 TLU respectively. This implies that project non-beneficiaries owned more livestock than beneficiaries. Following strock *et al*., (1991) the livestock numbers was converted into tropical livestock unit (TLU), to facilitate comparison between beneficiary and non-beneficiary farmers.

With regard to farming experience, project beneficiaries had more farming experience as compared to non-beneficiaries. The average experience of beneficiary

farmers was 20.87 years and the minimum and maximum farming experience to be 5 and 42 years respectively. On the contrary, non-beneficiary farmers had 15.04 years of farming experience on the average and the minimum and maximum years of farming experience were 2 and 40 respectively (Table 4.2).

In addition, income from the previous year's maize farming activity was assessed. Table 4.2 indicates that the average income recorded by beneficiaries was GH₵ 208.79 and the minimum and maximum farm income were GH₵ 0 and GH₵ 1500 respectively. On the contrary, the average farm income for non-beneficiaries was GH₵ 355.25 and the minimum and maximum farm income were GH₵ 0 and GH₵ 2760 respectively. The disparity in farm income may influence farmer participation in the credit programme.

4.1.1 Descriptive statistic of farm level data

Table 4.3 shows the descriptive statistics of the farm level data used in the study. The mean maize output for beneficiaries was 1560kg. This was obtained by using 0.947ha farm size, 17.44kg of seed, 194.12 kg of fertilizer, 4.84 litres of herbicide, 174.61 person-days of labour and 4.54 number of extension visits. On the other hand non-beneficiaries of the credit programme recorded a mean maize output of 446.47kg. This was obtained by using 0.573ha of farm size, 8.29kg of seed,100kg of inorganic fertilizer, 1.20 litres of herbicide, and 98.60 person-days of labour and 1.60 number of extension visits. The result revealed that beneficiary maize farmers had high maize output compared to non-beneficiary maize farmers.

Table 4.3: Descriptive Statistic of Farm Level Data

		Beneficiaries				Non-Beneficiaries			
Variable	Variable Definition	Min	Max	Mean	St.Dev	Min	Max	Mean	St.Dev
Maize output	Maize output in kg	500	3600	1560	840.52	50	1500	446.47	341.63
Farm size	Farm size in ha	0.4	2.4	0.947	0.494	0.1	2.0	0.573	0.410
Seed	Seed in kg	8	48	17.44	9.46	2	25	8.20	4.63
Labour	Labour in persondays	60	462	174.61	97.85	30	340	98.60	69.60
Fertilizer	Fertilizer in kg	100	500	194.12	109.49	50	150	100	40.83
Herbicide	Herbicide in litres	2	12	4.84	2.59	0	6	1.20	1.595
Extension visit	Number of extension visit per season	2	10	4.54	1.67	0	5	1.60	1.79

Source: Field survey (2015)

4.2 Factors influencing farmers' participation in the Hunger Project Credit Programme

The estimated parameters of the probit model on factors influencing farmer's participation in The Hunger Project are presented in Table 4.4. The likelihood ratio statistic as indicated by the chi square statistics are highly significant (0.0000). This implies that the model has a strong explanatory power. The model has a Pseudo R^2 of 0.4695 which indicates how well the regressors explain the participation probability. In all, eight variables were found to be significant in explaining the factors influencing farmers' participation in The Hunger Project Credit Programme. These are gender, age, years of formal education, number of livestock in tropical livestock unit(TLU) owned by the farmer, maize farming experience, previous year's maize income, farmers'

perception of lending procedures of The Hunger Project and farmers' perception of the distance between his/her house and the epicentre (loan centre).

Below is a table showing variables influencing farmers' participation in the hunger project with their coefficient and standard errors respectively.

