DETERMINANTS OF ACCESS TO CREDIT AND ITS IMPACT ON HOUSEHOLD FOOD SECURITY IN KARAGA DISTRICT OF THE NORTHERN REGION OF GHANA

By

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DECLARATION

I, MA-AZU ABDUL-JALIL, author of this Thesis, do hereby declare that, this submission is my own work towards my Master of Philosophy Degree in Agricultural Economics and that, to the best of my knowledge, it contains no material previously published by another author nor materials which have been accepted for the award of other degree of the university, except references to other peoples work which have been duly acknowledged in the text.

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DEDICATION

I am dedicating this work to my parents Mr. and Mrs. Ma-Azu, my brothers and sisters, Abdul-Aziz, Za-id, Muhideen, Faruq, Osman, Kumuriya, Rashida, Malika, A-isha, Safia, My grandfather, Late Alhaji Zuneidu Osman. Special dedication to my wife whose patience, prayers and encouragement made this dream a success and finally to our son Muhammad Tharwan Tipagya.

ABSTRACT

This study attempts to measure access to credit and its influence on food security in Karaga District of the Northern region of Ghana. The thesis assessed access to credit from both formal and informal sources. The study looked at the farm household characteristics, household assets, farm size and crop produced, demographic factors, farm and non-farm income activities in the study area , household head access to credit and forms of credits accessed, household livestock wealth, number of times eaten in a day by the household and month of stock depletion as measures of food security. The study also employed multivariate tobit model that estimated the determinants of credit. A chi-square test was used to link access to credit to food security. The study revealed that access to credit has significant impact on the household food security status of the farmers. Multivariate tobit estimates revealed that socio-economic factors such as age, male, household size, education, farm size and farmer-based organisation membership positively affect access to credit and subsequently food security. Also, institutional factors such as credit worthiness and guarantor had positive effects on access to credit and food security. Finally all locational dummies except Nyingali and Pishigu had positive influence on credit access and food security.

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TABLE OF CONTENT

LIST OF TABLES x

LIST OF FIGURES

LIST OF ACRONYMS

CIFS	Community-Driven Initiative on Food Security
DADU	District Agricultural Development Unit
DWAP	District Wide Assistance Project
FAO	Food and Agriculture Organization
FBO	Farmer-Based Organization
FGD	Focus Group Discussion
HHS	Household Size
HHEP	Household Economic Portfolios
IFAD	International Fund for Agriculture Development
IFPRI	International Food Policy Research Institute
ISSER	Institute for Statistical Social and Economic Research
JHS	Junior High School
MCA	Millennium Challenge Account
MASLOC	Micro-finance and Small Loans Centre
MiDA	Millennium Development Authority
MOFA	Ministry of Food and Agriculture
MVTE	Multivariate Tobit Estimates
NGO	Non-Governmental Organisation
PRSP	Poverty Reduction Strategy Paper
SHS	Senior High School

CHAPTER ONE: INTRODUCTION

1.1 Background

The fundamental challenge facing the world today is ensuring that millions of households living in poverty have access to enough food to maintain a healthy life. World leaders over the years have been looking for ways to solving the problem of food security and seemed to be the topmost priority in their discussions at every opportune summit (Omotesho, Adewumi and Fadimula, 2010). It is reported that global number of food insecure or undernourished people have increased over the years from 848 million during 2003 to 2005 to 925 million in 2010 (FAO, 2010), while up to 2 billion people are food insecure intermittently due to varying degree of poverty (FAO, 2003).

Food security is an issue of prime importance for every country of the world whether developed or developing. Even the most developed countries have faced food security related problems. However, the enormity of food insecurity differs from nation to nation and time to time. It is a multifaceted situation that is affected by a range of factors and can vary in significance across regions, countries, social groups as well as over time (Bashir, Schilizzi and Pandit, 2012). For example in the USA more than fourteen percent households were food insecure at least for some time during the year (Nord et al., 2008). Similarly, ten percent of Canadian households were food-insecure (Che and Chen, 2002). In Australia the proportion of food insecure population was over five percent and much higher among vulnerable groups (Booth and Smith, 2001). The situation in developing countries is bad and getting worse. For instance, in Africa about 239 million people are undernourished (FAO, 2010). Situations in other developing regions such as East Asia, South Asia and Latin America are a little better as compared to Africa (Brown et al., 2008).

The worsening food security situation in Africa seemed to be exacerbated by the fact that majority of the population are rural inhabitants. Rural populations suffer much of the crises because they do not produce sufficient food and do not have sufficient purchasing power to cover their food needs due to rural poverty (Omotesho et al., 2010). It is estimated that over ninety percent of agricultural production is from the rural farm households with little access to productive resources to adopt improved technologies that will enhance food production (Obamiro, Doppler and Kormawa, 2003).

According to Simtowe and Zeller (2006), the provision of credit to farmers is widely perceived as an effective strategy for promoting the adoption of improved technologies by rural farm households. Cornejo and McBride (2002) reviewed factors that affect technology adoption, and they highlight access to credit as a key determinant of adoption of most agricultural innovations. It is believed that access to credit promotes the adoption of risky technologies through the relaxation of the liquidity constraint as well as through the boosting of household's-risk bearing ability. Simtowe and Zeller (2006) reported that credit access had a higher impact on the adoption of hybrid maize among credit constrained households in rural Malawi. Petrick (2004) posits that lack of credit access may affect farm productivity because farmers facing binding capital constraints would tend to use lower levels of inputs in their production activities. Improved access to credit facilitates optimal input use and therefore could have a major impact on productivity. Thus, access to credit allows farmers to satisfy their cash needs induced by the agricultural production cycle and consumption requirements.

Despite the mammoth empirical evidence (Carnejo and McBrid, 2002; Obamiro et al., 2003 and Simtowe and Zeller, 2006) that exist to demonstrate the impact of credit access on food production and for that matter food security, ISSER (2010) reported a decline in the allocation of credit to smallholder farmers in Ghana.

1.2 Problem Statement

The availability and access to food to a large extent depend on increased food production as well as income to meet the household's consumption needs. Funds to carry out timely purchases of cash inputs such as fertilizer, quality seeds, herbicides and pesticides into agricultural production, as well as to buy capital equipment like hoes, cutlasses and water pumps has long been regarded as one of the critical constraints inhibiting increased food productivity in smallholder agriculture (Ellis, 2000). Smallholder farmers finance their agricultural activities through equity funds from their on-farm and off-farm activities (Seini, 2002; Sadick, Egyir and Amegashie, 2013). Due to the subsistence nature of agriculture practiced by the smallholder farmers their on-farm and off-farm activities are usually small scale and yield little income. As such, they are not able to invest in improved production technologies that will increase food productivity.

Under such circumstances, agricultural development scholars (Diagne et al., 2000; Simtowe and Zeller, 2006) posit that the provision of credit to farmers is the best remedy to complement the on-farm and the off-farm income of smallholder farmers to enhance food production. They argued that provision of credit to farmers is widely perceived as an effective strategy for promoting the adoption of improved and risky technologies through the relaxation of the liquidity constraint as well as through the boosting of household's-risk bearing ability.

The International Fund for Agriculture Development (IFAD), (2004) reported that over one billion farmers in the world lack access to basic financial services, depriving them of the means to improve their income, secure their existence, and cope with food insecurity and emergencies. It is further estimated that only five percent of farmers in Africa and about fifteen percent in Asia and Latin America have had access to formal credit due to lack of

collateral.

The agricultural enterprises are also beset with unfavourable factors which make financial service providers classify farmers as high risk clients who cannot use their farms as collateral for credit (Rahaji and Fakayode, 2009; De Klerk, 2008). These factors are low rainfall, poor soil fertility and inadequate infrastructure. Farmers‘ crops can also be destroyed by droughts, floods and insect pests. Herds of livestock can be devastated by disease and hunger. Unpredictable markets threaten farm livelihoods and incomes. These factors affect large groups of farmers at the same time and represent a high risk for financial institutions because many clients will have repayment problems. This is exacerbated by the fact that smallholder farmers often lived in widely dispersed communities resulting in high transaction cost in terms of credit administration and data gathering on the nature of their enterprises (Sadick et al., 2013; Rahaji and Fakayode, 2009). For this reason, financial service providers are reluctant to extend credit services to farmers and even if they do farmers are often charged high interest rates.

This compelled governments, development organizations and non-governmental organizations (NGOs) to include credit supply to farmers in their short and long term development programmes to enhance food productivity and hence food security in the wake of the global climate change. For example, Simtowe and Zeller (2006) recounted one such programme implemented by the Malawian government to intensify maize production through the use of hybrid maize seed and fertilizer in an ambitious credit programme based on joint liability lending. Under the programme Agricultural extension officers were given a task of overseeing the functioning of the credit groups and monitoring loan repayment. In Ghana, one of such programme is the Millennium Development Authority (MiDA) agricultural development programme recently implemented by the government of Ghana with funding from the American government of which the Karaga district, the area of focus of this study, was a beneficiary.

Over the last couple of years frantic efforts are made by NGOs, governmental organizations and some private financial institutions working in the Karaga district to make credit accessible to farmers with the aim of boosting food production to ensure food security. With all the efforts to make credit accessible to farmers, one important question that is inescapable is; Does farmers' access to credit or its improvement have any effect on the farm households' agricultural output, income and food security in the district? This research was therefore conducted in the Karaga district of northern Ghana to address this fundamental question to guide future agricultural development policies in the district.

1.3 Research Questions

In order to assess the effect of credit access on farm households' food security in the district, the following specific questions were raised.

1. What proportion of farmers in the district has accessed credit for farming in the last five years?
2. What are the sources of credit to farmers in the district?
3. What are the determinants of access to credit from formal and informal sources of credit?
4. What is the direct effect of farmers' access to credit on the farm household food security?

1.4 Objectives of Study

The study addressed the research questions above and attained the following objectives.

1.4.1 Main Objective

To assess the effect of farmers' access to credit on farm households' food security in the Karaga district

1.4.2 Specific Objectives

The specific objectives achieved by the study include:

1. To compute the proportion of farmers in the district who have accessed credit in the last five years.
2. To identify the sources of credit to farmers in the district.
3. To estimate the determinants of access to credit from the identified formal and informal sources of credit in the district.
4. To measure the effect of access to credit on food security of credit beneficiary farm households in the district.

1.5 Justification of the Study

Poor rural households in developing countries lack adequate access to credit. Many development professionals believe that this lack of credit has negative consequences for poor people's agricultural productivity, food security, health, and overall household welfare. Improved access to credit, they argue, will help poor rural households engage in more productive income-generating activities both on and off the farm and raise their living standards (IFPRI, 2001). The adoption of financial capital in terms of credit as a core strategy to alleviate poverty in recent times by the World Bank has shown to be an effective tool against poverty and food security. In addition to exhibiting exemplary performance regarding repayment and financial sustainability, emerging evidence has identified the positive impact of credit (financial capital) on household wellbeing, gender relations and women's empowerment (Hossein, 1998; Hashemi et al., 1996; Pitt and Khandker, 1996). Research work by Hossein et al. (1999) have pointed to the fact that access to credit has a positive correlation with food security. Despite the recognition by individuals and financial institutions of the influence of access to credit on household living standards and food security in current development discourse, little or no

research work has been done in the northern part of Ghana most especially Karaga District regarding the subject. This research work therefore seeks to situate Karaga District in the context of credit access and food security thereby serving as a policy document to government, non-governmental

organisations and other stakeholders hoping to operate in the district. There is no doubt that this research will also add or contribute to knowledge.

Both in response to these failures and in recognition of the critical role that credit can play in alleviating rural poverty in a sustainable way, innovative credit delivery systems are being promoted throughout the developing world as a more efficient way of improving rural households‘ access to formal credit with no or minimal government involvement. The failure of government-supported financial institutions throughout the developing world has also convinced many researchers of the need for a better understanding of how poor households in less-developed countries, often living in highly risky environments, insure against risk and conduct their intertemporal trade in the absence of well-functioning financial markets (Deaton 1989; Coate and Ravallion 1993; Townsend 1994; Udry 1994, 1995; Fafchamps 1992).

Several studies conducted in the past two decades have substantially increased economists' understanding of the workings of informal financial institutions in developing countries (see, for examples, the surveys by Besley 1995, Alderman and Paxson 1992, and Gersovitz 1988). The studies have revealed the complex strategies used by poor households in developing countries to increase their productive capacity, share risks, and smooth consumption over the life cycle. These strategies generally work through self-enforcing informal contracts among friends, neighbors, and members of the extended family, and are arranged within networks of informal institutions of diverse natures (Fafchamps 1992; Coate and Ravallion 1993; Udry 1994; Lund and Fafchamps 1997; Kochar 1997). These nonmarket informal institutions, the

economic rationales of which have long eluded the attention of researchers and policymakers, have often been found to outperform the financial institutions governments have set up to serve the rural population. One hypothesis that is often advanced by researchers and policymakers to explain this phenomenon is that government- and nongovernment organization (NGO)-supported credit programs often crowd out the financial services offered by these informal financial institutions. Hence, understanding how nonmarket informal

institutions serve the financial need of households and interact with the formal credit institutions set up by governments and NGOs is important. Such understanding is valuable for sustainable and market-oriented financial institutions that would expand and complement the services offered by the existing informal credit market rather than substitute for them.

1.6 Organization of the Study

The study is presented in five chapters. The first chapter gives an insight into the background of the study, problem statement, research questions, objectives and justification of the study. The second chapter reviews both theoretical and empirical literature on credit access, food security and their related issues. Chapter three is the research methodology of the study which encompasses the study area and its characteristic features, the conceptual framework, empirical strategy, hypotheses of the study, data collection and data analysis. Chapter four focuses on model estimation, discussion and presentation of results as well as diagnostic tests. The final chapter is the conclusions drawn from the results and also includes a summary of findings, recommendations, limitations and suggestions for future research.

CHAPTER TWO: LITERATURE REVIEW

This chapter reviewed literature related to the study. This particularly looked at the operational definitions of key concepts, determinants of access to and participation in credit programmes, household food security and its measurement, access to credit and how to measure access to credit, trend of food security in Ghana and northern region and the global perspective of food security and finally the production trend in the study area.

2.1 Operational Definitions of Key Concepts

Access to Credit: The study considered a farmer to have access to credit if the farmer is able to successfully borrow either the full amount, greater or less than the full amount of credit the farmer applied for. On the hand, a farmer is said to have no access to credit if the farmer‘s credit application is completely rejected.

Food Security: Food security is defined in different ways by international organizations and researchers. According to Smith et al. (cited in Maxwell, 1996), there are close to 200 definitions of food security. Since the World Food Conference of 1974 definitions evolved from viewpoints ranging from emphasis on national food security or an increase in supply to those calling for improved access to food in the 1980s (FAO, 1983). In the 1990s, improved access was redefined by taking into account livelihood and subjective considerations (Maxwell, 1996). Definitions underwent another round of evolution after the 1996 World Food Summit, when the definition was broadly access by all people at all times to enough food for an active, healthy life (Bickel *et al.*, 2000). Even though there are several definitions of food security, this study considered a household to be food secured if their farm produce together with food purchases from the market are able to feed the household from one planting season to the next planting season.

Household: The study considered a household to be a group of people living together under one roof, cooking and eating from the same pot.

2.2 Determinants of Access to and Participation in Microfinance Programmes

Many factors affect access to microcredit and the participation of individuals in various microfinance programs.

