AN ECONOMIC ANALYSIS OF PARTICIPATION IN CREDIT MARKET AND CREDIT RATIONING AMONG FARMERS IN KANO STATE, NIGERIA

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By

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ABSTRACT

Apart from providing fertilizer and machineries, agricultural credit provides access to all other resources, which may lead to remarkable improvement in output. However, due to lack of farm credit, agricultural production particularly in Kano-State, Nigeria does not significantly improve over the years. Therefore, this study aims at estimating the demographic and socio-economic indicators that are responsible for influencing farmers' decision to participate in credit market and factors that constraint them from accessing the farm credit. Micro data is used in this study involving 835 households and 45 microfinance banks, respectively. The result of the logistic model reveals that commercial farming, credit information, neighbourhood credit participation, traditional title and possession of radio and television relate positively to the credit market participation whereas a negative impact is noticed on the application of traditional tools. Similarly, results from the discrete choice models show that farmers who are either being engaged in subsistence farming or trading have a significant effect on the choice of credit market and credit rationing with the greatest impacts found on the farm profit and farmers' location. Moreover, the result of the partial proportional odds model indicates that the amount of credit received by farmers shows a positive relationship on irrigation, vehicle, farm record, number of creditors, financial literacy and location, albeit negatively related to subsistence farming. Even though proximity to lenders seems to play a role in credit supply equation, creditworthiness in general and its staff in particular are even more important. In conclusion, this research attests that poorer farmers are more likely to be excluded from the credit market than better-off households. Consequently, the finding in the credit market model recommends that there is need to build trust, encourage commercial farming, apply modern farming tools, strengthen property rights and increase financial literacy among farmers.

Keywords: agricultural credit, credit participation, credit choice, credit rationing, partial proportional odds model

ABSTRAK

Kredit pertanian bukan sahaja melibatkan penyediaan baja dan mesin, tetapi juga menyediakan akses kepada sumber-sumber lain yang boleh membawa kepada peningkatan keluaran pertanian. Bagaimanapun, pengeluaran pertanian di Kano-State, Nigeria tidak mengalami perubahan yang signifikan selepas beberapa tahun disebabkan oleh kekurangan kredit pertanian. Oleh itu, kajian ini bertujuan untuk menganggarkan indikator demografi dan sosioekonomi yang mempengaruhi keputusan petani untuk mengambil bahagian dalam pasaran kredit dan faktor-faktor lain yang mengekang mereka daripada akses kepada kredit pertanian. Kajian ini menggunakan data mikro yang melibatkan 835 isi rumah dan 45 buah bank pembiayaan mikro. Keputusan model logistik menunjukkan bahawa pertanian komersil, maklumat kredit, jiran yang menyertai pasaran kredit, kedudukan status tradisional, pemilikan radio dan televisyen mempunyai hubungan positif dengan penyertaan pasaran kredit. Sebaliknya, penggunaan peralatan tradisional mempunyai kesan negatif terhadap penyertaan pasaran kredit. Keputusan model pilihan diskrit juga menunjukkan bahawa petani yang terlibat dalam pertanian sara-diri atau menjalankan perdagangan mempunyai kesan yang signifikan kepada pemilihan pasaran kredit dan catuan kredit. Kesan yang terbesar dapat dilihat ke atas keuntungan ladang dan lokasi petani. Selain itu, keputusan daripada model ganjil berkadar separa menunjukkan bahawa jumlah kredit yang diterima oleh petani mempunyai hubungan positif dengan pengairan, kenderaan, rekod ladang, bilangan pemiutang, literasi kewangan dan lokasi, tetapi berhubungan negatif dengan amalan pertanian sara-diri. Walaupun lokasi pemberi pinjaman penting dalam persamaan kredit pertanian, namun pemboleh ubah bilangan kakitangan pembiayaan mikro merupakan pemboleh ubah yang lebih penting. Kesimpulan umum kajian ini menunjukkan, petani miskin lebih cenderung tersisih atau terkeluar daripada pasaran kredit berbanding isi rumah yang lebih kaya. Penemuan analisis model pasaran kredit mencadangkan pentingnya untuk membina kepercayaan, menggalakkan perladangan komersil, menggalakkan penggunaan alat pertanian moden, mengukuhkan hak harta dan meningkatkan literasi kewangan dalam kalangan petani-petani yang terlibat.

Kata kunci: kredit pertanian, penglibatan kredit, pilihan kredit, catuan kredit, model ganjil berkadar separa

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LIST OF ABBREVIATIONS

Abbreviation	Full Meaning
ACGSF	Agricultural Credit Guarantee Scheme Fund
ACSS	Agricultural Credit Support Scheme
ADP	Agricultural Development Project
AIC	Akaike Information Criterion
ASCAs	Accumulated Savings and Credit Associations
BIC	Bayesian Information Criterion
BOA	Bank of Agriculture
CACS	Commercial Agricultural Credit Scheme
CADP	Commercial Agricultural Development Program
CBN	Central Bank of Nigeria
CDF	Cumulative Distribution Function
DCM	Discrete Choice Model
DEM	Direct Elicitation Method
DMO	Debt Management Office
FAO	Food and Agricultural Organisation
FEAP	Family Economic Advancement Program
FMAWR	Federal Ministry of Agriculture and Water Resources
GDP	Gross Domestic Product
GOLOGIT	Generalized Ordered Logit Model
IM	Information Matrix
KSME	Kano State Ministry of Environment
LPM	Linear Probability Model
LR	Likelihood Ratio
MLM	Maximum Likelihood Method
MNLM	Multinomial Logit Model
NA	Native Authority
NACRDB	Nigerian Agricultural Cooperative and Rural Development Bank
OLS	Ordinary Least Square
PBN	People's Bank of Nigeria
PDF	Probability Normal Density Function
PCP	Percentage of Correct Prediction
PPOM	Partial Proportional Odds Model (GOLOGIT2)
ROC	Receiver Operating Characteristics
ROSCAs	Rotating Savings and Credit Associations
RUM	Random Utility Model

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

About 3.5 billion of the world population live in rural areas in 2014 (mostly in the developing world), 75 percent of them are in the poverty trap. In Sub-Saharan Africa (SSA) or Nigeria in particular, the ratios are higher with rural dwellers amounting to more than 50 percent (Todaro & Smith, 2011; World Bank, 2015a). Most of these people have been bypassed by economic progress, and engaged primarily in subsistence agriculture. Survival is their ultimate goal. Report from the Food and Agricultural Organisation (FAO) indicates that more than a billion people in the world are without adequate food supply to meet the basic nutritional requirement (Babatunde, 2012). This leads to the malnutrition of more than 270 million Africans. There is an increasing concern by economists over the growing number of farmers, missing market, poor rural infrastructure, access to working capital and decreasing agricultural productivity, especially in African nations (Todaro & Smith).

Evidence from the World Development Indicators show that in 2014, only 1.6 percent of the total workforce was committed to agriculture in the United States (U.S.), 12.2 percent in Malaysia and 4.6 percent in South Africa. However, when it comes to Nigeria, more than half of farmers engaged in agricultural sector, but not produce adequate for the country (World Bank, 2015a). In fact, the average cereal crop yield per hectare in Nigeria was three times lower than that of Malaysia (3889.23 kg per hectare) and South Africa

(3724.86 kg per hectare), and almost five times lower than U.S. in same period. The risen food import bills of Nigeria which inflates to over $11 billion per annum could relatively be explained by this stagnation (Adesina, 2013). But, some reasons behind this poor performance of agriculture and low productivity in Nigeria were more attributed to lack of access to credit, market failures, infrastructure, inconsistence government policies and neglect of the sector (Anthony, 2010; Onugu, 2012).

Nonetheless, prior to crude petroleum discovery in bulk quantities, the agricultural sector was the dominant sector and provides more than 75 percent of export earnings. The sector also accommodates about 70 percent of the total workforce, provides raw materials to industries and food to the nation (Galadanci, 2009; Onugu, 2012). However, while continuing exploration of crude petroleum in 1970s, and the redirection of the economy from diversified one to mono-petrol economy, the contribution of agriculture to GDP decreases to 47.6 percent, 30.8 percent and 22.90 percent in 1970, 1980 and 2014, respectively, as indicated in Table 1.1. Thus, between 1970 and 2014, Nigeria moved from a position of self-sufficiency in basic foodstuffs to one of heavy dependence on imports.