Table 4.4: Probit Model to Explain Factors Influencing Farmer Participation in the Hunger Project Credit Programme Conditional on Observable Characteristics

Covariate	Coefficient	St.Erro
Gender	0.9539***	0.37410
Age of respondent	-0.0435***	0.0142
Years of formal education	-0.0813***	0.0323
Household size	-0.0118	0.0515
Engagement in off-farm activity	-0.3318	0.2913
Number of livestock owned inTLU	-0.0357***	0.0091
Membership in farmer based organization	0.2975	0.2715
Maize farm experience in years	0.0517***	0.0164
Previous year's maize income	-0.0009**	0.0004
Farmers' perception of risk	-0.2324	0.2967
Farmers' perception of loan repayment period	-0.1678	0.3593
Farmers' perception of lending procedure	-0.7927***	0.2969
Farmers' perception of distance	-0.6877***	0.2783
Number of obs =170		
χ^2 LR (12) = 110.64		
Prob χ^2 > = 0.0000		
R^2 Pseudo = 0.4695		

Source: Field survey (2015).Note :(***) (*) indicate statistical significant at 1% and 10% respectively

The result shows that gender has a statistically significant influence on farmers' participation in the credit programme. The positive coefficient indicates that male farmers are more likely to participate in the credit programme than female farmers. This is attributed to the fact that males form the larger population in maize cultivation in the study area and cultivates large acres of land compared to their female counter part; the males thus have high credit needs than their female maize farmers. The result is consistent with studies by Awunyo-Vitor and Abankwah (2012) who documented that

males are more likely to access credit as compared to their female counterparts. Their finding suggests that women manage few resources and have small landholding with low productivity thereby affecting their access to
credit.

The coefficient of age is negative and is significantly related to participation. The result indicates that the older the farmers the less likely they would participate in the credit programme. The result is reasonably true because from the descriptive statistic participating maize farmer were fairly younger and are in their productive stage as compared to their counterpart. The result is consistent with the findings of Muhammed (2013) who argued that younger farmers are generally in their entry and expansion stage of farming and are therefore more aggressive to invest in farming hence are more likely to participate in the formal credit market.

The coefficient of years of formal schooling is negative and statistically significant at 1% which means that farmers with more years of formal education are less likely to participate in the credit programme. One plausible reason for this finding is that The Hunger Project's credit programme operates like a semi-formal institution where the loan application does not include rigorous paper work thus farmers with little or no education can easily access credit. The result is consistent with (Muhammed, 2013; Burslund and Tarp 2008) who found education to have a negative relationship with informal credit market participation.

The number of livestock in tropical livestock unit (TLU) owned by the farmer is found to have a negative relationship with participation. The coefficient is significant

at 1%, which implies that farmers who owned more numbers of livestock are less likely to access credit or participate in a credit programme. One plausible reason is that livestock is an asset farmers can liquidate during the cropping season to purchase inputs thereby reducing their need for credit.

The coefficient of maize farm experience is positive and significantly related with credit programme participation. The estimate is statistically significant at 1%, which implies that farmers who have much farming experience are more likely to participate in credit programmes. Farming experience increases farmers' confidence and is an indication of the farmers' ability to pay back the loan. The result is consistent with Ambali (2013) who argued that farming experience increases farmers participation in the credit market.

Previous year's maize income was found to have a negative and significant effect on participating (access to credit) in the credit programme. The estimate is statistically significant at 5%, which means that farmers who had high crop income from the previous year are less likely to participate in the credit programme. This is rational because with high income, the farmer is not constrained in the purchase of inputs for his/her farming activity and will not participate in a credit programme.

Farmers' perception of the lending procedure had a negative and significant effect on credit access. The estimate is statistically significant at 1% implying that farmers who perceive the lending procedure to be a constraint will not apply for credit or participate in the credit programme. One plausible reason for this result is that a cumbersome loan procedure serves as a disincentive for participating in a credit

programme. The result is consistent with that of Chauke *et el*., (2013) who found that farmers' perception of the lending procedure has a negative and significant effect on credit access.

Farmers' perception of the distance between his/her house and the epicentre (loan centre) had a negative and significant effect on participation in the credit programme and is significant at 1%. The result indicates that farmers who perceive the distance between their house and the epicentre to be far are less likely to access credit from The Hunger Project. One underpinning reason for this result is that farmers who are far away from the epicentre may incur a higher transaction cost in accessing credit from The Hunger Project. The result is consistent with that of Chauke *et el*., (2013) and Hussien (2007) who acknowledged that farm households are discouraged to access credit when the loan sources are situated further away from their residence.