2.2.1 Age

It has been indicated that as the age of women increase they cannot participate in microfinance programs effectively (Diagne, 1999). There is a negative correlation between age and the probability of participation in credit programme from formal and semi-formal institutions. This means that as an individual is growing up or ageing, the tendency to borrow from formal and semi-formal institutions decreases. This may be because the ability to repay the loan might decrease because the individual might be too weak to work to generate the needed income to pay back the credit (Togba, 2004).

A study by Mpuga in 2008 showed that the age of an individual is positively related to the decision to apply for credit and the amount of credit applied for. The young and energetic individuals with ambitions to earn higher incomes and expand investment or engaged in different activities are expected to be more active in terms of saving so as to accumulate enough capital. The older are likely to rely more on their past savings and accumulated wealth for consumption. He further stated that the young may tend to save and/or borrow more for various activities while the old may be less. Those at the medium age have positive and significant demand while the old are less inclined to demand for credit. Contrary to Mpuga‘s findings, a study by Tang et al. (2010) proved that old farmers are more likely to borrow than younger farmers. This is because older farmers have more social network or social capital and, thus,

have more access to credit market. The study by Nwaru in Nigeria, 2011 contradicts this result and proved that age of the individual does not have effect on credit demand.

2.2.2 Household total value of assets

In one study conducted in Malawi, total value of assets was found to have no significant effect on access to both formal and informal credits. The composition of household assets was much more important in determining household access to formal credit than the overall value of the assets (Diagne, 1999).

2.2.3 Landholding size

In a study conducted, landholding size was found to have a positive but statistically significant effect only on access to informal credit. The share of cultivable land in total household land had a positive effect on access to formal credit. This positive effect was attributed to the fact that seasonal agricultural loans come as input packages corresponding to farmers‘ acreage. On the other hand, the marginal effects of the share of the value of land in the total value of household assets was negative and statistically significant for both access to formal and informal credits (Diagne, 1999).

2.2.4 Member of a Farmer-Based Organisation

Group membership is an essential tool for screening loan applications and for ensuring that contracts can be enforced (Aryeetey, 2005).The group based microcredit program allows borrowers who cannot provide collateral, to form their own group where members are mutually liable for each other‘s repayments although loans are provided to individuals. Since MFO‘s agree not to take any legal action against defaulters, the only instrument they have against loan defaulters is joint liability, where if any member is unable to repay, other group members cannot borrow unless they assist in repaying defaulters debt (Al-Mamun et al.,

2011). Ghatak (1999) mentioned that group lending programme provide an opportunity for the MFI's to distinguish good borrowers from the risky ones. This joint liability feature of group based microcredit programme attracts the attention of development communities because of its ability to improve repayment performance which allows MFI's to achieve institutional financial sufficiency (IFS) and reaching large numbers of poor and hardcore poor households thus generating positive socio-economic impacts (Zhang, 2008). Thus, it is easier for women to access microcredit when they are in groups than as individuals.

2.2.5 Social Capital

Social capital as information diffusion network could influence credit programme participation. Consider a given borrower who seeks credit for an investment project or to smooth consumption in the face of adverse shocks to income. For the potential borrower, the decision to apply to a specific credit source for a loan will depend on the availability of reliable information about lending institutions. Thus family and community provide them this information. That contributes to decrease the search cost. Potential borrowers may learn about lending institutions and credit contracts through community activities and neighborhood meetings, or through informal interactions with neighbors and family members. Family and community networks can facilitate the flow of high-quality information about new credit market opportunities, thus lowering the search costs of the borrower (Okten and Osili, 2004).

2.2.6 Education

Education can influence participation in microfinance credit programme. Formal and semiformal sources require more papers to fill. It is assumed that the probability for a person who is not educated to take loan from formal and semi-formal is low and are most of the time ignored by these institutions. It is again assumed that households with a good educational level are more likely to choose more formal or semi-formal financing practices than less educated

ones (Togba, 2004).Tang et al. (2010) indicated education as one of the most important variables that affect households demand for credit. Their findings indicated that additional year of education by the household head would increase the probability of borrowing by another 2.5 percent. According to their study, while education increased households‘ probability to borrow from formal credit markets, it decreased or did not affect the informal credit demand at all. Chen and Chivakul (2008) also argue that, education, at primary and secondary level may affect demand positively, but at four-year university level, education has negative but insignificant effect. This could imply that highly educated individuals already enjoy high income and wealth and have little need to borrow. Bendig and others in 2009 demonstrated that better_educated heads are likely to use credit from formal financial services.

2.2.7 Loan Duration

The longer the loan maturity, the more the households demand the credit from MFI. The argument is that lenders lend small amounts and have maturity periods that minimize costs, often in a way that make their loans less attractive to businesses. The loan characteristics of microfinance schemes indicate that their loans are comparable to those of most existing informal arrangements. Loan maturities are generally short (Togba, 2004).

2.2.8 Household Size

The role of households‘ size can be seen indirectly. The larger the household the greater is its expenditure. The direction of relationship between this and participation in credit programme may however be ambiguous (Togba, 2004).In a study by Bendig et al. (2009) using a comprehensive survey in Ghana to identify the possible drives that affect the different types of households‘ demand for financial services, results from a multivariate probit regression method showed a positive influence of household size on demanding microcredit as larger households are more exposed to shock (e.g. illness) from higher number of household members. A study

by Tang and others in 2010 also revealed that, household size negatively affected the demand for credit. This was attributed to the fact that larger households assumed to contain more children and elderly people and not households with more economically active adults, are likely to consume a large share of their income and have less collateral.

2.2.9 Use of Loan

The households often examine whether there is need to fund their activity by loan when involving in income generating activities, or they need loans for the education, mortgage, health and consumption purpose (Togba, 2004).

2.2.10 Income

Income is the key variable observed by the lenders. Depending on the flow of revenue, households can get credit or not. Although the collateral (physical assets) is not required for some microfinance credit programme, income is considered as wealth for the households. This household wealth includes the endowment such as land, housing, etc. The probability to participate or demand credit is positively linked to wealth. But this is not always the case as microfinance aims at targeting the poor (Togba, 2004).

2.2.11 Cost of Lending (Interest Rate)

Like any other service/product, the participation in the microfinance credit programme is likely to be affected by their price. In such case, holding other factors constant, the higher the interest rate charged, the lower the demand or participation in credit would be observed (Togba, 2004).

2.2.12 Savings

Savings can be defined as the action of putting money aside in order to consume or invest at a later date. Money saved can be kept at home, deposited in the savings account or invested in different types of capital/assets. Savings in monetary terms is a way to manage liquidity at the

household level. In the long term, however, savings can contribute to increase the income base, for example, by investing in children's education, buying a cow or a new sewing machine. Therefore, savings has been defined as the amount kept aside in the current period and it is not income minus consumption/expenditure; it is a function of cash flow (Dhan Foundation, n.d.).

Savings, a necessary engine of economic growth, has been very low in Ghana. Gross Domestic Savings as a percentage of GDP in Ghana has been low compared with many other African countries, averaging, between 1980 and 2001, 6.4% in Ghana, 37.4% in Botswana, 21.4% in Cameroon, 21.6% in Nigeria, 13.9% in Kenya and 7.3% in Malawi (World Bank, 2003). The apparent low saving rate in Ghana has been due to a combination of micro and macroeconomic and political factors. In order to overcome the problem of low savings in Ghana, various monetary and fiscal policies have been pursued over the years, but these have not yielded the required results (Quartey, 2002; Ziorklui and Barbie, 2003).

Poor households can save, want to save and do save; but it is not easy for them (Rutherford, 1999). Poor households need to save money in order to reduce their vulnerability to negative shocks such as natural disasters, crop failure, job losses, illness or death in the family. Savings in kind or in cash creates a safety net for such households. Poor people are at a disadvantage because financial institutions that serve the better-off hardly target them. The poor often need to spend large sums of money to keep their households together. In addition, they also require savings to help them better manage their resources over time and enable them to plan and finance their investments.

For most microfinance institutions, it is a prerequisite for borrowers to adopt some level of savings habits. It appears that savings by women entrepreneurs or lack of it has a significant impact on their access to microfinance. A study by Alam (2002) revealed that as a rule in order to obtain a loan from Islamic Banks in Bangladesh, business owners at the grass-root level were required

to deposit a certain amount of their savings with the bank. This stipulation not only ensures saving but also allows the bank to judge the credit worthiness of rural-based small and cottage industry owners. The lending of funds by Islamic financing organizations to grass-root level units may be termed as *"giving and taking policy,"* which means that, borrowers first of all must deposit in order to be qualified for a loan. It creates a mutual obligation between the lenders and borrowers.

Amu and Amu (2012) reported that in general knowledge about savings in many districts in Ghana is low and that households save more in the informal forms than in the formal forms. They also found out that personal, societal and organizational constraints inhibit the individual's ability to save. It was revealed further that households do not have any particular pattern for saving as they save as and when they have excess income. They recommended an outreach programme to educate the rural households on savings, among other things.

2.3 Household Food Security

This section provides information on household food security.

2.3.1 Meaning of Household Food Security

Food security refers to a household's physical and economic access to sufficient, safe, and nutritious food that fulfills the dietary needs and food preferences of that household for living an active and healthy life (FAO, 2006).The World Health Organization defines food security as having three facets: food availability, food access, and food use. Food availability is having available sufficient quantities of food on a consistent basis. Food access is having sufficient resources, both economic and physical, to obtain appropriate foods for a nutritious diet. Food use is the appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation. The FAOadds a fourth facet: the stability of the first three dimensions of food security over time (FAO, 2006).

According to Fialor et al. (2004), food security of a household is defined as the ability of the household to meet its food requirements from its available resources. Thus, a household is food secure if it can produce its own food to consume throughout the year or is able to utilise its human or material resources, including the sale of farm produce or income from any of its activities to satisfy its food needs throughout the year. Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Food security for a household means access by all members at all times to enough food for an active, healthy life. Food security includes at a minimum the ready availability of nutritionally adequate and safe foods, and an assured ability to acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies) (www.ers.usda.gov.).

The stages of food insecurity range from food secure situations to full-scale famine. "Famine and hunger are both rooted in food insecurity. Food insecurity can be categorized as either chronic or transitory. Chronic food insecurity translates into a high degree of vulnerability to famine and hunger; ensuring food security presupposes elimination of that vulnerability. Chronic hunger is not famine. It is similar to undernourishment and is related to poverty, existing mainly in poor countries" (Ayalew, n. d.).

2.3.2 Measurement of Household Food Security

There are a lot of approaches used in accessing food security at the household level. Among these are the United States Household Food Security Survey Module, the Household Food Insecurity Access Scale, among others. Discussed below are some of these approaches.

2.3.2.1 United States (U.S.) Household Food Security Survey Module (HFSSM)

This is an 18-item questionnaire that asks respondents about uncertainty or anxiety about food supplies, experiences running out of food, perceptions of insufficient quantity or quality of

food, reported reductions or adjustments in normal food intake (including substituting fewer and cheaper foods), and associated consequences, such as physical feelings of hunger or weight loss. Responses to the questions in the scale are used to create a continuous numeric food insecurity ―score,‖ which can then be compared to established cut-points to categorize the level of food insecurity experienced by the household (Chaparro, 2012).

Sample questionnaires and various levels of food security of households have been given in Appendix 1. This module was developed by US Development Agency as an adaptation from the food security measurement method and has been in use since 1995. It has been used by a number of researchers to determine household food security. It has a number of questions that try to assess the quality of food available, its quantity, psychological acceptability and social acceptability of the situation at the household and individual levels over the previous twelve month period. Questions that address each of these food security components have been summarized in Table 2.1

Table 2.1: Components of food security and corresponding module items

	Level of Analysis	
Component of food security	Household	Individual
Quantity	Repleteness of household stores	Adequacy of energy intake
	Q2	Adult: Q7 Q10 Q11 Q13 Q15
		Child: Q9 Q14 Q18
Quality	Quality and safety of available foods	Adequacy of nutrient intake
	Q4	Adult: Q3
		Child: Q6
Psychological acceptability	Anxiety about food supplies	Feelings of deprivation and restricted choice
	Q1	Items incorporate this into wording
Social acceptability	Sources of food	Normal meal patterns
	Q2 (implied)	Adult: Q5 Q8 Q13 Q15
		Child: Q16 Q17 Q18

Source: USDA (2001)

Scoring of the scale is depicted in table 2.2 below; denoting what level of food security is associated with each number of positive responses. There is an underlying assumption that

households will respond to questions in the predicted order from least to most severe as shown in the 18-item questionnaire in Appendix 1. Although this may not always occur, scoring assumes this overall sequencing, and food security level corresponds to the total number of positive responses, rather than the particular item responses. Previously, a household responding positively to 0–2 items was classified as food-secure. In the new guide, households affirming no items are classified as food-secure, and those affirming one(1) or two(2) items are now classified as _at risk of being food-insecure or as _marginally foodsecure‘ (USDA, 2001).

Table 2.2: Scoring of the food security scales based on questionnaire responses

	Number of affirmative responses		
Food Security Level	18-item,households with children	18-item, households without children (10 used)	6-item short form, all households
Food-secure	0	0	0
Food-secure, at risk	1-2	1-2	1
Food-insecure without hunger	3-7	3-5	2-4
Food-insecure, moderate hunger	8-12	6-8	5-6
Food-insecure, severe hunger	13-18	9-10	

Source: Radimer and Radimer (2002).

2.3.2.2 Household Food Insecurity Access Scale (HFIAS)

The Household Food Insecurity Access Scale is a 9-item questionnaire which was developed for use in developing country settings based on the USDA approach, and queries respondents about three domains of food insecurity, including anxiety/uncertainty about the household food supply, insufficient quality of food (including variety and food preferences), and insufficient food intake and its physical consequences (Chaparro, 2002). A sample of the Household Food Insecurity Access Scale has been provided in Appendix II. This assessment is done based on

information for the past one month. Questions asked try to assess the psychological acceptability of food, the quality and quantity of food and general availability of food.

2.3.2.3 The Hunger Gap

This is a method that was adopted by Fialor et al.(2004) in their study on Impact of Withdrawal of Input Subsidies on Food Security in the Northern Region of Ghana. The index of food security was taken as the length of the hunger gap (lean months) before and after the withdrawal of subsidies. The hunger gap was defined as that period when the household's own source of food is exhausted and they have to rely on purchases from the market using savings or remittances or in extreme cases, borrowings. The nutritional quality of the household food basket was not examined; rather the household's own perception of a normal meal, during the period of availability was used to assess the level of food security before and after the subsidy withdrawal.

2.4 Microfinance and Household Food Security

A number of studies in the past have found a relationship between microfinance access and household food security. Pitt and Khandker (1998) in an examination of microcredit programs in rural Bangladesh, determined that household consumption expenditure increased by 18 taka for every 100 taka borrowed by women, as opposed to an increase of only 11 taka for every 100 taka borrowed by men. This is to say that participation in microfinance increases household food security and the effect of women's participation is higher than the effect of men's participation.

In one field brief done in Zambia, new clients of microfinance exhibited higher coping scores as against their continuing counterparts. The higher coping scores indicate that the new clients used coping mechanisms more often during the reporting period to adjust to food shortages. Similarly, continuing clients in Guatemala exhibited lower coping scores. These findings

suggest that households who are continuing borrowers may use access to finance to rely less on coping mechanisms, however does not indicate whether this is because the loan capital contributes to stabilized incomes so that they do not need to consider having to cope or that the households are using the capital to purchase food or offset the impact of using other potentially damaging coping mechanisms, for example taking children out of school to work or selling productive assets (Field Brief Number 11).