Table 1.1
Sectoral Contribution to GDP in Nigeria in Percentage, 1960 - 2014

Sectors	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2011**	**2012**	**2013**	**2014**
Agriculture	64.1	47.6	30.8	39.0	35.7	40.8	40.19	39.21	38.45	22.90
Crude Oil	0.3	7.1	22.0	12.8	47.72	15.9	14.8	13.8	12.82	10.44
Services	12.2	20.2	19.5	10.3	10.2	10.1	10.3	14.00	21.42	36.17
Manufacturing	4.8	8.2	8.1	8.2	3.4	4.2	4.2	4.2	4.23	9.95
Solid Minerals	0.8	0.9	2.2	0.3	0.3	0.3	0.4	0.40	0.40	0.14
Others	17.8	16.0	17.4	29.4	2.9	28.7	30.1	28.7	22.68	20.40

Source: CBN, 2015

Agricultural economists over the years maintain that rural poverty and agricultural stagnation are the repercussions of the lack of access to capital among others (Barry & Robison, 2001). Perhaps, in order to improve farming production and increase the welfare of rural dwellers, farmers have to use improved techniques of production (Nuryartono, Zeller, & Schwarze, 2005; Schultz, 1980). However, the adoption of these modern agricultural inputs and machineries are somehow expensive, and most farmers cannot afford to self-finance. As a result of these problems, the adoption of modern agricultural inputs and new machineries are very stumpy in Nigeria. Therefore, the desire for the peasants to switch from subsistence to mixed or commercial farming was hampered by the inability to obtain credit, imperfect market, low productivity, low income and investment.

In response to these issues, Nigerian government for over 40 years had established a lot of programs and policies aimed at increases production and access to credit. Some of these programs and policies includes the establishment of Agricultural Credit Guarantee Scheme Fund (ACGSF) in 1977 and Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB) in 2000 and later Bank of Agriculture (BOA) in 2010 (Iganiga, 2008, 2010; Odi, Olukotu, & Emmanuel, 2013; Odi, 2013; Okpara, 2010). But in spite of these efforts and measures, the supply of credit to this important sector is still insufficient, and majority of rural farmers have been severely rationed from credit participation. Likewise, the sectoral distributions of commercial banks were skewed to the non-agricultural sector.

An inspection from Table 1.2 shows that in the year 2000, 27.80 percent and 52.80 percent of the total commercial loans was allocated to manufacturing and miscellaneous (mixed of different sectors) sectors of the economy, respectively. But only 8.07 percent was allocated to agriculture. The conditions were much more severe in 2010 and 2014, where agriculture claimed only between one percent and four percent. However, in spite of the drastic increase in total credit allocation to the private sector almost 100 percent annually, from ₦1.5 trillion ($8.8 billion) in 2006 to ₦8 trillion ($47.05 billion) in 2009, the welfare of many Nigerian citizens remained unaffected (Popoola, 2010). Thus, the consolidation and recapitalization of the banking exercise and the government intervention still did not increase the supply of credit to most of rural and urban dwellers.

Table 1.2
Sectorial Distribution of Banks' Loans in Nigeria in Percentage, 1960 -2014

Sectors	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**	**2011**	**2012**	**2013**	**2014**
Manufacturing	4.21	21.7	30.82	30.32	27.80	10.93	13.71	22.78	12.14	12.76
Miscellaneous	21.6	5.9	2.86	4.32	52.80	22.71	17.95	22.59	22.32	30.00
Agriculture	9.75	1.99	7.28	16.2	8.07	1.67	2.67	4.60	3.82	3.50
Mining	0.97	1.88	0.80	1.39	6.34	3.75	4.49	4.93	20.68	0.20

Source: CBN, 2015

While in comparison to manufacturing sector, the gap was kept skyrocketing as shown in Figure 1.1. With only exception of 1960, the loans allocated to manufacturing sector was tripled in 1998, and seven times in 2005, respectively. In 2013 and 2014, the sum of ₦4.43 billion ($22.13 million) and ₦5.86 billion ($29.29 million) was allocated to manufacturing sector, while on the other hand, agricultural sector received only ₦1.39 billion ($6.96 million) and ₦1.61 billion ($8.04 million) in the same period. Though the agricultural contribution to GDP was far higher than that of manufacturing sector.

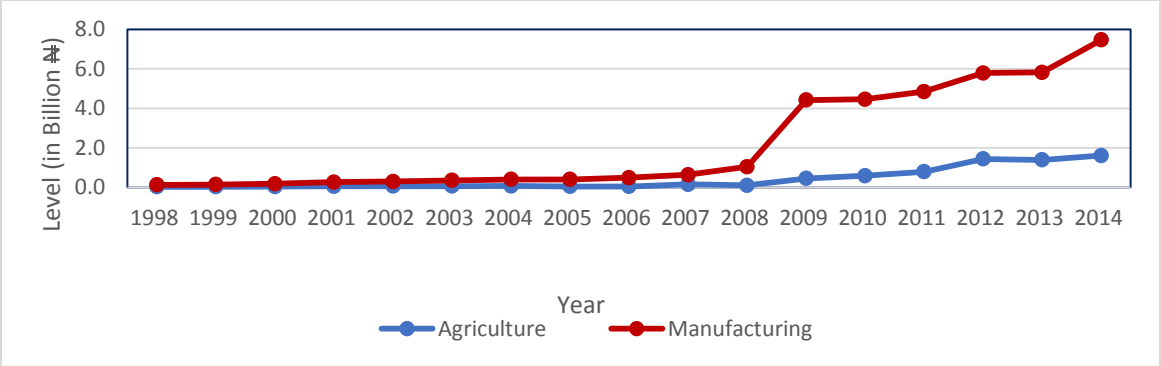


Figure 1.1

Sectorial Distribution of Banks' Loans in Nigeria between Agriculture and Manufacturing Sector in Millions, 1998-2014

Based on this analysis, the sectoral credit allocation tends to favour sectors with the least contribution to GDP at the expense of sector with higher contribution (agriculture), which increased financial hurdles to the farmers.

However, the conditions were not only aggravated and limited to commercial banks' lending. Statistical evidence from CBN (2015) shows that even the long well-established government financed programs such as ACGSF, agricultural loans are no longer available for most of the farmers. As documented, from the inceptions of ACGSF in 1978 to 2014, the scheme guaranteed and allocated a total number of 901,622 (97 percent) loans to individuals, 11,274 (two percent) to informal groups, 16,576 (one percent) to cooperatives and companies. This indicates poor performance as the scheme was set into motion in order to relax the collateral requirement, guarantee risk and extend credit to vulnerable farmers. While in 2014, only 69,062 individuals, 1,275 informal groups, 1,912 cooperatives and 73 companies had access to government-financed credit in the African largest country under ACGSF (CBN, 2015).

The fact that almost 70 percent of Nigerians do not have access to credit and also not covered by the formal financial and banking services of whatever forms (CBN, 2005), suggest that government finance programs do not cover many farmers. This is due to the fact that most of the Nigerian farmers do not only resides in the sparsely rural areas, but also unbanked, and the loans under ACGSF are distributed through commercial banks, which are mostly restricted to few urban centres. That is why inadequate access to farm credit has affected agricultural production in Nigeria. For instance, with reference to the study area – Kano State, Nigeria, evidence from Figure 1.2 indicates poor performance with respect to agricultural production in the state from 2002 to 2014, respectively. In 2002 and 2004 seasons, the thousand metric tonnes produced from the Kano State are only 1321.06 and 1445.82, respectively. These was later decreased to 1110.43 in 2008 and then increased to 1667.73 and 4822.38 in 2009 and 2013, as evidence from Figure 1.2. Thus, lack of farm credit remains the major obstacle to agricultural production.