4.3. Propensity score matching results

The Nearest Neighbour Matching, Stratification Method Matching and Radius Matching were employed for the matching. The entire estimate gave similar results indicating the robustness of the results. The results are presented in Table 4.5. It shows that farm size increases by 0.235ha using the NNM estimator and was significant at 10%. The SMM estimator reported an increase of 0.352 hectares in farm size and was significant at 1%. The RM estimator reported an increase of 0.325 hectares in farm size and was significant at 5%. This result is in consonance with Awunyo-Vitor, Al-hassan and Sarpong (2014) who established that participation in the formal financial market had an impact on farm size. The NNM estimate of the effect of The Hunger Project

credit programme on seed reported an increase of about 8.324 kg. This increase was statistically significant at 1%. In the case of SMM estimator, seed increase by 9.476 kg and was significant at 1%. Using the RM estimator with a calliper of 0.01, the result shows an increase of about 8.959 kg in seed usage and was significant at 1%. The result is consistent with Jehan and Muhammad (2008) who found significant improvement in seed usage by beneficiaries of agricultural credit in Pakistan.

Table 4.5: Estimated Impact of The Hunger Project Credit Programme Participation on Farm Input use.

	Nearest neighbour matching (NNM)	**Stratification method matching (SMM)**	**Radius matching (RM) with a calliper of 0.01**
Outcome	Average treatment effect on the treated (ATT)	Average treatment effect on the treated (ATT)	Average treatment effect on the treated (ATT)
Farm size	0.235*	0.352***	0.325**
	(0.193)	(0.110)	(0.125)
Seed	8.324***	9.476*** (1.96)	8.959***
	(2.241)		(1.822)
Labour	49.865***	64.054***	59.213**
	(35.435)	(21.242)	(23.242)
Fertilizer	65.546***	-	-
	(38.969)		
Herbicide	3.412***	3.849***	3.716***
	(0.686)	(0.499)	(0.401)
Number of extension contacts	3.882***	3.403***	3.205***
	(0.844)	(0.392)	(23.242)

Source: Field survey (2015) Note :(***) (**) (*) indicate statistical significant at 1%, 5% and 10% respectively

The NNM estimate of the effect of The Hunger Project credit programme on labour reported an increase of about 49.865 person-day. The estimate was significant at 1% level of significant. However, there was 64.054 person-days increase in labour usage and was significant at 1% using the SMM estimator. Moreover, the result of the RM reported an increase in labour use of about 59.213 person-days and this was significant at 1%. The result is supported by the findings of Kinkingninhoun et al.,

(2010) who found the cost of hired labor to increase by 8,925 FCFA for beneficiaries of agricultural credit in Benin.

The NNM estimate of the effect of The Hunger Project credit programme on fertilizer reported an increase of about 65.546 kg and was significant at 1%. However, the other two estimators did not yield any estimate: this may be because only four farmers in the non-participating group used fertilizer and possibly, there could not be suitable match. The result is in consonance with (Jehan and Muhammad 2008; LakerOjok & Kayobyo 2013 and Mghenyi, 2009) who found significant impact of credit programme participation on fertilizer utilization.

The result of the NNM estimator recorded an increase of about 3.412 litres in herbicide use. Concerning the SSM estimator, herbicide use increased by about 3.849 litre and RM estimator recorded an increase of about 3.716 litre in herbicide use. All the estimate of the three estimators was significant at 1%.

The number of extension contacts per season increased by 3.882, 3.402 and 3.205 using the NNM, SMM and RM respectively and all were significant at 1%. The implication of the result is that beneficiaries of the credit programme had more extension contact than non-beneficiaries, which may lead to high technology adoption and subsequently an increase in productivity. The increase in extension contact is due to the fact that the credit programme is followed up with extension.

The result of the study revealed that participating in the credit programme had significant impact on farm input utilization. Other studies have found significant impact

of agricultural credit programme on farm input use. (Arif, 2001; Devi, 2012 and Narayanan, 2015).