The study also revealed modest increases in per capita income for continuing clients. In Guatemala continuing clients had 25% more income than new clients and in Zambia the corresponding figure was 18% more. Increased incomes benefit food purchases with 83% of Guatemalan clients reporting using additional income to purchase food and 80% of Zambian clients reporting being more able to meet food needs. A regression analysis was done and this also showed that increased income contributes to improved dietary diversity scores: the increased incomes led to higher quality food consumption through a more diverse diet rather than just an increase in staple foods. This means that once households are able to meet their basic energy requirements they are able to diversify their diet or purchase higher quality foodstuffs. In addition, dietary diversity has been found to be a strong indicator of overall food security and improvements in nutrition are critical to address common ailments found among the poor.

The study further revealed that, for microfinance clients, food security itself is not a binary issue, families are at different levels of vulnerability during different periods of the year, and even relatively food secure households demonstrate clear signs of vulnerability to food shortages at certain times. It has also been confirmed that any positive or negative change in income has a direct impact on food security. Higher incomes are correlated to increased dietary diversity and lower coping strategies index results.

Khandker et al. (1998) note that the objective of micro-credit programmes is either to ease the credit constraints of households or to provide them with capital to invest in an activity; thereby increasing their income and consumption. Zeller and Sharma (2000) observe that there are three ways in which access to or lack of financial services can influence income and food consumption (food security) of households. The first is through income generation in which access to credit provides additional capital to enhance the level of the household's existing human, physical and social capital so as to earn more income or by increasing the risk-bearing capacity of households by investing in more risky and more profitable income generating activities. Secondly, improved access to financial services may reduce the holding of assets with lower risk-adjusted returns through more cost-effective assets and liabilities that reduce the cost for self-insurance. Finally, credit can directly be used to finance immediate consumption needs of the household. Households may stabilize their consumption in bad states of nature by adjusting their disposable income or liquidity through borrowing for consumption or borrowing for investment with the fungibility of credit the borrowed funds may be diverted to immediate consumption. Hulme and Mosley (1996) also demonstrate that, the link that exists between credit and poverty reduction is from new investments to the pattern of income change to poverty alleviation. Such a positive relationship depends on the profitability of the projects financed by the credit and their ability to generate direct and indirect employment.

It has been shown that micro entrepreneurs below the poverty line experience lower percentage income increases after borrowing than those above the poverty line. Studies have also demonstrated that households below the poverty line tend to use the loans for consumption purposes to a greater extent than households above the poverty line; thus their income should be expected to increase less (Gulli, 1998). Research findings suggest that poor households are likely to use micro credit loans for consumption purposes yet their loan repayments rates are higher than repayment rates for the formal financial institution, which are normally used by the

well-off in society is quite intriguing (Ghatak et al., 1999). Other studies have found that microfinance is relevant to poverty reduction not just for the beneficiaries but also there are positive spillover effects to the rest of the community

(Khandker, 2006). In his study Khandker (2006) uses a panel household survey from Bangladesh and observes that access to microfinance contributes to poverty reduction, especially for female participants, and to the overall poverty reduction at the village level. Pitt and Khandker (1998) found, using data from three programme in rural Bangladesh, that borrowing from group-lending schemes increased consumption of poor households.

However, Morduch 1998 has argued that Pitt and Khandker‘s result reflect programme selection effects rather than the impact of borrowing per se.

2.5 Measurement and Determinants of Access to Credit

There are presently two methodologies for measuring household access to credit and credit constraints in the literature. The first method infers the presence of credit constraints from violations of the assumptions of the life-cycle/permanent-income hypothesis. More precisely, the method uses household consumption and income data to look for a significant dependence (or ―excess sensitivity‖) of consumption on transitory income. Empirical evidence of significant dependence is taken as an indication of borrowing or liquidity constraint (see, for examples, the recent surveys by Browning and Lusardi (1996) and Besley

(1995). The second method directly uses information on households‘ participation and experiences in the credit market to classify them as credit constrained or not. The classification is then used in reduced form regression equations to analyze the determinants of a household being credit constrained (see Jappelli 1990;

Feder et al., 1990; Zeller 1994; Barham and Boucher 1994). The shortcomings of these two approaches are reviewed in Zeller et al. (1996:1997) and Diagne, Zeller, and Sharma (1997).

The next section develops a methodology based on the *credit limit* concept, which allows a more satisfactory analysis of the determinants of the extent of a household's access to credit and its demand for formal and informal credits.

2.6 Analyzing Access to Credit with the Credit Limit Variable

In general, lenders are constrained by factors outside their control on the maximum amount they can possibly lend to any potential borrower. Consequently, any borrower, however creditworthy, faces a limit on the overall amount she/he can borrow from any given source of credit, regardless of the interest rate s/he is willing to pay and/or collateral he is willing to put up to back the loan. Furthermore, due to the possibility of default and lack of effective contract enforcement mechanisms, lenders have the incentive to further restrict the supply of credit, even if they have more than enough to meet a given demand and the borrower is willing to pay a high enough interest rate (Avery, 1981; Stiglitz and Weiss, 1981). Therefore, from the borrower's view, the relevant limit on supply is not the maximum the lender is *able* to lend, but rather the maximum the lender is *willing* to lend.

The latter perceived *maximum limit* or *credit limit* that cannot be exceeded when borrowing, regardless of how much interest one is willing to pay, is the focus of the methodology used in this paper for quantifying the extent of household access to credit. To motivate the reduced form equations estimated in the empirical section of the paper, a conceptual framework focusing explicitly on the credit limit variable is summarized (see Diagne, Zeller, and Sharma 1997). The conceptual framework basically follows from a contract-theoretic view of loan transactions (see Freixas and Rochet 1997, for example). The framework is based essentially on the fact that the credit limit variable, facing a potential borrower, and the amount the potential lender wants to be repaid, are the variables that lenders can choose. On the other hand,

the optimal amount, b^*, to be borrowed within the range set by the lender remains the sole choice of the borrower, who also chooses ex-post (i.e., once the loan is disbursed) whether and when to pay back the loan.

The lender‘s optimal choice of, which is interpreted here as the supply for credit, is a function of the maximum s/he is able to lend. It is also a function of the lender‘s subjective assessment of the likelihood of default and of other borrowers‘ characteristics. However, this function is not a supply-for-credit function in the traditional meaning of the term, where, under the assumption of price-taking behavior, the supply-for-credit function represents the schedule of what the lender is willing to lend as the market interest rate varies. This traditional supply function for credit is not defined in this context, in which the lender him or herself chooses the interest rate. Similarly, the optimal interest rate, *r*, chosen by the lender is a function of , the lender‘s subjective assessment of the likelihood of default and other borrowers‘ characteristics. The reader is referred to Avery (1981) and Stiglitz and Weiss (1981), respectively, for an empirical and formal analysis of how the lender‘s assessment of the likelihood of default affects the optimal choice of both and *r*. On the other hand, the function defining the borrower‘s optimal choice of loan size, , is a demand-for-credit function in the traditional meaning of the term (i.e., the schedule of what the borrower is willing to

borrow when the interest rate varies). The fact that is a function of in addition to being a function of the interest rate is a mere reflection of the borrowing constraint and the imperfect substitutability of the different sources of loans. However, because of imperfections in the enforcement of the loan contract and the resulting adverse selection, the demand for credit need not be a downward-sloping function of the interest rate. Hence, as pointed out by Stiglitz and Weiss (1981), lenders cannot use the interest rate as a way of rationing credit.

2.7 Access to Credit and Participation in Credit Programs

Access to formal credit is often confused with participation in formal credit programme. Indeed, the two concepts are often used interchangeably in many credit studies. The crucial difference between the two concepts lies in the fact that participation in a credit programme is something that households choose to do freely, while access to a credit programme entails constraints placed on households (availability and eligibility criteria of credit programs, for example). In other words, participation is more of a demand-side issue related to the potential borrower's choice of the optimal loan size while access is more of a supply-side issue related to the potential lender's choice of the maximum credit limit. The *lack of access to credit* for a given source of credit can be defined as when the maximum credit limit for that source of credit is zero. That is, one *has access* to a certain type of credit when the maximum credit limit for that credit type is strictly positive; and one *improves* someone's access to that type of credit by increasing for that credit.

2.8.1 Factors Affecting Productivity in Smallholder Agriculture

According to Dercon (2004) and White (2005) food insecurity remained one of the most crucial challenges to economic development and has been aggravated by recurring rainfall shocks and wars which affect food production in most parts of Africa. The smallholder peasant sector is the most important agricultural sub-sector in developing countries. Its emphasis is on food crops as well as animal husbandry where considerable improvements in productivity depend on improved cultivation practices, management and marketing (Beyene and Musche, 2010). The production volume of food crops as well as the per capita food production has shown tremendous fluctuations in sub-Sahara African throughout the 1980s thus resulting in severe food shortages. The main reason attributed to these fluctuations is stochastic shocks such as recurrent drought, lack of market incentives for the small-scale food producers and poor extension services (Beyene and Muche, 2010; Dercon and Krishnan,

2000; Gezahegn, 1995). Adverse changes in climate, combined with long-term factors (technology, environmental, institutional) led to a decline of landholding, soil degradation and a decline in yield per hectare (Anley et al., 2007; Shiferaw and Holden, 1999).

2.8.2 Level of Food Productivity of Smallholder Farmers

According to Omobolanle (2010), one element of an effective strategy for poverty reduction is to promote the productive use of farm inputs. This can be done by creating opportunities for raising agricultural productivity among small and marginal farmers. It is well documented that for many small scale farmers, lack of access to financial services is one critical constraint to the establishment or expansion of viable agricultural enterprises. Microcredit may enable small and marginal farmers to purchase the inputs they need to increase their productivity, as well as financing a range of activities adding value to agricultural output.

2.9 Determinants of Households' Food Security

Studies by Haile et al. (2005) made use of various methodologies to identify determinants of food security in different parts of Ethiopia. According to these studies, ownership of livestock, farmland size, family labour, farm implements, employment opportunities, market access, levels of technology application, and levels of education, health, weather conditions, crop diseases, rainfall, oxen, and family size are identified as major determinants of food security (Shiferaw, *et al.*, 2003; Yared *et al.*, 1999; Webb *et al.*, 1992).

Much of the literature on food security focuses on developing and testing determinants of food insecurity at the household level (Maxwell, 1996). In line with the literature, this study also investigates factors determining food security. These determinants of food security are categorized into three groups within the framework of the general definition of food security mentioned above, that is, food availability, food access, and utilization. For example, food availability may be constrained by inappropriate agricultural knowledge, technology, policies,

inadequate agricultural inputs, family size, etc. On the other hand, access to food and its utilization could be constrained by economic growth, lack of job opportunities, lack of credit, inadequate training, inadequate knowledge, among others (Hoddinott, 1995). Accordingly, this study investigates the general effects of eleven factors, which fall in any of the three categories discussed above, on the food security status of households(Beyene and Muche, 2010). The role of institutions and household assets in determining food security is well addressed in the livelihood studies (Bebbington, 1999; Dorward et al., 2003; Devereux, 2001). Household food security is dependent on the physical availability of food, the ability of household to access the available food and the ability of individuals (particularly those susceptible to food deficits such as women, infants and children) to secure entitlement to it (Bouis and Hunt, 1999). Hence, it has been broadened beyond notions of food supply to include elements of access (Sen, 1981), vulnerability (Watts and Bohle, 1993) and sustainability (Chambers, 1989).

Though availability and accessibility to livelihood assets are major determinants of food security, factors related to human resource development including education, health care and clean water; population growth, urbanization and displacement of people highly influence food security and human nutrition (Dercon and Krishnan, 2000; Dercon and Hoddinott, 2003). For instance, conservation of agrobiodiversity becomes critical determinant when it integrates natural resource management and the use of improved agricultural technologies (Andersen, 1997; Thrupp, 2002). Other factors like labour, land-to-man ratio, diversification into producing cash crops and generating off-farm income, management of grazing land, household indebtedness, access to credit, performance of input-output markets, household expenditure (obligation to the state, rural institution, the household itself and other households), agricultural inputs and extension services which could help them in improving subsistence production and overall income streams determine food security (Bogale, 2002; Hardaker et al., 1997).

Researchers examined the determinants of food security. Surprisingly, the result does not support the importance of human capital development in food security. But this unexpected result is consistent with the study conducted in Mozambique (Garrett and Ruel, 1999). The findings clearly indicate the role of household assets and income diversification in contributing to household food security. The crucial contribution of different forms of capital (financial and physical) to attaining food security can be indirect and direct because farmers in the area could be engaged in share cropping and land renting where part of their cultivated land is operated by other families who do have the capacity to invest on the land. Therefore, access to land alone could increase the chance to attain food security through getting involved in other forms of economic transactions. In that sense, informal institutions that facilitate crop-sharing arrangements and engagement in informal land lease contracts will play a crucial role.

Moreover, the results also imply that scaling-up of the supply of chemical fertilizer can immensely contribute to enhancing food security. Policies and strategies that involve regulation of the trend of increases in the prices of agricultural products vis-à-vis chemical fertilizer and introducing necessary adjustments are essential to sustain this positive effect. Absence of this might cause a disproportional increase in input prices that will in turn create disincentives for farmers to purchase such inputs.

2.10 Impact of Agricultural Credit on Food Security

Rural financial services help the poor, low-income households increase their incomes, and build the assets that allow them to mitigate risk, smoothen consumption, plan for future, increase food consumption, invest in education, and other lifecycle events (Kibaara, 2006). Lack of adequate access to credit have had significant negative consequences for various aggregate and

household-level outcomes, including technology adoption, agricultural productivity, food security, nutrition, health, and overall household welfare (Diagne and Zeller, 2001).

Access to credit affects household welfare outcomes through three pathways(Zeller et al., 1997). The first pathway is through the alleviation of the capital constraints on agricultural households: expenditures on agricultural inputs and on food and essential non-food items are incurred during the planting and vegetative growth periods of crops, whereas returns are received only after the crops are harvested several months later. Most farm households show a negative cash flow during the planting season. Therefore, to finance the purchase of essential consumption and production inputs, the farm household must either dip into its savings or obtain credit.

Access to credit can therefore significantly increase the ability of poor households with little or no savings to acquire agricultural inputs. Furthermore, easing potential capital constraints through the granting of credit reduces the opportunity costs of capital-intensive assets relative to family labour, thus encouraging the adoption of labour-saving, higher-yielding technologies and therefore increasing land and labour productivity, a crucial factor in encouraging development, in particular in many African countries (Delgado 1995; Zeller et al., 1997).

The second pathway through which access to credit affects household welfare is by increasing household‘s risk-bearing ability and by altering its risk-coping strategy. The third pathway enabling access to credit for consumption smoothing is closely linked to the second, and we therefore discuss them together because they both affect the resilience of households in bearing production and consumption risks.

The mere knowledge that credit will be available to cushion consumption against an income shortfall if a potentially profitable, but risky, investment should turn out badly may induce a

household to bear the additional risk. The household may therefore be willing to adopt new, riskier technologies (Eswaran and Kotwal, 1990).