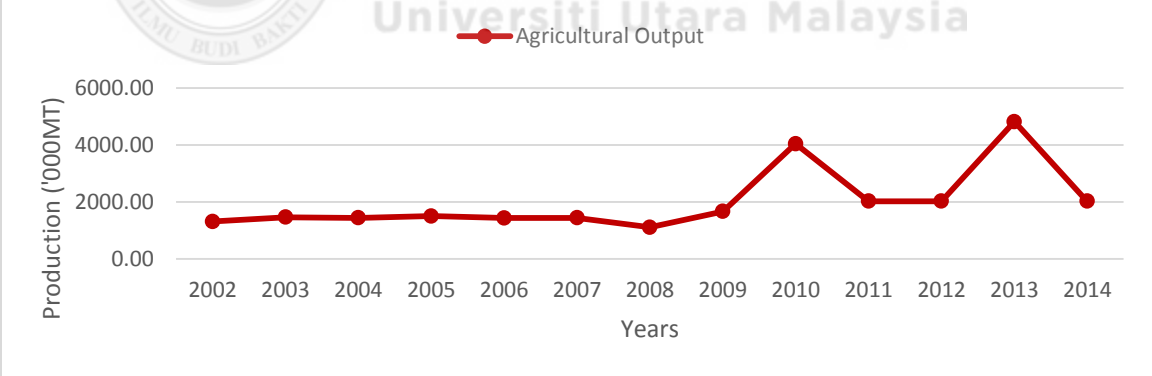


Figure 1.2
Agricultural Production of Kano State in Thousand Metric Tonnes, 2002-2014

In support of this, evidence from the World Bank report indicates that only five percent in Nigeria have access to formal loans, and 44 percent have formal bank account, while about two percent obtained loans from the informal source (World Bank, 2015a).

Besides, empirical evidence from Nigeria reveals that 79.2 percent of farmers were constraints in the agricultural credit market (Omonona, Lawal, & Oyinlana, 2010). This is supported by the findings that the extent of credit constraints is 73 percent in India, 71 percent in Congo and 59.9 percent in Ghana (Akudugu, 2013; Kuri & Laha, 2011a; Muayila & Tollens, 2012). Therefore, with reference to these devastating conditions and given the nature of agricultural credit in Nigeria, this study investigates the factors that explain the probability of farmers' credit market participation and rationing in Kano State, Nigeria.

1.2 Problem Statement

Evidently, lack of credit increases the level of farmers' poverty, deteriorates farm performance, and further worsens the welfare condition of rural farmers. It is, therefore, agreed to some extent among researchers that farm credit enhance farm performance and productivity which leads to significant improvement in rural welfare and farmers' income (Chisasa & Makina, 2013; Nwaru, 2011; Odi *et al*., 2013; Odi, 2013). Therefore, farm credit is one of the crucial inputs considered fundamental in agricultural production.

However, the inadequacy of agricultural credit in the country may have negative adverse consequences on savings, investment and rural welfare. Similarly, access to credit and non-availability of lending agencies remain the key drawback to the growth of agricultural sector in Nigeria, especially with particular reference to the study area – Kano State as evident from the production statistical data. Besides, Inyang (2013) explains that lack of access to credit is among the significant obstacles confronting farmers across Nigeria, which deteriorate the modernization and expansion of many

farms. This problem among others reduce value of agriculture to GDP, low cereal productivity, and skyrocket the food import bills of Nigeria to $11 billion as highlighted in the preceding chapter. In addition, the fact that formal financial sector provides services to only 44 percent of nearly 170 million Nigerians; and formal loan covers only five percent of the population highlight the problems in the sector. Besides, the adverse volatility of agricultural production in Kano State, the declining allocation of commercial banks' loan to agricultural sector further justified the need of this study. Therefore, with this consideration, this study investigates credit participation and credit rationing among farmers in Kano State, Nigeria.

1.3 Research Questions

Based on the above problems stated, this research seeks to answer the following questions:

i. What are the factors that influence farmers' decision to participate in agricultural credit market?

ii. Given the segmented nature of agricultural credit market in Kano State, Nigeria, what are the motivating factors that make farmers choose among the different source of agricultural finance?

iii. What are the factors that influence credit rationing or constraints in the agricultural credit market in Kano State, Nigeria?

iv. Does farmers' attributes determine the amount of agricultural credit received by them?

v. What are the determinants of the amount of credit supplied to farmers by microfinance banks?

1.4 Research Objectives

The general objective of this study is to determine agricultural credit participation and rationing in Kano State, Nigeria. The specific objectives are:

i. to determine the factors that influence farmers' decision to participate in agricultural credit market in Kano State, Nigeria;

ii. to analyse the determinants of farmers' choice among the different source of agricultural finance;

iii. to examine the factors that influence credit rationing in the agricultural credit market in Kano State, Nigeria;

iv. to analyse the characteristics that determine the amount of credit received by the farmers; and

v. to investigate the determinants of credit supplied to farmers by microfinance banks.

1.5 Significance of the Study

This study has provided a comprehensive treatment and understanding on credit participation and rationing in Nigerian credit market. More importantly, the findings of this research will serve as source of information on the agricultural credit status of the farmers to interest groups and governments at various level involved in channelling credit to farmers. This information is important for the development of agriculture in modifying the lending procedures and awareness to farm credit. More importantly, on its contribution to poverty alleviation by breaking the vicious circle of poverty in the farming communities. Thus, would help national food security through an increase in

agricultural productivity, lessen rural hunger and increase entrepreneurial ability of the farmers.

Similarly, this study has compiled a new micro-level dataset in the study area, which could also supplement other micro-level data elsewhere. This has important implication in the credit market literature that could be used for source of knowledge and comparison. However, one of the most important contributions of this study to literature in general is the ability for the research to include a number of potential determinants of credit market participation and credit rationing that have not been tested before, or in the Nigerian context. More specifically, the choice of farming system (subsistence and commercial); farming tools; credit information; financial literacy; marketing staff; presence of lenders; ownership of radio, television and vehicle have all found to be important in the models. Similarly, land tenure; farm profit; traditional title; neighbourhood or family participation and regions specific dummies where all found to explain the activities in the credit market.

Besides, evidence from the results indicate that credit participation and rationing depends on several factors that might have diverse effects across alternatives other than farmers' demographic characteristics. For example, theories of information asymmetric were based on supply-side approach that is why according to some authors rationing is overestimated in the credit market literature. While the significance of information and financial literacy in this study highlight the need for demand-side assessment. Thus, the

present study points that information and financial literacy are very important determinants of access to credit.

Notwithstanding, being almost the pioneer research in the study area, this study provides a new comprehensive and integrated micro-level quantitative analysis. This range from the probability of credit participation, to the choice of credit market, the possibility of rationing and the probability of credit supply. This integrated microeconometric modeling is very rear in the literature which brings another methodological contribution in the credit market literature. But a more important methodological contribution of this study for effective policy formulation would be seen from the research ability to introduced a partial proportional odds model in the quantitative analysis of credit market in particular and agricultural modelling in general. Such kind of model has not been analysed in this economic scope. Thus, this research work adds to the volume of literature in the agriculture in general and credit market in specific.

1.6 Scope of the Research

The scope of this study is limited to the participation in the agricultural credit market and rationing among the arable crop farmers in Nigeria. In order to be more precise, some local government areas were selected from Kano State for data gathering. Moreover, the study evaluates the factors responsible for influencing decision of the rural farmers to participate in the credit market or otherwise. In addition, the scope of this study is limited only to agricultural lending with respects to the factors that influence credit participation and rationing in the credit market. In addition to large sample size ($n=835$) that has been utilised in this research, the study believes that the sample of farmers that were selected

from farming families were enough and a representative of the rest of the farmers. Thus, it is believed that the data obtained are very accurate and provide useful and sufficient information for policy implications that would improve rural farmers' adequate access to agricultural credit.