4.4 Impact of The Hunger Project Credit on Maize Productivity

The maximum likelihood estimates of the endogenous switching regression model are shown in Table 4.6. The variables in the selection equation are similar to the variables in the probit model in Table 4.4 and have the same results. The results from the productivity equation shows that the coefficient of fertilizer had a positive sign for both beneficiary and non-beneficiary farmers; however, it is statistically significant at 5% for beneficiary farmers and 1% for non-beneficiary farmers; thus a unit increase in fertilizer results in a 0.1721unit increase in maize output for beneficiaries and a 0.1793 unit increase for non-beneficiaries. The implication is that fertilizer use leads to increased maize output for both groups of farmers. The result confirms the findings of (Okoboi et al., 2012 and Obasi et al., 2013) who concluded that fertilizer increases the productivity of land which leads to increase output.

The coefficient of labour has a positive sign, and statistically significant at the 5% level of significance for beneficiary farmers; as such a unit increase in labour use result in a 0.1772 unit increase in maize output. However, labour is statistically insignificant for non-beneficiary farmers, nevertheless had a positive sign; suggesting that a unit increase in labour use result in a 0.4322 unit increase in maize output. The results suggest that labour use increases maize output for beneficiary farmers. This result is consistent with Nuryartono *et al*., (2005). On the contrary, labour use does not significantly influence maize output for non-beneficiary farmers. This result support the finding of Dong *et al*., (2010) who established that, under credit constraints, increasing

or decreasing labour does not affect productivity, due to the fact that input factors may be underutilized because of credit constraints.

The coefficient of extension visits has a positive sign, but it is statistically insignificant for both beneficiary and non-beneficiary farmers. The result suggest that a unit increase in the number of extension visit leads to 0.0053 and 0.0527 unit increase in maize output for beneficiaries and non-beneficiaries respectively. This implies that the number of extension visits had no significant influence on maize output for the two groups of farmers, which may be attributed to low extension contact.

The coefficient of seed has a positive sign; however, it is statistically significant at 5% and 1% significant level for beneficiary and non-beneficiary farmers respectively, which implies that a unit change in seed use lead to a 0.0485 and 0.7079 unit changes in maize output of beneficiaries and non-beneficiaries respectively. The results suggest that the use of seed had a significant influence on maize output for the two groups of farmers. Surprisingly, the returns to seed were high for nonbeneficiaries compared to beneficiaries; this may be attributed to the fact that nonbeneficiary farmers also cultivate high yielding, disease tolerance and drought tolerance local variety of maize seed that is reserved for cultivation.

The coefficient of herbicide has a negative sign and it is statistically significant at 5% for beneficiary maize farmers; this implies that a unit increase in herbicide use leads to a 0.1136 unit decrease in maize output; this may be due to overutilization of the input. The result is consistent with Oluwatayo, Sekunmade, and Adesoji (2008) who found a negative relationship between agro-chemical use and farm output. On the other

hand, herbicide has a positive sign and statistically significant at 10% for non-beneficiary maize farmers; thus a unit increase in herbicide use leads to a 0.1881 unit increase in maize output.

Table 4.6: Maximum Likelihood Estimates of the Endogenous Switching Regression Model for Maize Productivity

Variable	Criteria Equation (Credit Access)		Productivity Equation			
			Beneficiaries (N=85)		Non- (N=85)	ıries
	Coef.	St.Err	Coef.	St.Err	Coef.	St.Err
Gender	0.89810***	0.3625				
Age of respondent	-0.0455***	0.0144				
Years of formal education	-0.0754**	0.0349				
Household size	-0.0281	0.0538				
Engagement in off-farm activities	-0.2719	0.2878				
Number of livestock owned in TLU	-0.0339***	0.0092				
Membership in farmer based organizations	0.3754	0.2705				
Maize farm experience in years	0.0607***	0.0168				
Previous year's maize income	-.0011**	0.0005				
Farmers' perception of risk	-0.2589	0.2924				
Farmers' perception of loan repayment period	-0.0223	0.3590				
Farmers' perception of lending procedure	-0.6822**	0.3161				
Farmers' perception of distance	-0.6698***	0.2756				
Constant	2.9533***	0.7854				
Fertilizer			0.1721**	0.0828	0.1793***	0.0686
Labour			0.1772**	0.0864	0.4322	0.2793
Extension visit			0.0053	0.0114	0.0527	0.0384
Quantity of seed			0.0485*	0.1515	0.7079***	0.2912
Herbicide			-0.1136**	0.0548	0.1881*	0.1087
Farm size			0.7428***	0.1418	-1.0577	0.3088
Constant			5.5927***	0.59010	2.2784	1.4926
Inverse mill ratio			-1.7506***	0.08278	-0.5529***	0.0781