A household may also benefit from mere access to credit even if it is not because with the option of borrowing it can avoid adopting such risk-reducing but costly strategies as the production of low-risk but less profitable food crops, such as local maize and cassava, and the accumulation of assets that mainly serve precautionary savings purposes but that may yield very poor or even negative returns (for example, keeping cattle or cash).

2.11 Credit Constraint, Access to Credit and Participation

Any borrower, however credit worthy, faces a limit on the overall amount he or she can borrow from any given source of credit. This maximum amount, arising from the limits to the resources of potential lenders, is independent of the interest rate that can be charged and the likelihood of default. Furthermore, due to the lack of effective contract enforcement mechanisms, lenders have the incentive to further restrict credit supply even if they have more than enough to meet a given demand and a borrower is willing to pay a high interest rate (Avery, 1981; Stiglitz and Weiss, 1981).

The credit limit is the maximum the lender is willing to lend. For any potential borrower, the lender‘s optimal choice of, interpreted here as credit supply, is a function of the maximum amount the lender is able to lend and a subjective assessment of the likelihood of default and other borrowers' characteristics. The lack of access to credit from a given source of credit can be defined as that source of credit equalling zero. That is, access to a certain type of credit exists when for that type of credit is positive; and access improves when for that type of credit increases. Access to formal credit is often confused with participation in formal credit programme. The two concepts are used interchangeably in many credit studies. The crucial difference between the two is that households freely choose to participate in a credit program,

but their access to a credit programme is constrained by various factors, including eligibility criteria and availability of credit programs. In other words, participation is more of a demandside issue related to the potential borrower‘s choice of the optimal loan size, while access is more of a supply-side issue related to the potential lender‘s choice of the credit limit.

2.12 Measurement of Access to Credit and its Impact on Household Outcomes

One of the most important policy and research questions regarding credit markets in developing countries is often posed in terms of how access to credit or its improvement translates into change in household agricultural output, income, food security, and so on. This question is central in many decisions regarding government- and NGO-supported credit programmes, where the economic benefits of providing households access to credit are often compared to the economic costs of setting up these programmes and delivering credit to the target households. Therefore, the meaning of the term ―access to credit‖ and its relation to other often synonymously used credit-related concepts such as credit constraint, credit demand, and participation should be clarified first, before its impact on any outcome is assessed. The next section discusses a methodology based on the credit limit concept, which allows a precise definition of ―access to credit‖ and enables a more satisfactory analysis of its

impact on household welfare.

Access to credit, in studies relating it to economic outcomes, has usually been measured in two ways: dichotomous membership in credit programs, and actual loan uptake. Both these measures may be unsuitable for estimating the true causal effect of access to credit (David and Meyer, 1980). First, since credit programme participation and loan uptake are voluntary, the measures are potentially endogenous. For example, parents who avail of loans may have better nourished children, but it cannot be concluded that loans advance child nutrition since parents more heedful of their children‘s health may be likelier to seek out helpful loans. Second, loan uptake would measure access to credit accurately only if credit limits were universally binding,

that is, if everyone‘s loan uptake were equivalent to her credit limit. In reality, individuals often don‘t fully exercise their option to borrow. Even so, that option may well influence their economic behaviour. For example, households with unexercised option to borrow might, as a result, feel sufficiently secure to expend more of their current resources upon children‘s nutrition. Third, membership in a credit programme often confers benefits unrelated to credit access such as literacy classes. These secondary effects of credit program participation may bias estimates of the true causal effect of access to credit. Finally, mere membership in a credit program may not guarantee ready access to credit since many groupbased credit programs stipulate that only a portion of a group‘s members may receive credit at any time. Hence, Diagne (1998) and Diagne and Zeller (2001) argue that the credit limit, that is, the maximum amount that may be borrowed, is a better measure of credit access. The authors reason that unlike credit program participation or loan uptake, which are related to demand for credit, the credit limit, reflecting mainly supply-side factors such as the availability of credit programs and the financial resources of lenders, is a truer measure of an exogenous credit constraint.

2.13Access to Financial Services

Access to financial services by smallholders is normally seen as one of the constraints limiting their benefits from credit facilities. However, in most cases the access problem, especially among formal financial institutions, is one created by the institutions mainly through their lending policies. This is displayed in the form of prescribed minimum loan amounts, complicated application procedures and restrictions on credit for specific purposes (Schmidt and Kropp, 1987). For small-scale enterprises, reliable access to short term and small amounts of credit is more valuable, and emphasizing it may be more appropriate in credit programmes aimed at such enterprises. Schmidt and Kropp (1987) further argue that the type of financial institution and its policy will often determine the access problem. Where credit duration, terms

of payment, required security and the provision of supplementary services do not fit the needs of the target group, potential borrowers will not apply for credit even where it exists and when they do, they will be denied access. The Grameen Bank experience shows that most of the conditions imposed by formal credit institutions like collateral requirements should not actually stand in the way of smallholders and the poor in obtaining credit. The poor can use the loans and repay if effective procedures for disbursement, supervision and repayment have been established. On the issue of interest rates, the bank also supports the view that high interest rate credit can help to keep away the influential non-target group from a targeted credit programme (Hossain, 1988). This further demonstrates the need to develop appropriate institutions for the delivery of loans to smallscale borrowers. Notable disadvantages of the formal financial institutions are their restriction of credit to specific activities, making it difficult to compensate for losses through other forms of enterprises, and their use of traditional collateral like land. There is need for a broad concept of rural finance to encompass the financial decisions and options of rural economic units, to consider the kind of financial services needed by households, and which institutions are best suited to provide them.

2.14 Characteristics of Credit Markets in Africa

Credit markets in Africa have mainly been characterized by the inability to satisfy the existing demand for credit in rural areas. However, whereas for the informal sector the main reason for this inability is the small size of the resources it controls, for the formal sector it is not an inadequate lending base that is the reason (Aryeetey, 1996b). Rather, the reasons are difficulties in loan administration like screening and monitoring, high transaction costs, and the risk of default. Credit markets are characterized by information asymmetry, agency problems and poor contract enforcement mechanisms (Nissanke and Aryeetey, 1995). They are mainly fragmented because different segments serve clients with distinct characteristics. Because of this, lending units are unable to meet the needs of borrowers interested in certain types of credit. The result

is a credit gap that captures those borrowers who cannot get what they want from the informal market, yet they cannot gain access to the formal sources. Enterprises that want to expand beyond the limits of self-finance but lack access to bank credit demand external finance, which the informal sector is unable to satisfy. Two main theoretical paradigms have been advanced to explain the existence of this fragmentation: the policy-based explanation and the structural-institutional explanations (see Aryeetey et al., 1997). According to the policy-based explanation, fragmented credit markets (in which favoured borrowers obtain funds at subsidized interest rates, while others seek funds from expensive informal markets) develop due to repressive policies that raise the demand for funds. Unsatisfied demand for investible funds forces credit rationing using non interest rate criteria, while an informal market develops at uncontrolled interest rates.

Removing these restrictive policies should therefore enable the formal sector to expand and thereby eliminate the need for informal finance. According to the structural-institutional explanations, imperfect information on creditworthiness, as well as cost of screening, monitoring and contract enforcement among lenders, results in market failure due to adverse selection and moral hazard, which undermines the operation of financial markets. As a result, lenders may resort to credit rationing in the face of excess demand, thus establishing equilibrium even in the absence of interest rate ceilings and direct allocations.

Market segments that are avoided by the formal institutions due to institutional and structural factors are served by informal agents who use personal relationships, social sanctions and collateral substitutes to ensure repayment. An extended view of this explanation is that structural barriers result in monopoly power, which perpetuates segmentation. Another view has attempted to explain the existence of informal finance as simply residual finance, satisfying only the excess demand by those excluded from formal finance.

According to this view, informal sector finance develops in response to the formal sector controls. Structural and institutional barriers across segments perpetuate segmentation by providing opportunity for monopoly power. A further explanation is that fragmentation exists due to inherent operational characteristics of the markets. Looking at the role of informal financial sectors in Ghana, Aryeetey and Gockel (1991), attempted to investigate factors that motivate the private sector to conduct financial transactions in the informal financial sectors.

They argue that the informal sector derives its dynamism from developments in the formal sector as well as from its own internal characteristics. The informal and formal sectors offer similar products that are not entirely homogeneous, implying that both sectors cater to the needs of easily identifiable groups of individuals and businesses, but at the same time serve sections of the total demand for financial services. However, participants from either sector may cross to the other depending on factors like institutional barriers, availability of credit facilities and the ease of physical access.

Aryeetey and Gockel (1991) examine some of the factors that influence demand for formal savings and lending facilities in Ghana and observe that incomes, bank formalities and banks‘ preference for large transactions were the major ones. Travel costs and time are among other factors that determine transaction costs to the entrepreneurs.

Besley (1994) has classified major features of rural credit markets that can be used to explain the existence of formal and informal credit markets in Africa. Among these are the existence of collateral security and covariant risk. Collateral security is often beyond the reach of many borrowers in rural areas. But even where this is not the case, the ability of the lender to foreclose is often limited, making enforcement of loan repayment difficult. Such difficulties help to explain the use of informal financial markets, which use social sanctions to ensure enforcement. In rural areas, shocks in incomes that create borrowers‘ potential to default will affect the

operation of credit markets. In most rural economies, borrowers are faced with risks arising from uncertainties about their incomes. By diversifying their loan portfolios, lenders can avert such risks. However, credit markets in rural areas are segmented, with lenders‘ loan portfolios being concentrated on borrowers facing common shocks to their incomes. An important cost of segmentation is that funds fail to flow across groups of individuals despite the benefits of doing so.

According to Besley (1994), this kind of segmentation may also be reinforced by government regulations. In incomplete markets, rural households could use partially functioning credit markets to provide insurance against income shocks mainly by trading insurance. However, due to incomplete information about the nature of the risk faced by each individual, and possible changes in the private behaviour of other individuals, insurance arrangements are only partial (Aryeetey, 1996b) or are totally absent (Aryeetey and Udry, 1997).

Another important factor of both formal and informal markets relates to penalties. In the absence of formal contract enforcement mechanisms, both formal and informal institutions rely on lending practices that emphasize loan screening rather than monitoring, which appears to suggest more concern with adverse selection than moral hazard. Differences emerge in the methods used by formal and informal institutions. Whereas formal lenders rely more on project screening, informal lenders rely more on the character and history of the borrower, particularly on personal knowledge of the borrower. Loans monitoring is rarely done by informal lenders due to the lenders‘ knowledge of borrowers, while in the formal market it is mainly due to lack of facilities. Transaction costs are generally lower in informal markets than in formal ones. One of the issues that emerge from this market structure is which financial institutions are accessible to the rural poor, and which factors determine their demand for credit from the different sources as determined by their participation decisions. The foregoing literature review shows that

financial markets in African countries are characterized by imperfect and costly information, risks, and market segmentation, resulting in credit rationing. This is one of the underlying factors in the coexistence of both formal and informal credit markets serving the needs of the different segments of the market. On the other hand, policy-based and structural-institutional explanations attempt to explain the coexistence of both segments of the market as a result of policy and structural-institutional

rigidities.

This review provides a conceptual background for an empirical investigation of borrowers' participation in credit markets and access to different sources. Imperfect information emerges as an important explanation for credit rationing. This is because, due to information asymmetry, loan terms and conditions are used that affect the behaviour of borrowers. The literature also shows that the assumption that formal interests rates are the reason borrowers do not use formal credit is not correct. Rather, the unique characteristics of credit services explain segmentation in the credit market. In addition, lack of effective contract enforcement and the consequent default risk are also important in loan rationing. Among the questions that arise out of this scenario is that of an empirical explanation for the coexistence of both formal and informal credit sources based on the foregoing background.

A related question is that of access to financial services from both sources. In a fragmented credit market, what explains borrowers' decision to borrow at all, and whether to borrow from either formal or informal segments?

2.15 Food Security Definition

The issue of food security has been understood by many development workers as the availability of food in the world marketplace and on the food production systems of developing countries (FANTA, 2003). However, global food availability does not ensure food security in

any particular country because what is available in the world market may not necessarily be accessible by famine affected people in African countries, as the economies of these countries, in general, cannot generate the foreign currency needed to purchase food from the world market.

One of the most influential definitions of food security is that of the World Bank in 1986. The Bank defined it as the "access by all people at all times to enough food for an active and healthy life." This definition encompasses many issues. It deals with production in relation to food availability; it addresses distribution in that the produce should be accessed by all; it covers consumption in the sense that individual food needs are met in order for that individual to be active and healthy. In addition, the availability and accessibility of food to meet individual food needs should be sustainable.

Food security — ―Access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies).‖

Food insecurity — ―Limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.‖

Hunger — ―The uneasy or painful sensation caused by a lack of food. The recurrent and involuntary lack of access to food. Hunger may produce malnutrition over time....

Hunger ... is a potential, although not necessary, consequence of food insecurity.‖

2.16 Global Perspective on Food Security

One of the great unsung global achievements of the second half of the 20th century has been the world‘s extraordinary success in raising global food production. While the global population has doubled to over 6 billion people in less than 50 years, average per capita food consumption has risen from about 2350 to 2800 kcal per day, with the fastest increases in both food output and consumption occurring in developing countries. In spite of this achievement, the number of people without enough to eat on a regular basis remains stubbornly high, at over 800 million, and is not falling significantly. Over 60% of the world‘s undernourished people live in Asia, and a quarter in Africa. The proportion of people who are hungry, however, is greater in Africa (33%) than Asia (16%). The latest FAO figures indicate that there are 22 countries, 16 of which are in Africa, in which the undernourishment prevalence rate is over 35% (FAO , 2008)

There are compelling moral arguments for eradicating hunger. However, these seem to carry little weight in resource allocation decisions, whether within the budgets of developing countries or in aid allocations. Instead, economic and political considerations tend to dominate in decisions on the use of fiscal resources. One of the main reasons for insufficient direct action against hunger may be the widespread assumption amongst policy-makers that hunger is a consequence of poverty. Many Poverty Reduction Strategy Papers (PRSP) assume that the incidence of hunger will, therefore, drop as a consequence of successful poverty reduction programmes, and hence fail to address food security as an issue in its own right. There are two flaws in this assumption. The first is that it fails to recognise the surprisingly low elasticity of food consumption in relation to increases in income (even at very low income levels) and hence the limited extent to which a general reduction in poverty will bring down the incidence of hunger. Secondly, it misses the opportunities for using reductions in chronic undernourishment

as a prime means of accelerating economic growth, reducing poverty and resolving many of the other problems facing very poor people (FAO, 2008).

The focus of this section is on improving the performance of small-scale farmers, because this is recognised as being a central element in any food security strategy in countries in which poverty and hunger are heavily concentrated in rural areas. It is not intended to imply that structural measures aimed at reducing hunger through better livelihoods need necessarily be confined to rural areas nor that, even in rural programmes, there will not be an eventual need for very substantial investments in sustainable natural resources management, infrastructure and services. Nor does it imply that improving farm performance is the only route to enhancing rural livelihoods: creating opportunities for growth outside of primary production may be equally important.

Several programmes have successfully set out to show that it is possible to bring about substantial improvements in the performance of small-scale farming systems. These, in turn, can contribute to better household and community food security, to increases in national food availability and to greater local prosperity. When small-scale farmers‘ production goes up and their incomes improve, they spend the money locally (unlike large farmers who spend much of it elsewhere) on labour-intensive goods and services that come from the rural nonfarm sector. This can lead to improvements in the incomes of the rural population as a whole, including landless labourers who make up, in many countries, a large proportion of the rural poor. However, it is becoming increasingly clear that not all types of smallholder performance improvement necessarily trigger substantial local food security gains.