1.7 Background of Kano State, Nigeria

Kano State as a political entity was established around 11th century when the first city wall was constructed during the reign of "Sarki Jusa" (Liman & Adamu, 2003). Kano links between the Islamic north and West Africa and also provide separate links to Central Africa during Trans-Saharan trade (Ellicott, 2002). The railway which came to Kano in 1911 couple with the construction of the first airport in Nigeria in 1936 linked it with virtually the rest of the world. This has placed the state as most populated city in Nigeria (9,401,288 inhabitants) (NPC, 2006). Currently, Kano State has over three million hectares of arable land (7,214 square miles); with an annual rainfall of about 900 millimetres which usually last between three and five months, with daily average temperature of around 20°C (Essiet, 2001). In addition, four different seasons have been identified in the state (Essiet, 1990). The dry and hot season; a dry and cold season; the warm and wet season and dry and warm season. Prior to 1970, the agriculture in the state survived mainly from the rain. But with the development of Kano river basin development project couple with Federal irrigation project, agricultural production has been redesigned, making it possible for the food and cash crops production in large quantities in both dry and wet seasons (Lynch, Binns, & Olofin, 2001). With this project, Kano is regarded as the most irrigated stated in Nigeria. Though Kano was categorised

under dry land areas, but it happens to be the wealthiest state in the country in terms of water resources with over 33 dams. Notably, two among these dams (Challawa and Tiga) are some of the largest in Africa (Barau, 2006).

Evidence from Figure 1.3 indicates that Kano farmers specialised in the following food and cash crops: root tubers; cereals; legumes; cotton, sesame, tomato, jatropha, garlic, moringa and others. In terms of marketing, processing and storage, the largest grain market in Nigeria if not in Africa (Dawanau Grain Market) is residing in the state at Dawakin Tofa Local Government Area (Adebayo, 2016). The market has about 600 traders with 20,000 shops and several storage and ware houses. At this market, food commodities are on daily basis transported to some countries in Africa, Asia, Europe and U.S. Though the price of agricultural commodities is highly affected by heavy post-harvest losses as a result of poor warehousing and missing market for the disposal of farm produce at realistic prices. But, Abuja Securities and Commodity Exchange (ASCE) has provided integrated system of decentralized trading, quality certification of farm produce, warehousing, settlement, clearing, delivery and market information. It enables exporters, agro-commodity merchants and industrial end users to have access to less transaction costs in commodities aggregation and logistics (Agbo, 2015). Though ASCE has not been able to make the necessary impact since inception due to some problems.

Notwithstanding, evidence shows that modernisation and growth of agriculture have been hampered by lack of credit in Nigeria (Inyang, 2013); such that most farmers have been severely constraints in the credit market. Statistical evidence indicates that between 2003

and 2008, agricultural production in Kano State has decrease from 1467.52 to 1110.43 thousand metric tonnes. With this in mind, this study analyses credit participation and rationing among farmers in Kano state, Nigeria.

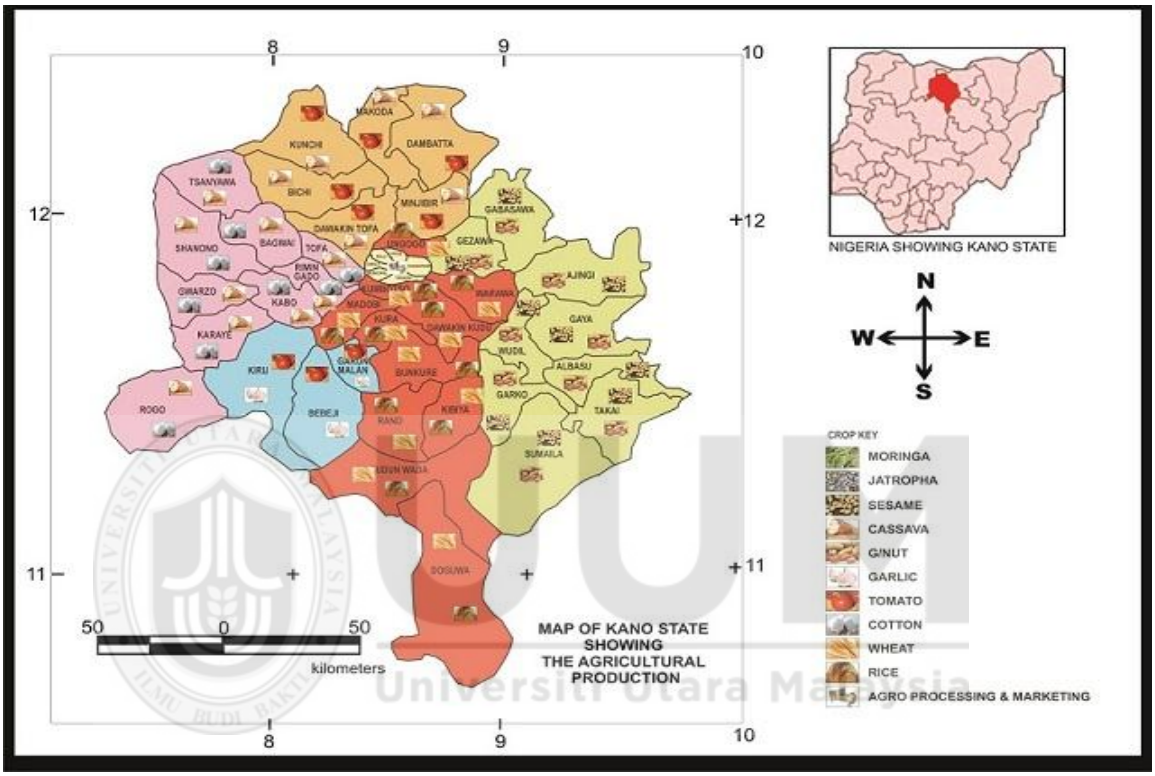


Figure 1.3
Map of Kano State Showing Agricultural Production Activities

1.8 Organisation of the Study

This research is designed into six chapters. Chapter One consists of introduction; problem statement; research questions; objectives; significance of the study; scope; and the key terms. While Chapter Two deals with the background of the study area and agricultural credit in Nigeria. Chapter Three and Chapter Four review the related literature and presents the process of data collection and research methodology as well. Socio-demographic profile of the respondents and presentation of results and analysis are discussed in Chapter Five while Chapter Six consists of summary and conclusion; policy recommendations; limitations of the study and suggestions for future research.

1.9 Definitions of Key Terms

This section provides some technical definitions of some key terms related to study, which include agricultural credit, credit rationing, credit access and participation in credit market.

1.9.1 Agricultural Credit

Credit is by and large distinguished as a standout amongst the most imperative perspective in farming productions which has been altogether explained by numerous authors. Atieno (1995) sees farm credit as simply giving or obtaining a loan with the end goal of farm production which incorporates loaning to individual farmers, farmers' cooperatives or affiliations. In addition, it incorporates immediate loaning to government and non-state parastatal for on-loaning to household. Atieno has recognized three types of farm credit; that is, transient credit, long and medium term lending. Accordingly, Nwaru (2011) defines farm credit as a temporary and present transfer of purchasing power from

an individual or cooperation who possess the resources to the borrower. But, most of the credit arrangements under formal and informal financial sectors such as private money lenders are usually repaid with interest (Long, 1968). Nonetheless, a substantial number of loan transactions among friends and relatives are taking place without interest rate (Turvey, Kong, & Huo, 2010). This concept of agricultural credit is adopted in this study.

Capital is significant input among the components of production, and also a vital for the advancement of agriculture in the country. The degree of access to this resource will most likely affect cultivating choice on one hand. On the other hand, without capital from the farmers, loanable fund is an option (Wayne, Seepersad, & Bekele, 2000). But as a result of low profit and shocks in prices connected with agricultural ventures in developing world, households are at some point entrapped into a poverty cycle, which decreases farm income, farm profit and farm produce. Hence, farm credit either from a secondary or a primary sources remains the real choice to improve cultivating exercises that can help among alternate for the cycle to break. Oyedele and Akintola (2012) indicate that farm credit is a crucial factor in cultivating exercises because it improves the capability of poor farmers to extend their production and increase their entrepreneurial skill as this would raise their income and capacity to settle the obligation. Therefore, it is of interest to households and policy makers to investigate credit access and its constraints.