ρ_1, ρ_2	0.50398*	0.3004	0.1562	0.4140
LR test for joint Independence of equations				χ^2= 2.81

Source**:** Field Survey (2015). Note :(***) (**) (*) indicate statistical significant at 1%, 5% and 10% respectively.

The coefficient of farm size has a positive sign and is statistically significant at 1% for beneficiary farmers. This implies that farm size has a significant influence on maize output; which implies that a unit increase in farm size leads to a 0.7428 unit increase in maize output. The result is consistent with Obasi et al., (2013) who found farm size to have significant effect on productivity. On the contrary, farm size has a negative sign and is statistically insignificant for non-beneficiary farmer; the results indicate that a unit increase in farm size leads to a 0.0577 unit decrease in maize output. This result suggests that farm size has no significant influence on maize output for non-beneficiary farmers; this may be attributed to the fact that most resources could not be fully utilized due to resource constraints. The result is consistent with (Carter, 1984; Masterson, 2007 and Okoye et al., 2008).

The coefficient ρ_1 for the correlation between the credit supply equation and the productivity equation of beneficiaries is positive and statistically significant; however, ρ_2 for non-beneficiaries is not significant from zero. The implication of the result is that farmers who access credit from The Hunger Project had higher productivity than a random farmer from the sample would have had, and farmers who were non-beneficiaries of the project had lower productivity than a random farmer from the sample would have had.

The likelihood-ratio test for joint independence of the three equations reported in the last row of Table 4.6 showed that these three models are not jointly independent

and cannot be estimated separately. The result of the study is consistent with (Boucher and Guirkinger 2007; Feder *et al*., 1990 and Dong *et al*., 2010) who used the endogenous switching regression approach to estimate the effect of credit on agricultural productivity.

Table 4.7 Maize productivity level for beneficiary and non-beneficiary farmers

Category	Mean	Std Dev	t-value	2-Tail sig(P-value)
Credit beneficiaries	1643.5	310.6		
Non-beneficiaries	838.9	473.9	13.09	0.000

Source: Field survey (2015).

The result in table 4.7 revealed that there is significant difference between the productivity of beneficiaries and non-beneficiaries at the one percent level of significance. Beneficiary farmers produce an average of 1643.5 kg of maize per hectare (1.64mt/ha), while non-beneficiary farmers produce an average of 838.9 kg of maize per hectare 0.84mt/ha. The result shows that beneficiary farmers had high yield of 1.64 mt/ha comparable to the optimum yield of 2.0 mt/ha; moreover, nonbeneficiary farmers could increase their productivity level if they access credit from the hunger project.

In a focus group discussion, it came to light that all the farmers received input credit (improve seed, fertilizer and herbicide) with a few of them getting additional financial credit. The farmers were trained by extension officers of the project who also supervised farmers' activities: this was to ensure that the credit received, especially the inputs, were not diverted. This approach may account for the high productivity gain.

According to Feder *et al*., (1990) the output effect of credit is smaller than expected due to diversion of credit in part to consumption.

4.5 Analysis of Resource Use Efficiency of Farmers

The efficiency ratios for beneficiary and non-beneficiary farmers are reported in Table 4.8. The efficiency ratios for beneficiary farmers indicate that the farmers can still optimize output by employing more seed, fertilizer and labour. As the efficiency ratios are more than one indicating underutilization of such resource by the farmers. Nevertheless, the efficiency ratio for herbicide is less than one indicating over utilization of the resource; thus there is the need to decrease it use. On the other hand, non-beneficiary farmers can still optimize output by increasing the quantity of seed, fertilizer, labour and herbicide use since the efficiency ratios are more than one. The results further revealed that beneficiary maize farmers are more efficient in the use of seed and labour input as compared to non-beneficiary maize farmers; however non-beneficiary maize farmers are more efficient in the use of fertilizer input as compared to beneficiary maize farmers.