According to FAO staff with experience in vulnerability profiling, many of the most food insecure rural people in developing countries are ―subsistence farmers‖. However their food insecurity may not be due so much to their inability to produce enough food to meet their needs

but to their economic situation which forces them to sell rather than store much of their production at time of harvest and of low prices in order to meet debt repayment obligations and emergency expenses. Their own production capacity may also be compromised by the need to sell their labour at times when it is most in demand, leading to untimely work on their own land. Most ―subsistence farmers‖ are paradoxically highly dependent on markets, but engage in disadvantageous monetized exchanges through selling food when it is most plentiful and cheapest, and buying it when it is scarce and expensive: only the ―richer‖ farmers are able to be truly self-sufficient. The same is true of small-scale fishermen who often sell their full catch in order to meet obligations and buy cheaper and less nutritious food.

Since the World Food Summit: five years later in 2002, a significant number of countries have confirmed to FAO their strong interest in implementing nationwide food security programmes and are seeking help in their design. While the Organization acknowledges that the course to be followed in each country will be different, it recommends that governments consider adopting strategies which simultaneously address both the production and access dimensions of food insecurity, in line with the two ―tracks‖ outlined above. But, in order to implement such strategies, there may be a need for accompanying institutional and policy reforms. This section looks particularly at the process of moving towards inclusive national scale food security programmes and at the necessary reforms.

2.15.1 Food Security in Northern Ghana

Ghana has been characterized over the years by regional inequality in terms of wealth and resource endowments that are basically geographical and political (Ewusi, 1976; Shepherd and Gyimah-Boadi, 2004). The northern part of Ghana which is predominantly of savannah vegetation is associated with extremely poor quality soils, short unimodal rainfall season and

periodic drought (Dickson and Benneh, 1988). This situation contrasts with the natural soil fertility and bimodal rainfall seasons of the southern part of the country.

Coupled with these adverse environmental conditions of Northern Ghana is the poor access to markets and well-functioning financial institutions. These conditions have contributed to a higher level of food insecurity in the region (Whitehead, 2006). The region has actually remained the poorest in terms of living standards, literacy levels, health, and nutrition status for several decades (Whitehead, 2006).

Although poverty levels have declined in the country over the last decade, progress has been much slower among food crop farmers than for other livelihood groups (Devereux, 2008). In particular, rural households in the north suffer seasonal strains in well-being and seasonal pressures are found to be worst where the households face declining food stocks. Despite the efforts by policy makers to combat poverty by improving farmers‘ access to improved technology, poverty remains prevalent in the region. Devereux (2008) points out that the _poorest‘ groups in Northern Ghana who are normally vulnerable to shocks such as drought, bush fire, and loss of animals may no longer engage in agriculture at all and for that matter struggle to obtain enough food, especially during the _hungry season‘ months of the year (Owusu and Abdulai, 2009).

2.15.2 Food Security Summary in Northern Ghana

The food security status of households which experienced poor agricultural production during the 2009 season is becoming precarious as food stocks become depleted, a trend that will most likely increase the incidence of food insecurity and malnutrition in some parts of northern Ghana. Other households whose food stocks are already depleted may likely be suffering from the lingering effects of several years of bad agricultural production, which could eventually erode their resilience and render them highly susceptible to food insecurity.

With the peak of the ―lean season‖ approaching, an increasing number of these households will likely see a plunge in diversity and consumption frequency of different food groups as additional resource requirement for the preparation and management of new fields for the current season exerts further stress on available income. Increased market dependence for cereals by households currently facing poor access to food will continue to be constrained by the above average (5-year average) prices of staple food crops and decreased access to income-generating activities.

There also are emerging food insecurity concerns in the Bunkprugu-Yunyoo District of the Northern Region where inter-ethnic conflict among the Kambatiak, Gbandauk, Nasiabuk, Tubong and Gbankoni communities led to destruction of food stocks and the displacement of 4048 people from 369 households. While the resumption of peace has enabled some households to plant their fields, the loss of key livelihood assets could affect the ability of those families to engage in full-scale agricultural activities.

2.15.3 Food Security Situation in Karaga District

The table below illustrates the food security situation between 2006 and 2007. It takes into consideration the current food crop and animal production in the district.

Table 2.1: Areas under cultivation for the period 2006-2007

No.	Crops	Area under crop cultivation in hectares	
		2006	2007
	Maize	4,350	4,216
	Rice	1,000	1,625
	Millet	2,350	2,127
	Sorghum	3,000	2,377
	Cassava	350	278
	Yam	725	1,263
	Groundnut	3,500	2,668
	Cowpea	2,400	1,576
	Soya beans	3,000	2,548

Source: DADU Karaga

From the above table 2.1, year under considerations are 2006 and 2007. It can be seen that the total area cultivated for the various crops decreased in the year 2007 this can be attributed to the occurrence of drought and the subsequent flooding of the farms of farmers in the District. However the area under cultivation for rice and yam increased in the year 2007 by 625 and 538 hectares respectively. Their increase is also attributed to the fact that the flooding did not really affect the rice fields in the district.

The table below also illustrates the food security situation between 2006 and 2007. It takes into consideration the current food crop and animal production in the district.

Table 2.2 Production levels of food crops for the period 2006-2007

Crops	Certified production (IN MT) and respective Years				
	2006	**2007**	**2008**	**2009**	**2010**
RICE	2000	2025	2200	3600	4120
MAIZE	4350	4220	4480	4500	4720
MILLET	1350	1230	1110	950	920
SORGHUM	1200	1350	1040	1060	870
GROUNDNUT	3500	3200	3670	3700	3460
SOYA BEAN	2540	3000	3055	4205	4300
YAM	725	1260	1210	1580	1600
CASSAVA	350	280	310	295	270

Source: DADU Karaga

From table 2.2, it shows a drastic decrease in the yield of the various corps under cultivation in the year 2007, this is mainly attributed to the flooding that occurred in the year 2007 which resulted in lots of corps being submerged in water. On the other hand rice and yam registered a considerable increase in yields which could be attributed as a result of the increase in the total area cultivated in the same year.

The table below shows the number of livestock in the district for the period of 2006 and 2007.

Table 2.3: YIELD PER UNIT AREA IN METRIC TONNES PER HECTARE

CROPS	2006	2007	2008	2009	2010

RICE	3.0	2.5	3.0	3.5	3.4
MAIZE	1.7	0.9	1.5	1.7	2.4
MILLET	0.6	0.7	0.6	0.6	0.5
SORGHUM	0.9	0.9	0.8	0.8	0.7
GROUNDNUT	0.9	0.7	1.0	1.0	0.9
SOYA BEAN	1.0	0.8	1.2	1.2	1.3
YAM	11.5	10.0	12.0	13.0	12.5
CASSAVA	9.0	8.0	9.2	9.5	10.0

Zone	**Cattle**							
	Bulls	**Young bulls**	**Bullocks**	**Cows**	**Heifers**	**Heifer calves**	**Bulls calves**	**Herd total**
Karaga	558	872	42	2191	548	1,096	547	8,854
Yemo-karaga	306	197	24	1,204	411	455	203	2,800
Pishegu	434	570	12	2,838	1,095	1,058	680	7,687
Namburugu	518	400	68	1,105	623	448	324	3,480
Total	**1,816**	**1,069**	**146**	**7,338**	**2,677**	**3,057**	**1,754**	**22,821**

Source: DADU Karaga

Besides crop production, the average farm family raises a wide variety of livestock and local poultry.

Livestock (cattle, sheep and goat, poultry and pigs) production gained some prominence with the presence of the Livestock Development Project and Non- Governmental Organizations (NGOs) like community Driven Initiative for Food Security (CIFS) and World Vision Ghana (WV) in the District.

LDP since 2005 funded regular and consistent vaccination programmes against scheduled diseases. Disease surveillance was conducted every quarter to ensure early detection and control to disease outbreaks. A cash credit of four thousand five hundred Ghana cedis (GH¢4,500.00) was approved for thirty (30) farmers by LDP to support small ruminants production in 2005.

One hundred and twenty (120) farmers in the district were also given credit in kind support of 10 ewes per farms in 2010 by the same project.

World Vision Ghana and CIFs supported farmers in some selected communities in the District with sheep and goats to enhance small ruminant production.

Under these project farmers trainings were organize by DADU Karaga on healthcare and husbandry practices in ruminants production. These programmes made significant impact in animal production as observed in the 2010 district livestock census conducted.

With regards to the situation of livestock in the district, there has been an increase in total number of livestock in the district. Some of the major livestock reared in the district include; cattle, sheep, goats, poultry and pigs.

2.16 Theoretical Discussions on Access to Credit.

Among other things, lack of credit is one of the primary problems hampering production, productivity and income of rural farm households. Since access to institutional finance is very limited, the majority of the poor are forced to seek financial services through informal channels (Sisay, 2008). Zeller (2000) notes that rural farmers seek credit from diverse sources which may include relatives, friends, miscellaneous lenders, traders, cooperative societies, banks and other governmental private agencies. It is evident from the study by Adeola,(2008) that 84.7% of smallholder farmers depend on co-operative societies for agricultural credit. This is followed

by personal savings, friends/relatives(62.5%) which is closely followed by _susu clubs' traditional savings association (60%).

Adeola(2008) pointed out the borrowing behavior of respondents in Oyo state using the logit model and identified the determinants of credit constraints. His results showed that the coefficient of transitory income, education level and predicted interest rate have important bearing on borrowing behavior. The study also reveals that 59% of the respondents had access to formal credit as against 41% that had no formal credit. A study conducted by

Mpuga (2004), employing a tobit model analysis of formal and informal credit sector in Uganda shows the impact of explanatory variables on the amount of credit received by the individual. The result of the study indicates that household size, total asset, educational level and ownership of land were significant factors.

In addition, the output from the study made by Barslund and Finn (2003) on analysis of formal and informal credit in Vietnam using the probit and tobit model found that collateral is used for about 70% of formal loans and no collateral is needed for the informal loans. The result also showed that age, livestock and sex have positive influence on the demand for credit from formal and informal sources. Although the view that finance is not important for economic development is still held by some prominent economists, most now agree that financial markets play a central role in fostering growth, and that the financial system affects the behavior of firms and individuals (Holden and Prokopenko,2001).

2.17 Role of Credit in Alleviating Poverty

It has been a long-held belief among policymakers that poor households in developing countries lack access to adequate financial services for efficient inter temporal transfers of resources and risk coping, and that without well-functioning financial markets, these households do not have much prospect for increasing in any significant and sustainable way their productivity and

living standards. Because of these reasons and the fact that traditional commercial banks typically have no interest in lending to poor rural households due to their lack of viable collateral and the high transaction costs associated with the small loans that suit them, most developing-country governments and donors have set up during the past three decades credit programs aimed at improving rural household access to formal credit. The vast majority of these credit programs especially the so-called ―agricultural development banks,‖ which provided credit at subsidized interest rates, have failed to achieve their objectives both to serve the rural poor and be sustainable credit institutions (Adams, Graham, and von Pischke, 1984;Braverman and Guasch, 1986; Adams and Vogel, 1986).

Both in response to these failures and in recognition of the critical role that credit can play in alleviating rural poverty in a sustainable way, innovative credit delivery systems are being promoted throughout the developing world as a more efficient way of improving rural households‘ access to formal credit with no or minimal government involvement. The failure of government-supported financial institutions throughout the developing world has also convinced many researchers of the need for a better understanding of how poor households in less-developed countries, often living in highly risky environments, insure against risk and conduct their inter temporal trade in the absence of well-functioning financial markets (Deaton, 1989; Coate and Ravallion, 1993;Townsend, 1994; Udry, 1994: 1995; Fafchamps, 1992).Several studies conducted in the past two decades have substantially increased economists' understanding of the workings of informal financial institutions in developing countries (see, for examples, the surveys by Besley 1995, Alderman and Paxson 1992, and Gersovitz 1988). The studies have revealed the complex strategies used by poor households in developing countries to increase their productive capacity, share risks, and smooth consumption over the life cycle. These strategies generally work through self-enforcing informal contracts among friends, neighbors, and members of the extended family, and are arranged within

networks of informal institutions of diverse natures (Fafchamps, 1992; Coate and Ravallion, 1993; Udry, 1994; Lund and Fafchamps,1997; Kochar1997). These nonmarket informal institutions, the economic rationales of which have long eluded the attention of researchers and policymakers, have often been found to outperform the financial institutions governments have set up to serve the rural population.

CHAPTER THREE: METHODOLOGYOF THE STUDY

This chapter captures the study area, location and size, climate, soil and topography, population, map of the study area, sampling techniques, theoretical discussions on access to credit, conceptual framework, empirical model specification, statement of hypothesis and data analysis.

3.1 Study Area

Karaga District was carved out of the then Gushegu/Karaga District and officially inaugurated in August, 2004. The only infrastructure the District capital-Karaga could boast of was the area council office, a one room guest house and electricity. Thus from this background, our main focus has been to accelerate the pace of infrastructural development as the foundation for the total development of the district (Source-Karaga District Profile).

3.1.1 Location and Size

The district is located in the North-Eastern Northern region, roughly between latitudes 93° and 103° North and longitudes 0° and 45° west. It shares boundaries with four districts in the northern region, west and east Mamprusi to the north, Savelugu/Nantong to the west and Gushegu (the mother district) to the south and east. Karaga the district capital is 24km from Gushegu and 94km from Tamale, the Regional capital.

3.1.2 Climate, Soils and Topography

The climate reflects a typical continental climate experienced in northern Ghana. There is a rainy season that lasts from May-October, peaking in August and September. The rest of the year is virtually dry. Rainfall amount is between 900 and 1000mm per annum. Temperatures are high throughout the year with the highest of 36°C or above in March and April. Low temperatures are experienced between November and February (the harmattan period). The

district lies entirely within the voltain sand stone basin dominated by sandstones, shales, siltstones and minor lime stones. The northern tip of the district is underlain by lower voltain, which consist of rocks, dominated by shales and sandstones. The soils are mainly savannah ochrosols, ground water laterites formed over granite and voltain shales. Small areas of savannah ochrosols with some lithosols and brunosols are very low. The laterites are similar in acidity and nutrient level to the ochrosols, but are poorer in physical properties, with substantial amounts of concretionary gravel layers near the top horizons and more suited for roads and other constructional works than supporting plant root systems. Despite gentle slopes, the soils are highly vulnerable to sheet erosion and in some areas, gully erosion also occurs. This condition occurs primarily because of the annual burning of the natural vegetation, leaving the soils exposed to the normally high intensity rains (up to 200mm per hour) at the beginning of the rainy season. The continuous erosion over many years has removed most of the top soils and depleted or destroyed its organic matter content. Such a situation does not allow the soil fauna to thrive and keep the top soil layers open and created for healthy plant roots to develop. It results in serious compaction, with considerable reduction in rainfall infiltration rate.

These soils even when affected by erosion and reduced fertility, have some potential for agriculture if their available nutrients and water are managed sensibly, including appropriate organic matter supplementation measures to restore a better soil water infiltration rate, will depend on the extent to which is possible to manage the recurring annual bush fires and extend the rainfall surface retention time to facilitate increase in the amount that gets to the plant rooting zones, level of the soil water holding capacity.