1.9.2 Access to Credit

Access to credit is the ability of a farmer to borrow from a particular source of credit, even though for a different reason, he may not necessarily choose to borrow. But the extent to which a particular farmer has access to credit is defined by the maximum

amount he can borrow at a particular point of time (credit limit). Therefore, if the credit limit is positive, that particular farmer is said to have credit access (Diagne, Zeller & Sharma, 2000).

1.9.3 Participation in Agricultural Credit Market

A farmer is said to be credit participant if he borrowed from a particular source of credit (Diagne, 1999). This source of credit includes commercial banks, agricultural banks, cooperatives bank, part-time and full-time private money lenders (Balogun & Yusuf, 2011). In this case, credit access is different from credit market participation, because a household might have credit access but for a different reason he may decide not to participate in the credit market. Whereas, a household may participate in the credit market without having regular access to that particular credit market. This is possible due to special intervention by government or interest groups.

1.9.4 Credit Rationing

Credit rationing refers to a condition whereby the supply of farm credit is lower than the demand at the usual interest rate (Petrick, 2005). This definition is referred to as pure credit rationing (Jaffee & Stiglitz, 1990). According to this definition, farmers, in some circumstances could secure credit while others who are willing and able to borrow at prevailing interest rate are unable to secure loans, given same conditions. Thus, their loan request is either be accepted or rejected or to some extent obtain a lower amount than their request (Feder, Lau, Lin, & Luo, 1990). Therefore, farmers are said to be credit

constraints if they could not borrow enough to satisfy their economic demand or lacks having access to credit. This study will use these concepts to model agricultural credit.

CHAPTER TWO

AGRICULTURAL CREDIT IN NIGERIA

2.1 Introduction

This chapter explains some of government agricultural finance programmes dealing directly with the subject of the study. These include the following: ACGSF, NACB, NACRDB and CACS.

2.2 Major Agricultural Financial Programs in Nigeria

The history of modern microfinance dated back to 1970s from the work of Muhammad Yunus and the increasing activities of Grameen Bank. The relevance and prospects of this Bangladeshi bank on shaping the new banking system and providing financial services especially to the poor have been acknowledge in numerous studies (Hashemi, Schuler, & Riley, 1996; Jain, 1996; Morduch, 1999; Muhammad & Jolis, 1999; Yunus, 2003). Therefore, in order to increase access to financial services, government of Nigeria have upgraded rotating and non-rating deposit and lending association to registered cooperatives up to the current legalization of microfinance bank under the control of CBN in 2005 (CBN, 2005). But in order to be more precise in this assessment, emphasis will be given to the major institutions and schemes that have been directly related to agricultural funding in Nigeria.

2.2.1 Nigerian Agricultural Cooperative Bank

Nigerian Agricultural Cooperative Bank (NACB) was 100 percent owned by the CBN (40 percent) and Nigerian Government (60 percent). It was created in 1973 with a particular end goal of raising farm product, improve rural areas, raise rural incomes and welfare through the provision of medium and short term advances (Iganiga, 2008; Odi, 2013).

NACB gives loans to the rural and urban tenants at concessionary rates. This was carried out through the procurement of credit to farmers at individual levels, affiliations, associations, organizations, federal and state government organizations. The amount of projects that were finance in agriculture rose in 1990 from 2,446 to 6,286 in 1994. Similarly, the ratio of loan granted by the bank develops by 13.22 percent amid the period while the ratios of woman's shares granted loan was just 1.73 percent as at 1999. Finally, NACB runs with ₦3.8 billion ($22.4 million) as outstanding credit unpaid between 1973 and 1999 (CBN, 1999, 2005; Iganiga, 2008; Nancy & Maurice, 2013).

2.2.2 People's Bank of Nigeria

People's Bank of Nigeria (PBN) was intentionally settled in 1989 with the end goal to mitigate against the disappointment of Nigerian Rural Bank (1977) and spread out financial bundles to local people, less favoured households and rural inhabitants. Such banking product incorporates loans and investment funds to households. For the purpose of this objective and to extend banking services to rural regions, the PBN draws a large portion of its clients from the informal divisions of the economy (CBN, 1999). Unlike NACB counterpart, this bank was 100 percent owned by Nigerian government. However,

almost 100 percent of its capital were deduced from the three tiers of governments (Iganiga, 2008; Odi, 2013).

The number of loans served by the bank is only 625 in the year 1989, but increases to 3,917 after a few years, and afterward radically declined to 131 in 1994. The economic turmoil of 1990s and a decline in the need of consumer products that negatively affected the economy; and additionally, the need to recuperate the credit were in charge of the decrease in the amount of credit in the period. However, only 53 number of credits in 1993 were documented as unpaid loans, and it drastically reduced to 25 in 1998. Additionally, there is no information with respect to the sectoral appropriation and stream of credit between the remote and urban zones. Yet in the same year women represented about three percent from the aggregate customer (Iganiga, 2008).

As a result of poor working and ill-functioning of this bank with respect to credit conveyance, it was formally consolidated with Family Economic Advancement Program (FEAP) and NACB on October eleventh, 2000, which give birth to Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB).

2.2.3 Nigerian Agricultural Cooperative and Rural Development Bank

This newly agricultural bank was initiated in 2000 and recapitalized with ₦51.82 billion ($304.8 million) with primary objectives of funds mobilization and conveyance of credit to the farmers and poor peoples (Anyanwu, 2004). In 2002, a total of ₦2.13 billion ($12.53 million) was conceded to 26,942 out of 28,422 candidates that amounted to

₦2.90 billion ($17.06 million). In 2003 within the first quarter, ₦1.045 billion ($5.89 million) was additionally conceded for the applicants while ₦2. 916 billion ($17.15 million) had also set aside for further dispensing to applicants in the third quarter. Nonetheless, the bank represented just 0.46 percent of aggregate banks credits in the year 2006, and declined to 0.19 percent in 2008 in the country while the deposits was only 0.22 percent and 0.08 percent in the same period, with unpaid credit amounted to ₦14.3 billion ($84.12 million) in 2008. Tragically, the exercises of NACRDB still confined to a few urban regions with very minimal women representation (Iganiga, 2008; Odi, 2013).

2.2.4 Agricultural Credit Guarantee Scheme Fund

Agricultural Credit Guarantee Scheme Fund (ACGSF) was created in 1977 from the Decree No. 2 and began operation in 1978 with the end goal to serve as insurance to farm risk, expand finance and to address asset base collateral issues. Under this scheme, the loans are to be dispensed by the commercial banks (CBN, 2013; Isiorhovoja, 2013; Onoja & Onu, 2010). On the commencement, both the share capital and paid-up capital are only ₦185.6 million ($1.09 million). Similar to NACB, ACGSF is 40 percent and 60 percent owned by the CBN and the Federal Government, respectively. From the inception, ₦3 billion ($17.65 million) was made available for the scheme with a specific end goal to build a capital base plan of the ACGSF. The CBN, which are exclusively allotted to manage the project would assure up to 75 percent of the principal, if there should arise an occurrence of defaulting because of hazards and unexpected disasters outside the administration of the farmers. Evidence from the statistical CBN bulletin shows that credit arrangement of commercial banks to farmers rise with the establishment of ACGSF

up to the last quarter of 1989. However, after the adjustments policies which follows by the deregulations of financial sectors in late 1986, there was drastic decrease in loaning to the farmers. This is part of the risk alleviation techniques by the commercial banks, because of the economic turbulence. Evidence indicates that 56,328 projects were financed in 2011 and then as usual decreases to 48,739 in 2012 which was later increased to 56,277 and 72,322 in 2013 and 2014, respectively (CBN, 2015a). However, in spite of the report that ACGSF has insured ₦56 billion ($329.41 million) in the past 34 years (Leadership, 2012), evidence from the empirical studies indicate that the scheme were unable to insure one percent of the farmers in Nigeria (Isiorhovoja, 2013).