However, both beneficiaries and non-beneficiaries are not efficient in the use of resources as their efficiency ratios are more or less than one. The result is in consonance with (Akram et al., 2013 and Kara et al., 2015) who argued that participation in credit programme result in increased input use but not efficient use of input.

Table 4.8: MVP and MFC of Resource for Beneficiary and Non-Beneficiary Farmers

	Beneficiaries			**Non-Beneficiaries**		
INPUT	MVP	MFC	MVP/MFC	MVP	MFC	MVP/MFC

SEED	533.82	2.01	265.58	4778.96	2.95	1619.98
FERTILIZER	169.74	70.00	2.42	99.2	70.00	1.4
LABOUR	194.34	12.48	15.57	235.6	11.59	20.33
HERBICIDE	-4,503	12	-375.25	7132.48	12	594.37

Source: Authors' Calculation

4.6 Analysis of Farmers' Constraints

From Table 4.9, the most severe constraint for beneficiary farmers is time of loan delivery with a mean rank of 1.96. The second constraint is not being given the full amount applied for with a mean rank of 2.09, followed by proximity to the loan centre (Epicentre) with a mean rank of 2.71. On the other hand, risk of not being able to repay the loan because of crop failure was the most severe constraint for nonbeneficiary farmers with a mean rank of 2.50. This is followed by proximity to the loan centre and time of loan delivery with mean ranks of 2.79 and 3.34 respectively. Results from the pooled sample shows that time of loan delivery is the most severe constraint followed by proximity to the loan centre and not being given the full amount applied for with mean ranks of 2.69, 2.75 and 3.06 respectively.

The Kendall's coefficient of concordance (w) indicates that there were 76%, 39% and 43% agreement between rankings by beneficiary farmers, non-beneficiary farmers and the pooled sample respectively. These were all significant at 1%. The Kendall's W for beneficiary farmers indicated that there is a high degree of agreement between the ranking of the constraints. The Kendall's W for non-beneficiary farmers and the pooled sample indicated a low level of agreement between the rankings of the constraints. The significant levels indicate that the null hypothesis that there is no agreement among rankings by maize farmers is rejected in favour of the alternative hypothesis that there is an agreement among rankings of maize farmer.

Table 4.9: Ranks of Constraint Farmers Face in Accessing Credit from the Hunger Project

CONSTRAINTS	BENEFICIARIES		NON-BENEFICIARIES		POOLED	
	Mean rank	Rank	Mean rank	Rank	Mean rank	Rank
Time of loan delivery	1.96	1	3.34	3	2.69	1
Not being given the full amount applied for	2.09	2	3.92	4	3.06	3
Proximity to loan centre	2.71	3	2.79	2	2.75	2
Risk of not repaying the loan because of crop failure	3.79	4	2.50	1	3.11	4
Time of loan repayment	4.88	5	5.10	6	4.99	5
Mode of loan repayment	5.80	6	6.34	7	6.09	7
Inadequate information about the credit programme	6.77	7	4.02	5	5.31	6
Total N	46		52		98	
Kendell's W	.761		.387		.430	
Test Statistic	210.016		120.749		252.870	
Degree of freedom	6		6		6	
Asympototic sig.(2 side test)	.000***		.000***		.000***	

Source: Field survey (2015). *** represent 1% level of significance.

CHAPTER FIVE

SUMMERY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter is intended to provide summary, conclusions and recommendations of the study; the chapter is fashioned into three sections, the first section presents summary of the study, the second section presents conclusions and finally recommendation based on the empirical finding of the study are presented in the third section.