The topography of the area is generally undulating with numerous small streams draining it. The district has a number of smaller valleys with larger valleys found towards the periphery where smaller streams merge into larger ones. The climate reflects a typical tropical continental

climate experienced in Northern Ghana. There is a rainy season that lasts from May-October peaking in August and September. The rest of the year is virtually dry. The vegetation is a typical guinea savannah type, characterised by tall grasses interspersed with drought resistant trees such as the Shea and dawadawa.

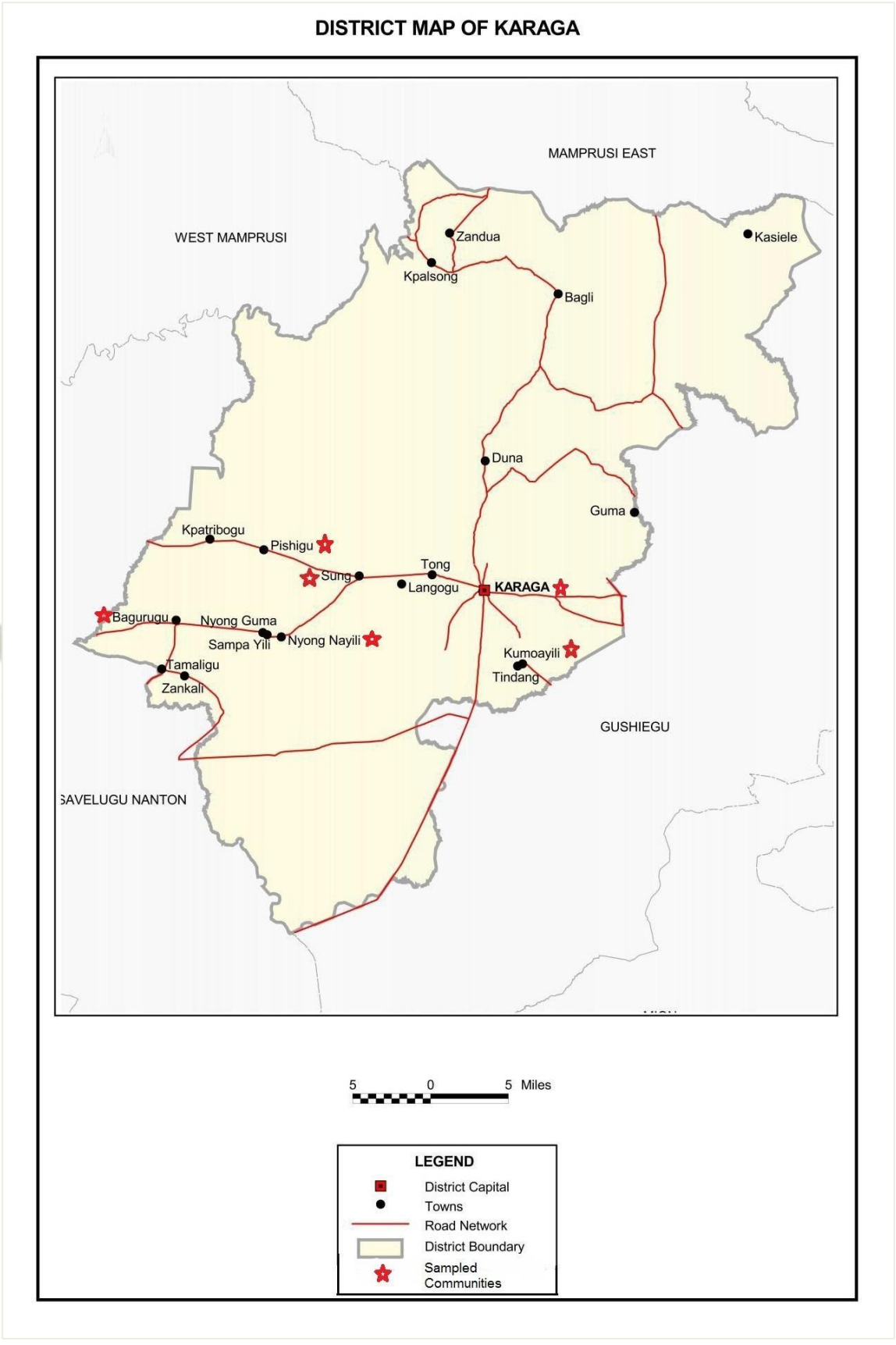
3.1.3 Population

The current population of the District is estimated at 75, growth rate of 2.7%. At a current growth rate the population will double in 20 years. The sex composition of the District shows that females constitute 51.7% of the population while males form 48.3%. There are 205 communities in the district. The largest household size in the Northern Region (PHC 2000) is in Karaga(11). Considering that household sizes are larger in rural than in urban areas, the average household size for the district will be 8 persons. Over 70% of the settlement in the district has population of less than 800.

Karaga the district capital is the only settlement with a population of over 10,000. The population of Karaga constitutes about 20.4% of the district population. Only eleven communities have populations of more than 1000 people. All these settlements are found to the western section of the district along the Karaga-Sung-Pigu and Sung-Tamalgu roads.

Below is a map illustrating population of ten largest settlements in the district.

Figure 3.1: A Map Showing the Karaga District



3.2 Research Design and Sampling

A multistage sampling technique was employed for this study. The target population for this study is all farmers in Karaga District. Cluster sampling method was used to select communities from each zone of the north, east, west, south and central parts of the district.

Thus, five communities are selected as follows: Namburugu (North), Nyingali (East), Pishigu (West), Komoayili (South) and Karaga township (Central).

A household survey was conducted in ten randomly selected communities and spread in five agricultural zones; Namburugu and Nangung in the Northern zone, Nyingali and Shelilanyili in the Eastern zone, Pishigu, Nyong, Bagurugu and Sung in the Western zone as this zone constituted a cluster of relatively bigger communities, Komoayili in the southern zone and Karaga township. A total of 400 household heads were interviewed using a well-structured questionnaire. To determine household sample size per village, household heads in the villages were listed and random selection was made based on the population of each village.

The share of total sample size in respective villages was as follows: Namburugu (8.5%), Nangung (7.5%), Nyingali (10.25%), Shelilanyili (9.75%), Pishigu (12%), Nyong (10.25%), Bagurugu (10%), Sung (9%), Komoayili (7%) and Karaga (15.75%). The household survey was supplemented with community level survey using the Focus Group Discussion (FGD) method.

Following Calderon (2003), the sample size (N) used in the study was determined using the formula: $n = N/ (1 + Ne^2)$, where n = sample size; N = Total population of farmers and e = desired margin of error.

The current population of the district is estimated at 77,706 from a PHC 2010 figure of 62,719 at a growth rate of 2.7%. The sex composition is 40370(51.95%) for female while men constituted 37336(48.05%). Based on these figures, the farmer population is estimated at

40,172 (N). The margin of error (e) used for this study was 5%=0.05. Therefore n = 40,172/ (1 + 40,172×0.05^2) =400. The sample size was therefore estimated at 400.

3.3 Conceptual Framework

The underlying structural framework for analyzing credit demand is a household production model with utility maximizing households, who access credit (access = 1) if a credit is expected to increase utility, and they do not access credit (access = 0) in the opposite case. If a household demands credit, the size of the credit obtained is determined by variables related to the optimal investment if the credit is for investment purposes or the optimal consumption credit if the credit is for consumption (Barslund and Finn,2003). Also the theory of consumer behavior shows that demand for credit is defined as the probability that an individual answered yes to the question: did you apply for credit in the months before the season. The level of credit demand is then defined as the amount of credit demanded by the individual (Mpuga, 2004).

Total utility function can be expressed as:

$$U = u\,X\,X\,X(_1, _2, _3.....X_n) \qquad (1)$$

Where U represents the total individual/household utility, which is assumed to be a function of goods and services consumed. X_i represent individual/household demand for consumer and durable goods.

$$AC = f\,X\,V\,L\,I(_i, _i, _i,)_i \qquad (2)$$

Where AC represents amount of credit obtained, X_i is a vector representing individual and household characteristics including sex, age, level of education and the number of household members. V_i is the farm characteristic, L_i represents the location characteristics and I_i is the institutional factors.

3.3.1 Specification of Empirical Model

The multivariate tobit model is specified as

$$ACr = F(\beta_0 + \beta_1 age + \beta_2 male + \beta_3 hsize + \beta_4 edu + \beta_5 fsize + \beta_6 fbo + \beta_7 crewor + \beta_8 guran + \beta_9 extcon + \beta_{10} motor + \beta_{11} donk + \beta_{12} bullk + \beta_{13} nam + \beta_{14} nyin + \beta_{15} pish + \beta_{16} kom + \mu) \quad (3)$$

$$(+ \quad \pm \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad - \quad -)$$

Table 3.1: Multivariate Tobit Model

Dependent variable	Explanatory variable	Effect
Access to credit	Age	+
	male	+/-
	Household size	+
	Education	+
	Farm size	+
	Farmer based organization	+
	Credit worthiness	+
	guarantor	+
	Extension contacts	+
	Motor bike	+
	donkey	+
	bullock	+
	Namburugu	+
	Nyingali	–
	Pishigu	–
	Komoayili	+

The binary logit model is specified as

$$HFS = \beta_0 + \beta_1 age + \beta_2 male + \beta_3 hsize + \beta_4 edu + \beta_5 fsize + \beta_6 fbo + \beta_7 formal + \beta_8 informal + \mu \quad (4)$$

$$(+ \quad \pm \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad + \quad +)$$

$+ {}_{9}\text{extcon} + {}_{10}\text{motor} + {}_{11}\text{donk} + {}_{12}\text{bullk} + {}_{13}\text{nam} + {}_{14}\text{nyin} + {}_{15}\text{pish} + {}_{16}\text{kom} +$

$+ \quad + \quad + \quad + \quad + \quad - \quad - \quad +$

Table 3.2: Binary Logit Model

Dependent variable	**Explanatory variable**	**Effect**
Household foo security	Age	+
	male	+/-
	Household size	+
	Education	+
	Farm size	+
	Farmer based organization	+
	Credit worthiness	+
	guarantor	+
	Extension contacts	+
	Motor bike	+
	donkey	+
	bullock	+
	Namburugu	+
	Nyingali	–
	Pishigu	–
	Komoayili	+

3.3.2 Statement of Hypothesis

1. Consumers‘ age, education, farm size and membership of farmer based association will have a positive effect on the amount of credit demanded from both formal and informal sources of credit.

2. Consumer credit worthiness and availability of guarantor will have a positive influence on the amount of credit demanded from both formal and informal sources of credit.
3. Consumers‘ assets such as motor bicycle, donkey and bullock will have a positive influence on the amount of credit demanded from both formal and informal sources.
4. Residing in Nanburugu and Komoayili will have a positive influence on the amount of credit demanded by farmers from both formal and informal sources.
5. Residing in Nyingali and Pishigu will have a negative influence on the amount of credit demanded by farmers from both formal and informal sources.
6. The amount of credit accessed from both formal and informal sources will have a positive influence on farmers‘ household food security.

3.4 Data Analysis

Both descriptive and inferential analysis were used. The proportions of farmers in the district who have accessed credit was analyzed using pie chart. The sources of credit to farmers in the district was analyzed using tables, frequencies and percentages. The determinants of access to credit from the identified formal and informal sources of credit in the district were analyzed using multivariate tobit model. The effect of access to credit on food security of credit beneficiary farm households in the district was analyzed using the binary logit model and finally the constraints to credit acquisition was analyzed using the Kendall‘s coefficient of concordance and. The parameters of the models were estimated through the maximum likelihood approach.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

This chapter consists of two main sections. Section one presents a descriptive analysis of the individual and household characteristics of the farmers as well as farm characteristics. Also

discussed under this section are information on the sources of credit and the food security status of the farmers in the district .Section two presents discussions on the empirical results. The empirical estimates of the multivariate tobit for the determinants of farmers access to credit from formal and informal sources are discussed. Finally, the effects of farmers‘ access to credit on household food security are also discussed.

4.1 Descriptive Analyses

This section gives an outline of the discussions on individual and household characteristics of farmers, the proportion of farmers who access credit, sources of credit to farmers and the food security status of the farmers.

4.1.1 Individual and household characteristics

The individual and household characteristics of farmers are presented in Table 4.1. The descriptive statistics were calculated for the farmers who access credit from the formal source, informal source and no access to credit. The results show that farmers who access credit from the formal source have mean age of about 43 whereas those who access credit from the informal sources have average age of 46 and the farmers who do not access credit have an average age of 43. This suggests that farmers who access credit from informal sources are on the average 3 years older than those who access credit from formal sources and farmers who do no access credit. On the average farmers who access credit from the formal sources have 12 years of formal education whereas those who access credit from the informal sources have on the average 5 years of formal education. Farmers who did not access credit also on the average had attained about 12 years of formal education. This suggests that on the average farmers who access credit from informal sources have less formal education. The mean of the male dummy variable is 0.85, 0.81 and 0.89 respectively for formal and informal access to credit and no credit respectively. The mean farm sizes for the three categories of farmers are 12.04, 11.73

and 0.76 respectively for formal and informal source of credit, and no access to credit. This shows that farmers who access credit are able to farm on large farm sizes compared to farmers who do not access credit.