2.2.5 Agricultural Credit Support Scheme

Like ACGSF, Agricultural Credit Support Scheme (ACSS) was additionally launched by the Federal Government and CBN with the involvement and backing from the Bankers Committee of Nigeria. The basis behind the activity is to permit farmers to adventures the undiscovered opportunities in agribusiness, export potential and rise in foreign income, decrease the sustenance cost, lessen inflation, and diversification of the economy. For farmers' cooperatives and individuals to have access to this fund, farmers need to counsel their bankers through their local associations and affiliated with state committees. Initially, the loan will be given to farmers at 14 percent interest rate, however, clients who repay back their advances on favourable and scheduled time would enjoy an incentives of six percent rebate from the initial interest rate. Thus, decreasing the aggregate rate of interest to eight percent (CBN, 2015b).

2.2.6 Commercial Agriculture Credit Scheme

Commercial Agricultural Credit Scheme (CACS) of 2009 was initiated by the Federal Ministry of Agriculture and Water Resource (FMAWR) and CBN with end goal of raising funds to commercial farmers. Specifically, on the issues related to storage, processing, promotion, production and marketing of agricultural produce. However, the real targets were to give credits to large and business farmers at low rate (nine percent), and to decrease the cost of farm production. Thus, will decrease the cost of sustenance, and improve production, generate more employments, increase income, improve foreign business and provides raw materials to the urban neighbourhood (Vanguard, 2015). CACS as one part of the Commercial Agricultural Development Program (CADP) and seven-point plan of Yar'adua administration, was funded by the trust of ₦200 billion ($1.176 billion) prepared by the Nigerian Debt Management Office (FMAWR, 2010). Prior to the new guidelines, the minimum asset base for borrowing is ₦350 million ($1.75 million) for corporate borrowers; this however, were reduce to ₦100 million ($500 thousand) under the new guidelines in 2014. Similarly, the half-year report from the Nigerian monetary authority reveals that in 2013 ₦16.3 billion ($81.5 million) were allocated to 19 projects under this scheme. Where out of this amount, marketing and production firms accounted for 10.5 percent and 36.9 percent, respectively while processing firms goes away with 52.6 percent (Vanguard, 2014). However, Okpara (2010) observed that most of these policies and programs were frustrated by lack of managerial ability, supervision, misused of resources, bribery, corruption, poor policy implementation and coordination.

2.3 Conclusion

This chapter discussed various issues such as the technical meaning and types of agricultural credit. Different agricultural credit programmes and agricultural banks in Nigeria that have been established for a long period were assessed. NACB was created with the sole aim to extend credit to the farmers but it runs aground with over $22 million unpaid credit in 1999. ACGSF came into being in 1977 in order to secure loans to the farmers without collateral and to insure them against natural calamities. But within the past 34 years in action it covers less than one percent of farmers in Nigeria. While the activities of NACRDB are confined to the few urban centres, the funds under CACS is hardly accessible to many farmers. Thus, despite the activities of this programs, farm credit is still inadequate in the country.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter deals with the theories and empirical review in agricultural lending. Various aspects such as the concept of credit participation, permanent income hypothesis and several empirical studies were discussed. Similarly, the concept of credit rationing, types of credit rationing and factors responsible for credit exclusion and theories of credit market were also reviewed. Lastly, apart from conclusion, the chapter closes with the empirical studies of rationing in the agricultural credit market.

3.2 Access to Credit and Participation in Credit Market

Some researchers argue that access to credit is often confused with participation in the credit market (Diagne, 1999). Certainly, these two concepts are usually interchangeable with one another. But the primary distinction among the two lies in the fact that the latter is something that borrowers select themselves to participate (self-selection) freely, while the former entails some degree of restrictions upon the households. These limitations include eligibility and availability as criteria for a given credit programs (Abideen, Huq, & Mydin, 2012; Diagne & Zeller, 2001). In addition, Diagne (1999) maintains that access to credit which is supply-side phenomenon is related directly to the choice of lenders' credit limit, whereas credit participation which is more of demand-side, is associated with potential debtors' choice of optimum loan size. In this way, Diagne defined lack of access to credit as a state whereby the maximum credit limit for a particular source of

loan is zero. This means that, a household has access to a particular type of credit if the maximum credit limit is positive, and someone can improve one's access to credit by increasing his maximum credit limit.

However, a more summarized and logical distinctions of access to credit, participation in credit market and credit constraints was given by Diagne and Zeller (2001). According to them, a household is said to have access to a particular type of credit if they can able to borrow from that particular source, even though for a different reason, he may not choose to borrow. But the extent to which a particular household has access to credit is defined by the maximum amount he can borrow at a particular point of time (that is credit limit). Therefore, if the credit limit is positive, that particular household is said to have credit access on one side. On the other side, a household is credit participant if he borrowed from a particular source of credit while a household is said to be credit constraints if he could not borrow enough to satisfy his economic demand or lacks having access to credit.

Diagne *et al.* (2000) further classified non-credit participants' and credit participants' household according to different types of credit access and binding constraints attached to that particular credit, with respect to household members. The authors argue that if at least a single-household member has positive credit limit for a particular type of credit, that household is said to have access to credit. Likewise, a household is said to be credit constrained if at least one of its members has zero-credit limit. To support this argument, Diagne *et al.* found that eight percent in Malawi and 16 percent in Bangladesh of non-credit participants' households, did have access to credit. That is to say, they could have

got a loan if they decided to participate, whereas 28 percent and two-third are without access to credit. Though 40 percent and 31 percent are credit participants in Malawi and Bangladesh, but they do not have credit access. This indicates that even for credit participants, their continuing access to credit is not certain and subject to so many random shocks.

Besides, this volatility in access to credit might bring doubt in planning and farm decision-making, which hardly to cope with, and hence affect production (Carter, 1989; Feder *et al.*, 1990; Foltz, 2004). At this juncture, it is worth noting that these differences are particularly important in this research because all the three concepts have received different treatment, and there is no doubt these have add impetus into the literature of credit market.

3.3 Theories of Credit Participation

According to literature, there are two approaches that could explain why farmers participate in credit market, that is, the permanent income theory and community risk sharing.

3.3.1 Permanent Income Hypothesis

According to Friedman (1957), permanent income hypothesis refers to any change in consumption caused by transitory income (shocks to income) can be sufficiently smoothed through borrowing in the market. Because households will try to increase their utility over their life through borrowing in case of adverse shocks in the transitory

income, and savings during economic booms. In this way, demand for credit or participation in the credit market is aroused from the demand for consumption smoothing that mitigate for shocks of income. However, Conning and Udry (2007) and Morduch (1995) argue that the violation of the perfect capital markets as presumed by the theory in developing economies, where the capital markets are deeply distorted by the problems of information asymmetric, can be one of the reasons to explain the existence of rationing in the credit markets. Thus, under deficient capital markets, consumption and production are not totally maximized (Doan, Gibson, & Holmes, 2010; Duflo & Udry, 2004). Hence, reliance of consumption on transitory income indicates that households are unable to borrow enough to cover the income gap caused by negative shocks. Consequently, under this situation a household is said to be credit constrained or rationed (Morduch, 1995).

Armendariz and Morduch (2010) postulate that numerous households, specifically the poor, might not have enough savings. This particular household might like to use the money today rather than waiting for tomorrow; therefore, this current spending motives makes credit rationing more stubborn. Hence, constraints to credit may be validated by the presence of savings constraints, and obviously, lack of savings means lack of accumulated asset. Thus, access to institutional credit authorizes household to consume its lasting income while the consumption effects for the unpredicted fluctuations to income and wealth could be extended over time (Udry, 1990).

Additionally, demand for credit or participation in credit market is not only meant for coping with income shocks, but also for investment in profitable activities. Hence, in the

absence of perfect capital markets, credit constraints is said to exist if the individuals are unable to borrow sufficiently to meet their production demand (Doan *et al.,* 2010). Besides, demand for credit will be higher if the individuals have bigger production ventures or battle with adverse shocks to their production projects such as drought, harvest loss and flooding. These caused farmers to need more capital for the purpose of restoring or enlarging their production activities (Guirkinger, 2008; Kochar, 1999).

3.3.2 The Community Relationship and Risk Sharing Hypothesis

The community relationship and risk sharing is one of the channels of adverse shock absorption or risk sharing (Lim & Townsend, 1994; Townsend, 1994). Townsend found that individual consumption co-moves with average village consumption, but not as much as influence by present income, unemployment and other individual personal shocks. He also found that response to income fluctuations in order to meet the appropriate desired consumption level is borrowing from the banks or community. Besides, response to individual income shocks is credit transactions not sales of asset.