5.1 Summary

The aim of the study was to determine the effect of the hunger project credit programme participation on farm input usage, to determine the effect of the hunger project credit programme on the productivity of maize farmer, to determine and compare the resource use efficiency of beneficiaries and non-beneficiaries and to analyse the constraints farmers face in accessing credit from the hunger project.

A field survey was conducted in seventeen (17) communities within the kwahu west municipality in the month of May 2015 in which structured questionnaire was use to solicit primary data for the study. A multi-stage sampling technique was employed to sample 170 maize farmers for the study; 85 project beneficiaries and 85 non-beneficiaries.

The propensity score match was use to match programme participant with non-participant based on similarities in observable characteristics to determine the impact of credit programme participation on farm input usage. The endogenous switching regression model was use to determine the effect of the hunger project credit programme on maize productivity; moreover the Kendall's coefficient of concordance was use to analyse the constraints farmers face in accessing credit from the hunger project.

5.2 Conclusion

The study provides insight into how agricultural credit programme could impact upon the productivity of smallholder farmers. The result of the probit model shows that

gender, age, years of formal education, Number of livestock owned in tropical livestock unit, maize farm experience in years, previous year's maize income, farmers' perception of lending procedures and farmers' perception of distance between his/her residence and epicentre had a significant influence on participation (access to credit) in the credit programme. The PSM results reveals that participation (access to credit) in The Hunger Project credit programme had a significant effect on farm input used. The results suggest that the marginal effect of credit on farm input usage is high.

Subsequently, the result of the second stage endogenous switching regression model revealed that all the inputs employed by project beneficiaries had a significant effect on maize output with the exception of the number of extension contacts, which had no significant effect on maize output. The result further shows that farmers who had access to credit had higher productivity than a random farmer from the sample would have had; and farmers who did not access credit had low productivity than a random farmer from the sample would have had. The productivity differences between the two groups of farmers indicate that non-beneficiary farmers can increase their productivity substantially if they have access to programme credit.

The study further shows that both beneficiary and non-beneficiary farmers were not efficient in input usage, as resources were underutilized with the exception of herbicide which was over utilized by beneficiary farmers. The study further shows that the major constraints farmers face are time of loan delivery, proximity to loan centre and not given the full amount applied for.

In viewpoint of agricultural credit policy, one important factor worth noting is the enormity of the anticipated productivity gain; agricultural credit may be beneficially invested elsewhere if the marginal productivity gain from credit is small.

5.3 Recommendations

Based on the empirical findings of the study, these recommendations are made;

1. The hunger project should design policies to encourage more non-beneficiary maize farmers to take advantage of the credit programme to expand their input use and maximize their productivity.
2. Extension education and training should be intensified to train maize farmers in the kwahu west municipality on the application of recommended rate of farm input to improve their resource use efficiency.
3. Project implementers should as much as practicable address the constraints farmers face in participating or accessing credit from The Hunger Project through:
   (i) Timely delivery of credit;
   (ii) Increased access to credit; and
   (iii) An increase in the amount of credit available to meet borrowers' demand.

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APPENDICES

APPENDIX A: Questionnaire

EFFECT OF THE HUNGER PROJECT CREDIT PROGRAMME ON PRODUCTIVITY OF SMALLHOLDER MAIZE FARMERS IN THE KWAHU WEST MUNICIPALITY

Questionnaire for Maize Producers

Name of community……..

Respondent phone number…… Respondent house number……

Respondent identity number…… Date of enumeration……

A. DEMOGRAPHIC AND SOCIOECONOMIC FACTORS

2. Gender of respondent (1) Male [ ] (2) Female [ ]

3. Age of respondent…… years.

4. Marital status (1) Married [ ] (2) Single [ ]

5. Religion ……

6. What is your level of Educational? (1) Primary [ ] (2) Junior high/middle [ ]

(3) Secondary [ ] (4) Tertiary [ ] (5) None [ ]

7. Number of years spent in formal school.....

8. Number of household……..

9. Are you engage in any off-farm activity?

(1) Yes [ ] (2) No [ ]

11. Do you own livestock? (1) Yes [ ] (2) No [ ]

12. If yes

Give the types of livestock and the quantity owned

I	Type of livestock	Tick all that apply	Indicate proportion of livestock
Ii	sheep		
Iii	goat		
Iv	Local fowl		
V	Others specified		

13. Are you a member of any farmer based organization? (1) Yes [ ] (2) No [ ]

14. Indicate number of years in maize cultivation ……...years.

B. FARM LEVEL DATA

15. Indicate season of maize cultivation (1) major season [ ] (2) minor season [ ]

16. What is the size of your maize farm? ……. acres 17

Did you use herbicide during the cropping season?