Table 4.1 individual and household characteristics of farmers

Variables	Credit Access from Formal Sources	Credit Access from Informal Sources	No access to credit
Socioeconomic Factors	Mean(s.d)	Mean (s.d)	Mean (s.d)
Age	42.80(11.23)	46.00 (12.69)	43.33 (9.43)
Male	0.85 (0.36)	0.81 (0.40)	0.89 (0.33)
Education	12.09(3.91)	5.00 (3.72)	11.70(4.13)
Household size	13.64(7.31)	11.81(9.04)	9.06 (2.11)
FBO	0.65 (0.34)	0.69 (0.11)	0.75 (29)
Farm size	12.04 (10.01)	11.73 (7.29)	0.76(25)
Institutional Factors			
Credit Worthiness	0.66(0.23)	0.44 (0.32)	0.77(0.41)
Guarantor	0.44(0.16)	0.56(0.37)	0.66(0.52)
Household Assets			
Value of motor bike	GH¢2,586.12(55.09)	GH¢2,686.55 (41.85)	GH¢965.78(0.43)
Value of Donkey	GH¢3,251.90(88.80)	GH¢ 2,140.00 (0.00)	GH¢892.27(0.44)
Value of Bullock	GH¢2,396.67(64.74)	GH¢ 1,388(0.35)	GH¢ 999.68(0.61)
Location dummies			
Namburugu	0.45(0.23)	0.62(0.28)	0.78(0.28)
Nyingali	0.54(0.41)	0.84(0.43)	0.86(o.283
Pishigu	0.67(0.22)	0.75(0.60)	0.92(0.43)
Komoayili	0.76(0.19)	0.59(0.41)	0.76(0.23)
Mean credit	GH¢ 961.85(129.73)	GH¢ 405.55(13.2)	

SD= standard deviation
Source: field survey, 2014

The study explored the credit worthiness of farmers and the results show that the mean for the credit worthiness dummy variable is 0.66 for farmers who access credit from the formal sources and 0.44 for the farmers who access credit from the informal. Farmers‘ assets were valued for motor bicycle, donkey and bullock since these are common assets among farmers in the study area. The mean value in Ghana cedis for motor bicycle across the three categories of farmers

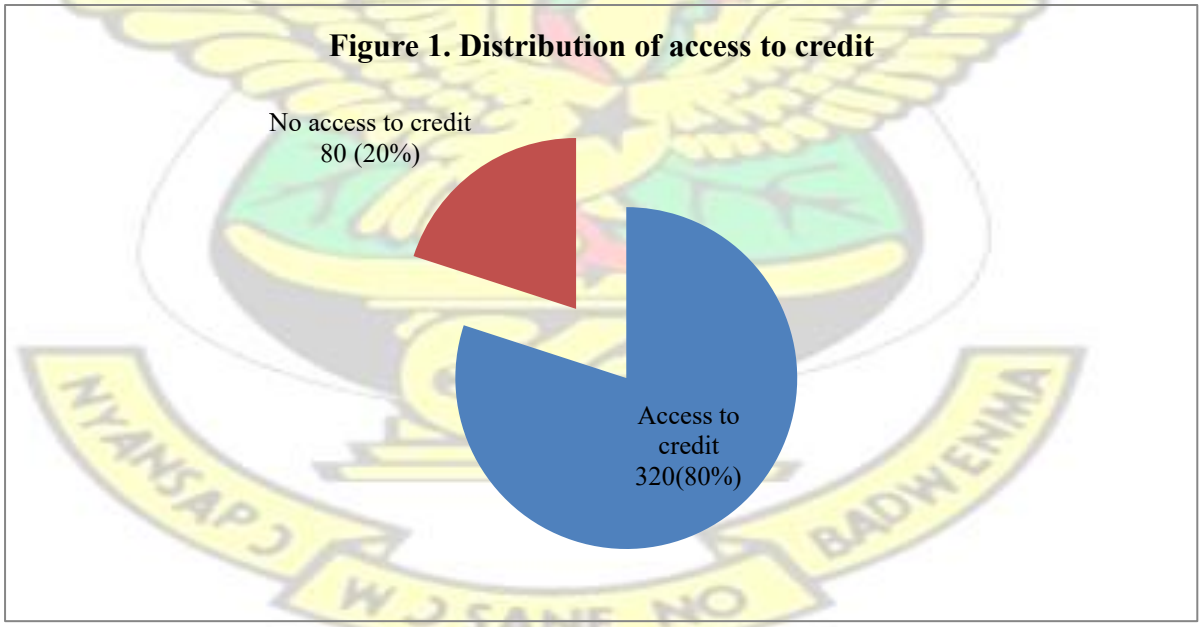
are 2,586.12, 2,6 86.55 and 965.78 Ghana cedis respectively. The mean for donkey is 3251.90, 2140 and 892.27 Ghana cedis for farmers who access credit from the formal source, informal source and no credit access respectively. The mean for bullock is2396.67, 1388 and 999.68 respectively for the three categories.

The mean amount of credit for both the formal and informal sources of credit shows that on the average farmers who access credit from the formal sources receives higher amount compared to those from the informal sources with means of 961.85 and 405.55 Ghana cedis respectively.

4.1.2 Access to Credit

As indicated in Figure 4.1, 320 farmers have accessed credit during the 2014 production season accounting for 80% of the sampled farmers whereas 80 farmers representing 20% did not access credit. This suggests that access to credit is high in the study area.

Figure 1. Distribution of access to credit



4.1.3 Source of Credit to the farmer

The sources of credit available to farmers are presented in Table 4.2. The results reveal that among farmers who access credit from formal sources, 20% received their credit from development banks followed by rural banks and cooperatives with percentages of 19.33. Eighteen percent of the farmers obtained their credit from microfinance institutions. However, only 10% of the farmers obtained credit from the commercial banks. This is in line with the findings of Zeller (2000).

On the other hand farmers who access credit from the informal sources indicated that a greater proportion of their credit emanates from relatives with a percentage of 41.18% followed by money lenders with a percentage of 20.59%. Friends of the farmers also provided some credit to assist them in their farming operations with a percentage of 17.65% whereas NGO‘s in the study area also supported farmers with credit either in cash or kind.

Table 4.2 Sources of credit

Formal source	**Frequency (%)**	**Informal source**	**Frequency (%)**
Commercial banks	**15 (10%)**	Relatives	**70(41.18%)**
Development banks	**30(20%)**	Friends	**30(17.65%)**
Credit unions	**20 (13.33%)**	Wholesalers	**20(11.76%)**
Rural banks	**29 (19.33%)**	Money lenders	**35(20.59%)**
Cooperatives	**29(19.33%)**	NGO‘s	**15(8.82%)**
micro finance	**27(18%)**		

Source: field survey, 2014

4.1.4 Food security status of farmers

Table 4.3 was computed from responses from the 18-item questionnaire of the United States Household Food Security Survey Module. The results show that most of the respondents who access credit from the formal sources are food secured at risk with a modal percentage of 53.33 and only 4.67% of them are food insured with severe hunger. Only 13.33% are fully food secured whereas 20% are food insured without hunger. Also 8.67% are food insured with moderate hunger. On the other hand, 50.59% of farmer who access credit from the informal sources are food secured with risk whereas 20.59% are food secured without any risk. Only 2.94% are food insecure with severe hunger. However, 13.59% are food insecure without hunger. It must be emphasized that none of farmers without credit access was food insecure with severe hunger. This implies that access to credit does not necessarily mean one is food secured since food insecurity still prevail among farmers who have access to credit from various sources. Furthermore, in total the results show that 67% of the respondents are food secured with 33% being food insured. Only 3% are food insecure with severe hunger.

Only 15.50% are fully food secured with 51.50% being food secured with risk.

Table 4.3: Household food security levels for farmers

Household Food Security Status Level	Formal source Frequency (%)	Informal source Frequency (%)	No credit Frequency (%)	All respondents Total frequency (%)
Food secure	20(13.33%)	35(20.59%)	7(8.75%)	62(15.50%)
Food secure, at risk	80(53.33%)	86(50.59%)	40(50%)	206(51.50%)
Food insecure without hunger	30(20.00%)	23(13.59%)	24(30%)	77(19.25%)

Food insecure, moderate hunger	13(8.67%)	21(12.35%)	9(11.25%)	43(10.75%)
Food insecure, severe hunger	7(4.67%)	5(2.94%)	0(0)	12(3%)
Total	**150**	**170**	**80**	**400**

Source: field survey, 2014

4.2 Empirical results

This section presents the empirical results of the study. Specifically the section presents the results of the multivariate tobit model for the determinants of farmers access to credit and the binary logit models for the effects of credit access to household food security. Also included in this section are the results of the Kendall's ranking of constraints on credit acquisition.

4.2.1 Determinants of access to credit

Table 4.4 presents the determinants of households' access to credit from both formal and informal sources. The dependent variable was the amount of credit obtained by the farmers from both the formal and informal source. The sample included both farmers who have access credit and those who did not access credit and as such the dependent variables were censored.

Table 4.4Multivariate tobit estimate of the determinants of credit access from both formal and informal sources

Variables	Formal Sources			Informal sources		
Socioeconomic Factors	Coefficient	Standard error	Z-Values	Coefficient	Standard error	Z-Values
Age	0.0109***	0.0035	3.10	-0.0051	0.0032	-1.57
Male	0.0892	0.1939	0.46	-0.1692***	0.0322	-5.26
Education	0.0172***	0.0034	5.09	-0.0022	0.0092	-0.24
Household size	-0.0045	0.0070	-0.64	-0.0018***	0.0006	-3.00
FBO	0.0583***	0.0077	7.56	0.0306***	0.0075	4.09
Farm size	0.0026**	0.0012	2.14	0.0023***	0.0004	5.75

Institutional Factors						
Credit Worthiness	0.0980***	0.0199	4.93	0.1389*	0.0543	2.56
Guarantor	0.2029*	0.1051	1.93	-0.1451*	0.0748	-1.94
Household Assets						
Motor Bike	-0.0742	0.2061	-0.36	-0.0584	0.1424	-0.41
Donkey	0.3445**	0.1705	2.02	0.0916	0.1090	0.84
Bullock	0.1609***	0.0596	2.70	0.1704**	0.0674	2.53
Location dummies						
Namburugu	0.0640	0.1829	0.35	0.1428	0.1242	1.15
Nyingali	0.0436	0.1817	0.24	0.1479	0.1202	1.23
Pishigu	0.1686	0.1606	1.05	-0.0388	0.2994	-0.36
Komoayili	0.8720***	0.1817	4.80	-0.8419***	0.1437	-5.86
Constant	-0.6329**	0.3133	-2.02	0.8801***	0.2126	4.14
Wald Chi2(18)= 94.78*** Log likelihood=-608.86 rho12= -0.7751		Sigma10.8900 Sigma2 0.6585				

Source: Field survey 2014. ***, ** and * represents significance at 1%, 5% and 10% levels respectively. Note: Likelihood ratio test of rho12=0; Chi2 (1) =313.113***

The results from the multivariate tobit estimated for the farmers who access credit from the formal sources reveal that age of the respondent significantly influence the amount of credit obtained from the formal sources. This suggests that as age increases the amount of credit demanded from the formal sources also increases all things being equal by the estimated coefficient of 0.0109 at 1% level. The results are consistent with the findings of Mpuga(2004).

The results also show that male have a negative coefficient of 0.1692 in the informal sector. This implied that male farmers have high default rate as compared to female farmers.

The years of formal education attained have a significantly positive effect on the amount of credit accessed by the farmers from the formal sources. The results show that a unit increase in a farmers‘ year of formal education results in 0.0172 increases in the amount of credit that he

or she accessed from the formal sources of credit. This finding is supported by the results of Greuning*et al*. (1998).

Membership of farmer based organization has a significantly positive effect on the amount of credit accessed by farmers from the formal sources. Being a member of farmer based association increases the amount of credit accessed by farmers by 0.0583 at 1% level compared to farmers who are not members of farmer based associations. This implies that being a member of farmers based association increases farmers chances of getting credit from the formal sources all things being equal.

Farm size has a significantly positive influence on the amount of credit that farmers access from the formal sources with an estimated coefficient of 0.0026 at 5% level. This means that as the farm size increases, farmers demand for credit also increases by the size of the estimated coefficients. The result is supported by the findings of Barslund and Finn (2003).

Farmers‘ assets were valued to see its effect on the amount of credit demanded. The results show that the value of donkey has a significant influence on the amount of credit demanded by the farmer from the formal sources with an estimated coefficient of 0.3445 at 5% level whereas the value of bullock had a highly significant effect on the amount of credit demanded by farmers from the formal sources with an estimated coefficient of 0.1609 at 1% level. This suggests that these assets may act as collateral for securing loan from the formal sources. This is in line with the results of Barslund and Finn (2003).

Farmers‘ credit worthiness was found to have a positive and highly significant influence on ones amount of credit accessed from the formal sources with an estimated coefficient of 0.0980 at 1% level. This means that one‘s ability to repay the loan is very vital in the credit acquisition. Farmers who have guarantors have high probability of getting higher amount of credit from the formal sources with an estimated coefficient of 0.2029 at 10% level.

The location of the respondents were also explored to see if specific locations of the farmers have an influence on the amount of credit that the farmers access. The results show that residing in Komoayili has a positive and highly significant coefficient of 0.8720 at 1% level compared to farmers who reside in Karaga the reference category.

On the other hand, the results from the multivariate tobit model estimated for the farmers who access credit from the informal sources indicated that, being a male has negative influence on the amount of credit accessed from the informal sources with an estimated coefficient of 0.1692 and highly significant at 1% compared to females. This implies that male farmers receive lesser amount of credit compared to females in the study area. This is supported by the findings of Ilahi, (2001).

Household size was found to be highly significant with a negative coefficient of 0.0018 at 1%. This suggests that the higher the number of household member the lesser the amount of credit that is accessed from the informal sources.

Membership of farmer based organization has a significantly positive effect on the amount of credit accessed by farmers from the informal sources. Being a member of farmer based association increases the amount of credit accessed by farmers by 0.0306at 1% level compared to farmers who are not members of farmer based associations. This implies that being a member of farmers based association increases farmers chances of getting credit from the informal sources all things being equal.

Farm size has a significantly positive influence on the amount of credit that farmers access from the informal sources with an estimated coefficient of 0.0023at 5% level. This means that as the farm size increases, farmers demand for credit also increases by the size of the estimated coefficients from the informal sources of credit. The result is supported by the findings of Barslund and Finn (2003).

Farmers‘ credit worthiness was found to have a positive and significant influence on ones amount of credit accessed from the informal sources with an estimated coefficient of 0.1389 at 10% level. This means that one‘s ability to repay the loan is very vital in the credit acquisition. Farmers who have guarantors have less probability of getting higher amount of credit from the informal sources with an estimated coefficient of 0.1451at 10% level. This is not surprising since guarantors are not required for most of the informal sources of credit in the study area.

The value of bullock had a highly significant effect on the amount of credit demanded by farmers from the informal sources with an estimated coefficient of 0.1704 at 5% level. This suggests that the value of asset plays a significant role in the amount of credit accessed from both formal and informal sources.

The results show that residing in Komoayili has a negative and highly significant coefficient of -0.8419 at 1% level compared to farmers who reside in Karaga the reference category. However, the amount of credit accessed from Namburugu, Nyingali and Pishigu does not significantly differ compared to Karaga. It was further revealed that farmers residing in Komoayili have positive coefficient of 0.8720 attributable to accessibility to formal credit centres in terms of road network. The negative coefficient from the informal sources explains the fact that farmers prefer formal sources because of the volumes of credit as compared to informal sources.

4.2.2 Effect of credit access on food security

Table 4.5 presents the binary logit estimates of the effects of farmers‘ source of credit to household food insecurity. The results show that the higher the amount of credit obtained from the formal source, the more food secured is the farmer household. The formal source of credit variable was found to be statistically significant at 1% with a coefficient of 0.1632. This implies that an increase in the amount of credit will lead to a decrease in food insecurity and as credit

access should be a vital area if food insecurity is to be addressed. Furthermore the amount of credit obtained from the informal sources has a significantly positive coefficient of 0.1775.

Additionally, the study explored some socioeconomic, institutional, household assets and location factors that influence farmers' household food security. The results show that among the socioeconomic factors, household size and education has a positive influence on farmers' household food security where as being a male has a negative influence on household food security. The value of motor bicycle was found to have a positive influence on food security whereas the value of donkey has a negative influence on food security.

The location dummies indicated that farmers residing in Namburugu, Nyingali, Pishigu and Komoayili are more likely to be food secured compared to farmers residing in Karaga all things being equal.