However, negative income shock does not necessarily call for credit participation since individuals can avert income declining by decreasing other inputs and increasing labour earnings (Kochar, 1999). In contrast, changes in income originated by demographic shocks could only be smoothed through credit (Doan *et al.*, 2010). In this regard, Kurosaki (2006) shows that rural dwellers in Pakistan used credit, particularly from the informal source, as it is the most vital mechanism that cope with negative income fluctuations.

Moreover, demand for credit and insurance are higher in several low-income countries (Morduch, 1995), since income is not only unstable but also low. Thus, individual become at risk when consumption drops after negative income fluctuations. But in the presence of perfect markets, individuals might not be at risks because of income fluctuations. Since most of the risks would be spread away, therefore, transient income shocks would have no effect on consumption (Doan *et al.*, 2010). In fact, individuals could save or borrow to cover up. Therefore, consumption smoothing is intact. However, if capital markets are not functioning, individuals are constrained in their ability to get a loan. Hence, the impact of income fluctuations on consumption will be worst.

In sum, the responses to consumption and production shocks are multifaceted. It could be borrowing, labour earnings, production diversification, sales of accumulated assets and external assistance. One of the solutions might be labour income; however, it may be futile in the situations of insufficient employment for both self-employment and wage during economic crises. Thus, access to credit is the only shocks absorber (Doan *et al.*, 2010; McKenzie, 2004; Udry, 1990). Nonetheless, imperfect capital market might result in credit constraints and incomplete risk sharing.

Therefore, participation in the credit market should be influenced by farmers' demand for loan and their creditworthiness that can be used as sorting criteria by the lenders. Thus, factors influencing participation in the credit market should be represented by either farmers' demand for loan or creditworthiness. Especially if farmers are from the average

population rather than just from the poor family. Available evidence from the literature shows that better endowments such as human and physical resources might enable the individuals to participate in the credit market. For instance, farm size, labour force or family size (Duong & Izumida, 2002), house value, income, and other fixed and durable assets (Duy, D'Haese, Lemba, Hau, & D'Haese, 2012), education (Nguyen, 2007), ages and occupation (Diagne, 1999; Okurut, 2000) are significant determinants of credit market participation.

Conversely, when it comes to poor individuals, the above-mentioned factors may play different roles in explaining their participation in the credit market. They could be demand driving factors rather than creditworthiness components of the individuals. For instance, Thaicharoen, Ariyapruchya, and Chucherd (2004) and Khandker (2005) found that physical and human endowments such as land, assets, education are negatively related to credit participation. Thus, according to Conning and Udry (2007), these differences in the determinants of credit market participation for different clusters of individuals suggest that capital markets in developing economies are sub-divided into different parts such as formal and informal lenders. Such that creditors may use different approaches to sort and screen applicants and appraise borrowers' creditworthiness based on their segments.

3.4 Determinants of Credit Participation

Studies of participation in agricultural credit are still insufficient in developing economies, yet most of the researches available have identified several factors as the key

determinants of demand for credit, and/or to demand from a particular source of credit (formal and informal sectors). These includes demographic and socio-economics characteristics of the farmers, regional and social capital characteristics and wealth accumulated from past saving, among others, could affect the demand for credit (Kofarmata, Applanaidu, & Hassan, 2014; Udoh, 2005). These attributes influence household differently, in such a way that what influences the demand or participation for credit by a particular individual might be different from other individuals.

3.4.1 Farmers Attributes

Farmers' attributes, which refers to characteristics of farmers such as age, gender, marital status, family size, farming experience, education, and so on, have been reliably found to affect the demand for credit. In a survey study in Burma, India, Ghana and Ireland, Kaino (2005), Kumar, Singh, and Sinha (2010), Akudugu (2012) and Howley and Dillon (2012) found that age of a household is positively related to credit demand. However, age of a farmer which is a crucial determinant of credit proved to have a quadratic function. This is evident from the work of Shah, Hashmi and Bukhari (2008) and Doan *et al.* (2010) in Pakistan and Vietnam that credit demand increases with age, and decreases as an individual grows older. On the other hand, Okten and Osili (2004) and Okurut, Schoombee and Berg (2005) found that old farmers are more probable to demand credit. Ngan, Ninh, and Lensink (2008) further explain that older farmers have a higher probability of repayment, due to their maturity than younger ones; hence, they are more likely to have access to credit. However, the findings of Katchova (2005) in U.S., Bendig, Giesbert and Steiner (2009) in Ghana and Mpuga (2010) in Uganda indicate that

demand for credit is attributed to younger and more energetic individuals and their application is likely to succeed.

It is also hypothesized that households with more family members are more likely to benefit from family labour; hence, they are more likely to demand loans. In view of this, some studies found that the preference to demand credit increases with an increase of one member in the households (Bendig *et al.*, 2009; Kumar *et al.*, 2010; Okurut *et al.*, 2005; Shah *et al.*, 2008). Tang, Guan, & Jin (2010), Balogun and Yusuf (2011) and Gbadebo, Ademayowa, Mobolaji and Ayanyemi (2013) also reported similar result China and Nigeria. Moreover, the probability to demand higher amount of credit increases with an increase in family size (Turvey & Kong, 2010). On the other side, Swain (2007) and Akram, Munir, Hashmi and Saleem (2012) found that the effect of family size is statistically insignificant in rural Pakistan and India. In fact, according to Doan *et al.* (2010), the probability that a household will demand a higher amount of credit decreases with an increase in the family members. It follows that households with more family members have less repayment capacity due to higher consumption expenditure and therefore more likely to be discouraged from borrowing.

In addition, those with higher qualification among the households are expected to exploit business opportunities that can generate more earnings in the future; hence, they are more likely to demand credit. Using Logit and Probit models, a number of studies have found that an additional year of schooling by household head is likely to increase his demand for credit (Akudugu, 2012; Mpuga, 2010; Okten & Osili, 2004; Okurut *et al.*, 2005; Tang

et al., 2010). These results was supported by Swain (2007), Bendig *et al.* (2009), Ejaz and Khan (2011), Onyeagocha (2012) and Gbadebo *et al.* (2013); but contradict the finding of Udoh (2005) who reported that educated farmers are less likely to demand credit in Nigeria. This implies that those with higher education already have more incomes and, therefore, have little or no need to borrow. But unlike other findings, Akram *et al.* (2012) and Doan *et al.* (2010) found that in Pakistan and Vietnam, education of the households does not explain their financial preference. This shows that credit demand is influenced by other motives that are independent to human capital index.

With respect to farming experience, Onyeagocha (2012) found that those with higher years in the farming business are more likely to borrow than those with fewer years of experience in Nigeria. But the influence of this regressor varies according to the source of credit and regional effects. For example, Turvey *et al.* (2010) found that farmers with more experience may not likely use formal loan exclusively, but prefer informal borrowing in China. While in other provinces of China, the probability to demand credit increases with availability of formal loan. Though Atieno (1997) argues that farmers with less experience are more likely to demand more credit than those with higher farming experience. In fact, those with farming experience have more chances to acquire managerial skills and, therefore, more likely to utilize available alternatives in financing their business apart from credit, due to longevity in farming ventures.

In addition, availability of family labour, or number of adult in the family may stir up demand for loan (Sarap, 1990; Shah *et al.*, 2008). This is evident from the work of Okten

and Osili (2004) in Indonesia that higher a proportion of adult or number of active siblings in the family may stimulates credit demand. Therefore, households with more male adults are expected to borrow more in order to make the best use of abundant family labour into productive activities.

Similarly, occupational interest of households such as business, administration or agriculture is likely to affect the demand for credit (Disney, Fichera, & Owens, 2012; Mpuga, 2010; Nagarajan, Meyer, & Hushak, 1998; Papias & Ganesan, 2010; Tang *et al.*, 2010). Nagarajan *et al.* in Gambia found that demand for loan increases with decrease in farming activities. This shows that additional earnings from non-farming business would increase liquidity in the hand of farmers and enhance their confidence for self-funding, thus would decrease their participation in the credit market. Similarly, Papias and Ganesan found that participation in credit market is positively related to farmer being engaged in other income activities in rural Rwanda. It follows that farmers who diversify their business or engaged in other income generating activities have more additional income that can guarantee their repayment ability. This will motivate the lenders to advance credit to them. However, this contradict the finding of Tang *et al.* that individuals with farming as their secondary occupation are less likely to participate in the credit market.