21. If you used herbicides please fill out the table below:

	Type of	Quantity used (litres)	Unit Price	Amount

22. What type of seed did you plant? (1) Improve seed [ ] (0) otherwise [ ]

Type of seed planted	**Quantity planted per acre (kg)**	**Unit Price per kg**	**Amount**
i. Improved			
ii. Otherwise			

23. Did you use fertilizer? (1) Yes (2) No

If yes, indicate

Type of fertilizer	**Quantity use (kg)**	**Unit cost per bag**	**Amount**
N.P.K			
SULPHATE OF AMMONIA			

24. In the 2014 cropping season what was the quantity of maize harvested kg/acre? ..
25. What was the value of each unit (bag) at the time of selling? ……

26. Did you cultivate maize in the year 2013? (1) Yes [ ] (2) No [ ] If yes,

27. In the 2013 cropping season what was the quantity of maize harvested kg/acre? ....

28. What was the value of each unit (bag) at the time of selling? ……

30. What is the cost of labour per day (GH₵)…….

29. Indicate the number of persons, number of hours and number of days spent on each activity.

Labour category	Number of persons	Activity	No of hours spent/day	No of days spent
Male adult Female adult Children < 18		1st Weeding		
Male adult Female adult Children < 18		Planting		
Male adult Female adult Children < 18		1st Fertilizer application		
Male adult Female adult Children < 18		2nd Weeding		
Male adult Female adult Children < 18		2nd Fertilizer application		
Male adult Female adult Children < 18		Harvesting		
Male adult Female adult Children < 18		De-husking		
Male adult Female adult Children < 18		Shelling		
Male adult Female adult Children < 18		Bagging		

INSTITUTIONAL FACTORS

30. Are you aware of The Hunger Project credit programme? (1) Yes [ ] (2) No [ ]

31. Did you receive credit from The Hunger Project? (1) Yes [ ] (2) No [ ]

If yes answer Q. 32 - 34 if no skip to question 36

32. Did you receive in cash or in kind? ……

33. If you received in cash, indication the amount …….. GH¢

34. If you received in kind, indicate the quantity received, unit price of item at the time received and total amount.

ITEM	QUANTITY	UINT PRICE	AMOUNT
Seed Maize			

NPK			
Sulphate of ammonia			
Herbicide			

35. What is the total value of credit received? ……

36. Do you perceive taking a loan to be risky? (1) Yes [ ] (2) No [ ]

37. What is your perception of the loan repayment period; do you consider it to be a constraint to loan application? 1. Yes [ ] (2) No [ ]

38. What is your perception of the lending procedure of The Hunger Project; do you consider it to be cumbersome? (1) Yes [ ] (2) No [ ]

39. What is the distance between your house and the Epicentre? ……..

Kilometre.

38. Do you perceive the distance between your house and the Epicentre to be far?

(1) Yes [ ] (2) No [ ]

40. Do you get extension service? 1) Yes [ ] 2) No [ ]

41. Indicate the number of extension visits per month.....

42 Who provided the extension service? (1) Government extension agent [ ] (2) NGO [ ] (3) Both [ ]

D. CONSTRAINTS FARMERS FACE IN ACCESSING A LOAN FROM THE HUNGER PROJECT

43. Tick as many as applicable and rank the following constraints.

N0	List of Constraints	Tick As Many As Applicable	Rank
1	Inadequate information about the credit programme		
2	Not being given the full amount applied for		
3	Risk of repaying the loan because of crop failure		
4	Time of loan delivery		
5	Mode of loan repayment		
6	Time of loan repayment		

7	Proximity to loan centre		