Table 4.5 Binary logit estimates of the effect of credit access on household food security

Variables	Coefficients	Standard errors	Z-values	Marginal effects	Standard errors	Z-values
Socioeconomic Factors						
Age	-0.0022	0.0085	-0.26	-0.0004	0.0015	-0.26
Male	-0.8655**	0.3812	-2.27	-0.1810**	0.0883	-2.05
Household size	0.0233*	0.0124	1.88	0.0042*	0.0022	1.88
Education	0.0576**	0.0238	2.42	0.0104**	0.0043	2.42
Farm size	0.0112	0.0104	-1.08	-0.0020	.00186	-1.08
Institutional Factors						
FBO	-2.2990	1.6781	-1.37	-0.0547	.04028	-1.36
Formal source	0.9025***	0.3270	2.76	0.1632***	0.0594	2.75
Informal source	0.9818***	0.3482	2.82	0.1775***	0.0632	2.81
Extension Contact	0.2888	0.2188	1.32	0.0527	0.0402	1.31
Household Assets Motor						
Bike	1.4705***	0.4553	3.23	0.1903***	0.0389	4.89
Donkey	-0.5820	0.3549*	-1.64	-0.0925*	0.0485	-1.91
Bullock	0.5589	0.5946	0.94	0.1143	0.1342	0.85
Location dummies						
Namburugu	1.4045***	0.3706	3.79	0.2991***	0.0842	3.55

Nyingali	1.2080***	0.3694	3.27	0.2553***	0.0845	3.02
Pishigu	0.6924**	0.3394	2.04	0.1313**	0.0664	1.98
Komoayili	0.9208**	0.4092	2.25	0.1939**	0.0949	2.04
Constant	-3.5741***	0.7369	-4.85			
Wald Chi2	67.18***					
Pseudo R^2	0.089					
Log likelihood	-345.65					

Source: field survey, 2014

4.2.3Analysis of Household Credit Constraints

The constraints to credit acquisition are presented in Table 4.6. The results show the delay in credit acquisition is the highest constraint to credit access in the study area followed by cumbersome processing of loan. The next constraint is long distance from home to financial institution followed by lack of education on credit. Loan diversion was ranked as the fifth constraint; lack of collateral was ranked as the 6th followed by credit default rate. Gender biasness was ranked as the least constraint. The asymptotic significance of the Kendalls W shows that all the consumers are in agreement with the ranking of the constraints.

Table 4.6 Constraints to credit access

Constraints	**Mean Score**	**Rank**
Long Distance from Financial Institution	4.02	3
Delays in Loan Acquisition	1.82	1
Cumbersome Process	2.66	2
Loan Diversion	6.17	5
Lack of Collateral	6.28	6
Credit Default Rate	6.31	7
Gender Biases	6.71	8
Lack of Education	5.10	4
N	291	
Kendall‘s W	0.614	
Chi – square	4.4943	
Degree of freedom (Df)	7	
Asymptotic Significance	0.000***	

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

This chapter presents a summary of the main findings, conclusion drawn and recommendations emanating from the study. The limitations of the study are discussed and finally suggestions are made for future research.

5.2 Summary of main findings

This study sought to assess the factors that affect household access to credit both from formal and informal sources in the study area. The study also assess the various household food security measures by computing the values of household assets, household livestock wealth and estimated the average number of times each household eats in a day. To determine the various food security measures, a descriptive statistic technique was used to estimate the parameters of household food security measures. A sample of 400 households was selected covering the three the whole study area.

A multivariate tobit model technique was used to examine the factors that affect household access to credit from both formal and informal sources. Results from the study revealed that

- There is high access to credit of about 80% in the study area.
- The main sources of formal credit to farmers in the study area are development banks followed by rural banks and cooperatives.
- Most of the informal credits emanate from relatives and money lenders.
- Most of the farmers who access credit from the formal and informal sources are food secured at risk whereas only a small proportion is fully food secured. Only a small proportion of farmers are food insecure with severe hunger.
- Socioeconomic factors such as age, education, farm size and membership of farmer based organization positively affect the amount of formal credit accessed by farmers.

- Farmers‘ credit worthiness, availability of guarantor, ownership of donkey and bullock as well as residing in Komoayili positively influence the amount of formal credit accessed by farmers.
- Socioeconomic factors such as household size and being a male significantly impact on the amount of credit a farmer can access whereas farm size and membership of farmer based organizations have a positive impact.
- Farmers‘ credit worthiness and ownership of bullock, as well as residing in Komoayili positively influence the amount of informal credit accessed by farmers whereas availability of guarantor exerts a negative influence on the amount of formal credit accessed by farmers.
- An increase in the amount of credit from formal and informal sources decreases food insecurity.
- Household size and education has a positive influence on farmers‘ household food security where as being a male has a negative influence on household food security.
- The location dummies indicated that farmers residing in Namburugu, Nyingali, Pishigu and Komoayili are more likely to be food secured compared to farmers residing in Karaga, all things being equal.
- Delays in loan acquisition, cumbersome processes, long distances from financial institutions and lack of education are the most pressing facing the household head in the study area.

5.3 Conclusions

Based on the results of the study, the following conclusions are made.

1. It is concluded that access to credit is not a major problem in the study area but rather the timing of the credit is a major constraint.

2. The study concludes that access to credit from both formal and informal sources reduces food insecurity but still most of the farmers are food secured at risk.
3. The study also concludes that access to credit does not necessarily means one is food secured since food insecurity still prevails among farmers who have access to credit from various sources.
4. The study further concludes that access to credit is significantly influenced by socioeconomic factors such as age, gender, household size, education, farm size and FBO membership.
5. Institutional factors such as credit worthiness, guarantor and household assets like donkey and bullock significantly influence credit access in the study area.
6. Location of residence significantly affected the amount of credit accessed and food security.

5.4 Recommendations

The following policy recommendations are made based on the study findings.

1. The study recommends that, credit should be made available to farmers at the right time in the farming season.
2. It is recommended that credit alone should not be used as an intervention to reduce food insecurity but rather include programs that educate farmers on the efficient use of credit since education has a positive influence.
3. Farmers should be encouraged to form farmer based associations.
4. Financial institutions or credit sources should be strategically positioned to be easily accessible to farmers whiles reducing the cumbersome processing for credit among farmers who are less educated.
5. Farmers should be encouraged to keep assets like donkey and bullock since it enhances the amount of credit accessed and reduces food insecurity.

6. Since education had a positive influence with both formal and informal sources of credit, farmers should be encouraged to improve their levels of education by enrolling in adult and or continuing education centres in the study area.

5.5 Limitations of the Study and suggestions for future research

1. In the study area, most households have lower educational level and many do not keep records of the inputs and outputs.
2. This study suffers from the weakness associated with survey interviews when data accuracy depended heavily on the respondent‘s ability to recall past information and to answer survey questions accurately.
3. This study used a single approach in measuring household food security. Future research can consider different methods and compare the results to see if they are robust.

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APPENDICES

APPENDIX 1

ACCESS TO CREDIT AND HOUSEHOLD FOOD SECURITY IN KARAGA DISTRICT OF THE NORTHERN REGION OF GHANA FARM HOUSEHOLD QUESTIONNAIRE

a) Name of respondent……

b) ID Number……...…

c) District……..…

d) Village / Community……..

e) Date……..……

A PERSONAL CHARACTERISTICS

1. Age of respondent…….years
2. Gender of respondent
   Male [ ]
   Female [ ]
3. Marital status
   i. Married [ ]
   ii. Single [ ]
   iii. Divorced [ ]
   iv. Widowed [ ]
4. What is your highest level of education?
   i. Primary [ ] ii. JHS / Middle [ ] iii. SHS/ Vocational [ ] iv. Tertiary [ ] v. None [ ]
   vi. Others (specify)……..
5. What is your religious affiliation?
   i. Islam [ ] ii. Christianity [ ]
   iii. Traditional [ ]
   iv. None [ ]
   v. Others (specify)……

6. What is your ethnic background?

i. Dagomba [ ]

ii. Mampurisi [ ]

iii. Frafra [ ] iv.

Konkomba [ ] v.

Ashanti [ ]

vi. Others (specify)……..

7. (i) Do you belong to any farmer based organization?

Yes [ ]

No [ ]

(ii) If yes, do you receive any of the following assistance from the farmer's organization? Tick the appropriate box.

Type of assistance	Yes/ No	Value of assistance ((GH¢))
Technical assistance / training		
Provision of inputs		
Machinery services		
Equipment		
Credit in cash		
Credit in kind		
Provision of storage facilities		
Marketing services		
Others (specify)		

B. HOUSEHOLD CHARACTERISTICS

8. What is your household size?.....

9.a Give the number of your children …….

b. How many children are above 18 years?.....

c. How many children are below 18 years?.....

10. Livestock wealth

Animal	Number sold	Unit price (GH¢)	Number consumed	Total value (GH¢)
Cattle				
Sheep				
Goats				
Pigs				
Fowls (chicken)				
Guinea fowls				
Others (specify)…..				

11. Household assets

Assets	Yes/ No	Value of asset ((GH¢))
Cutlass		
Tractor & implements		
Hoe		
Bicycle		
Building		
Sacks		
Pick axe		
Donkey		
Bullock plough		
Others (specify)……..		

C. PLOT-LEVEL CHARACTERISTICS

12. What is your total farm size?.....acres

13. How far is your farm from home?.....km

14. How flat is your farm plot?

i. Flat [ ]

ii. Undulating [ ]

iii. Others (specify) [ ]

15. What is the fertility of your farm plot?

i. Fertile [ ]

ii. Moderately fertile [ ] iii. Very fertile [ ]

iv. Not fertile [ ]

16. What is the type of soil on your farm plot?

i. Loam [ ] ii. Sand [ ]

iii. Sandy loam [ ]

iv. clay loam [ ] v. Gravel [ ]

vi. Others (specify)…….

17. How do you acquire land for farming?

i. Hired [ ]

ii. Family [ ]

iii. Patrilineal Inheritance [ ] iv. Purchase [ ]

v. Others (specify)……..……..……

18. What farming system do you practice?

i. Mono cropping [ ]

ii. Mixed cropping [ ]

iii. Mixed farming [ ]

iv. Crop rotation [ ]

v. Others (specify)…….…….

19. How do you prepare your land for cultivation? Choose one or more

i. Hoe and cutlass [ ]

ii. Tractor [ ]

iii. Bullock / donkey [ ]

iv. Others (specify)……..…

20. Variable input use in 2009 crop season.

Resource	Yes	No	Quantity	Unit price(Gh¢)
Fertilizer				
Seeds				
Pesticides/insecticides				
Weedicides				

21. (a) Do you have access to labour during production?

Yes [ ]

No [ ]

(b)If yes, what kind of labour do you use for your farm operations?

i. Hired [ ]

ii. Family [ ]

iii. Others (specify)……..

22 Family labour Input on the farm

Activity	males		females	
	No. of persons	No of days worked	No. of persons	No. of days worked
Land preparation				
Sowing/Planting				
Weeding control				
Harvesting				

23. Hired labor input on the farm

Activity	male				female		wage rate to hired labour (Gh¢)	Cost of hired labour (Gh¢)
	No. of persons	No of days worked	wage to rate hired labour (Gh¢)	Cost of hired labour (Gh¢)	No. of persons	No of days worked		
Land preparation								
Sowing/Planting								
Weeding control								
Harvesting								

24.What crops did you cultivate in the 2009 season? Mention them

…….

…….

25. What was your farm size in the crops listed?

Crop	Farm size (acres)
Maize	
Millet	
Sorghum	
Groundnut	
Rice	
Soya bean	
Cowpea	
Potatoes	
Vegetables	
Others (specify)	

26. Cultivation of crops in 2009

Crop	Quantity sold (kg)	yield per acre	Unit price (GH¢)	Quantity consumed (kg)	Quantity Stored (kg)	Total value (GH¢)
Maize						
Millet						
Sorghum						

Soya bean						
Rice						
Yam						
Groundnut						
Cowpea						
Vegetables						
Potatoes						
Others (specify)…						

27. a Did you observe fertility decline on your farm plot ?

Yes [ ]

No [ ]

b. If yes, which measures did you use to improve the fertility on your plot? Name them

……..……

……

28. a Were you visited by an extension officer in 2009?

Yes [ ]

No [ ]

b. If yes, how many extension visits did you receive?

i. Once [ ] ii. Twice [ ] iii.

Thrice [ ] iv. More than 3 times

[ ]

D. NON–FARM ACTIVITIES

29. a. Did you engage in an off-farm employment activity in 2009?

Yes [ ]

No [ ]

b. If yes, provide the information below

Off-farm work	Income (GH¢)
Wage employment	Monthly/daily wage(GH¢)
Security	
Teaching	
Wage Labour	
Other specify	

Self-employment	Daily/weekly/monthly income (GH¢)
Basket weaving	
Rope weaving	
Zan mat weaving	
Blacksmithing	
Cloth making	
Stone quarrying	
Charcoal burning	
Shea butter extraction	
vendoring	
Petty trading	
Kayayo	
Other specify…….	

E. CREDIT ACCESS BY FARM HOUSEHOLD

30. a. Did you receive credit in 2009?

Yes [ ]

No [ ]

b. If yes, in what form did you access the credit ?

i) cash [ ] ii) inputs [ ] iii) Others

(specify) …….

31. If yes, provide the information below

Source of credit	Amount of credit (GH¢)	Penalties in case of default	Mode of payment
Informal			
Family / Relative			
Friends			
Money lenders			
Formal			
Banks			
NGO‘s			
MCA			
Insurance Companies			
MASLOC			
Others (specify)……..……			

32. Which of these conditions was applied in your case?

i) collateral [ ] ii)

Group member []

iii) Credit worthiness [ ] iv)

Guarantor [ ]

v) others (specify)……..……

33. Provide the information below

Source of credit	credit Amount used on-farm (GH¢)	credit Amount used off-farm (GH¢)	how credit utilized
Informal			
Family / Relative			
Friends			
Money lenders			
Formal			
Banks			
NGO‘s			
MCA			
Insurance Companies			
MASLOC			
Others (specify)……..…			

34 a) Do you have member (s) of your household who migrate outside to work?

a. Yes [ ]

b. No [ ]

b) If yes, how much on the average do you receive as remittance from the migrant(s)?

state ……Gh¢

F. CONSTRAINTS TO CREDIT ACQUISITION

35. What constraints do you face in credit acquisition? Determine the extent of constraint

Constraints / problems	Very high	high	low	Very low	None
Long distance from financial institution					
Delays in loan acquisition					
Cumbersome process					
Loan diversion					
Lack of collateral					
Credit default rate					
Gender bias in credit acquisition					

Lack of education					
Others (specify)……..					

G. FOOD SECURITY MEASURES

36. How many times do you eat in a day?

i. Thrice [ ]
ii. Twice [ ]
iii. Once [ ]
iv. None [ ]
v. Others (specify) …….

37. Indicate your staple crops, month of harvest and month of stock depletion

Staple crop	Month of harvest	Months of stock depletion
Maize		
Millet		
Soya bean		
Sorghum		
Rice		
Groundnut		
Yam		
Cowpea		
Vegetables		
Potatoes		
Others (specify)…….		

38. Which of these mechanisms / survival strategies do you adopt in order to cope with food insecurity?

Select from the table below

No.	Coping Mechanism	Very often	often	low	very low	None
	Reduce the number of meals served each day					
	Reduce the portion / sizes of meals					
	Eat less preferred foods					
	Eat wild vegetables & fruits					
	Sell chicken and fowls					
	Sell livestock (goats, sheep, pig					
	Send certain members of household to live elsewhere					
	Sell durable household possessions					
	Sell personal valuable					
	Seek food from relatives/friends					
	Members work for pay in food					
	Others (specify)……					

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.
.

39. In your opinion, mention some of the factors that constrain your production.

List them……

APPENDIX 2 Household Food Insecurity Access Scale (HFIAS)

Table 2.2: Scoring of the food security scales based on questionnaire responses

	Number of affirmative responses*		
Food Security Level	18-item, households with children	18-item, households without children (10 used)	6-item short form, all households
Food-secure	0	0	0
Food-secure, at risk	1-2	1-2	1
Food-insecure without hunger	3-7	3-5	2-4
Food-insecure, moderate hunger	8-12	6-8	5-6
Food-insecure, severe hunger	13-18	9-10	

(Radimer and Radimer, 2002).