In addition, Mpuga (2010) found that those with farming as their primary occupation are less likely to demand credit from conventional banks, money lenders and government banks than those with the main occupation in trade and administration. While informal

borrowings are more attributed to industrial workers. However, farmers with the main occupation in business ventures have higher chances of obtaining loans from all the different source of credit. While on the other hand, the influence of individuals' occupation was found to have a mixed effect. For example, Kumar *et al.* (2010) found that individual with main occupation in farming is likely to demand higher amount of loan. This can be explained from the perspectives that full-time farmer would obviously in need of capital in order for him to hire more labour and finance farming inputs. However, the overall finding of Ayamga, Sarpong, and Asuming-Brempong (2006) in Northern Ghana suggest that households with engagement in both farming and non-farming activities are very likely to participate in credit programme. This indicates that the extent of diversification as a result of revenue generated from other income and farm output by these types of households give them an opportunity to secure loan. Hence, the tendency to repay back loan is very high.

3.4.2 Farms Attributes

Farm characteristics refers to the specific qualities or attributes associated with farmland. Many studies have argued that demand for credit could be influenced by farms' characteristics, specifically farm size (Atieno, 1997; Godquin & Sharma, 2005). In view of that, Bendig *et al.* (2009), Kaino (2005) and Mpuga (2010) found that those with large farms are more likely to demand farm credit than those with small holdings. This result is further supported by Howley and Dillon (2012) and Onyeagocha (2012) and more recently by Gbadebo *et al.* (2013). Moreover, Okten and Osili (2004) further clarify that

the probability to demand farm credit increases with the total number of land owned, while Akram *et al.* (2012) and Doan *et al.* (2010) found no link between them.

But in terms of firm growth, access to institutional credit have been reported to encourage growth of an enterprise in Kenya and Rwanda (Atieno, 2001; Ismael, 2013). Because firm's growth is reliant upon firm's profit and the ability to utilize inputs efficiently including capital among others. In view of that, Ismael found that business growth is positively related to credit access. Thus, credit rationing could limit the growth of firms and its size, leading to declining in productivity. In favour of this argument, Hartarska (2012) found that firm's growth particularly for the new entrant matters a lot in terms of lenders' assessment and decision of whether to supply credit to the firm in question in U.S.

Moreover, farming income in this context has been considered as farms' attributes and was found to affect the demand for credit in various researches. Nwaru (2011) shows that an increase in farming earnings, other things being equal, would generate more saving that could lead to increase in the demand for loan in Southern Nigeria. This finding is supported by Katchova (2005) in U.S. and Gbadebo *et al.* (2013) in Nigeria, but contradict the finding of Udoh (2005) who claims that demand for credit is inversely related to farming income among women in Southern Nigeria. While Atieno (1997) reveals that farming income is neutral in explaining the preference to demand loan in Kenya. Though this contradiction was clarified by Turvey *et al.* (2010) that farmers with a higher ratio of farming income are likely to borrow from the informal source and less

likely to borrow from the formal source. While an increase in the households' income (from a different source) may discourage informal borrowing and encourage borrowing from the formal source. This argument supports the hypothesis that borrowing from the informal source is higher for farmers with exclusive income from farming while formal borrowing is for households with more diversified activities.

Other farm characteristics such as farm expenditure was found to increase the demand for credit in some part of Nigeria and India (Sarap, 1990; Udoh, 2005), while an increase in inputs prices will discourage households from borrowing in rural India (Swain, 2007). Moreover, in rural Madagascar, Zeller (1994) found that 78 percent of any given loan transaction was spent on the purchase of farming equipment and production inputs. According to Datta (2003), ownership of farming facilities such as an irrigation system is positively related with credit participation in India. In fact, farmers who frequently denied loan, might be attributed to small land couple with low agricultural output, reflecting a low demand for farm credit because of low level of farm output.

Additionally, firm with an adequate record of investment activities or production history which could represent firms' creditworthiness and managerial expertise, makes it more likely to demand external borrowing. In an empirical survey in Vietnam, Nguyen and Luu (2013) argue that proper accounting record might likely motivate firms to reduce heavy reliance on internal finance and resort to external borrowing. They also report that firms with permanent bookkeeping have higher chances of having access to external loan. Consistent with these findings, Petrick and Latruffe (2003) in Poland, found that

commercial oriented farmers are more attributed with adequate accounting record, and this increase 14 percent of their borrowing chances. Similarly, Petrick (2004b) reports that farmers with proper accounting record is a signal of managerial expertise that make the future investment possible. It appears that firm with accounting book is likely to have lower borrowing cost. In general, bookkeeping is a reliable record that lenders could base their evaluation of the firms' investment, productivity, risks and profitability, particularly, the borrowers' credit worthiness, which will decrease agency problems.

3.4.3 Institutional Characteristics

Demand for goods is expected to be affected by its price; in this case, the price of credit is interest rate. In fact, one of the primary institutional attributes that are likely to affect the availability of credit is its price. In this view, previous studies have found that demand for credit increases with decrease in interest rate (Balogun & Yusuf, 2011; Hassan *et al.*, 2012; Nwaru, 2011; Udoh, 2005). Similarly, Tang *et al.* (2010) and Ejaz and Khan (2011) found that an increase in cost of borrowing and bribery decreases demand for farm credit.

It has been demonstrated by Long (1968) that higher interest rate on farm credit is a signal to market failure. Interest rate that are charged by the banks in both developed and developing countries amount to 30 percent or over in some countries annually such as India and Thailand. However, other financial providers advance credit to households relatively at lower rates ranging from nine percent to 17 percent, especially under government finance programme which are consistently found to attract farmers.

Okerenta and Orebiyi (2005), Muayila and Tollens (2012), and Ololade and Olagunju (2013) found that an increase in interest rate would distance some borrowers from having access to credit in some part of Congo and Nigeria. While in some studies in Poland and Southern Nigeria, Petrick (2004b) and Akanni (2007) found a positive correlation between interest rate and credit access. This implies that as the interest rate increases, other things being equal, the amount of credit supplied will be more available to the borrowers (Nwaru, 2011). In this case, lenders will be willing to supply more if the price

of credit is very high. However, Shah *et al.* (2008) found that an increase in interest rate would lead to increase in demand for loan. This implies that credit has a shadow price, and so many determinants other than own price (Atieno, 1997).

Furthermore, proximity to lending agencies is a significant factor that can affect the credit activities (Ejaz & Khan, 2011). Okten and Osili (2004) postulate that successful credit applicants are more likely to emanate from the neighbourhood of credit providers. In addition, Akudugu (2012) and Balogun and Yusuf (2011) in Ghana and Nigeria found that demand for credit increases as distance to lending agencies decrease. Similarly, residents who are leaving near to lending agencies are more likely to demand credit than otherwise. In contrast, Doan *et al.* (2010) found that demand for credit increases with being far away from the banks in Vietnam. This might be explained from different perspectives that most of the government-supported credit programme has been designed to favour rural farmers that are in most cases far away from the urban centres.

Carling and Lundberg (2005) further explain that proximity to banks could infer that lenders have good information on the market upon which borrowing firm operate, or the ability of the firm to expand its project and resources (human and asset). Put differently, the extent of information asymmetry has been found to be low in the neighbourhood of the lenders.

Likewise, increase in demand for asset-based collateral or guarantor, such as group formation by the formal lenders, might be some of the factors that can affect credit

participation. Several studies have found that having asset-based collateral increases the flow of credit into the hands of borrowers (Foltz, 2004; Petrick, 2004a) while lack of it decreases access to the formal loans (Kacem & Zouari, 2013). Petrick added that *Ceteris paribus,* lending agencies are more willing to consider households with tangible collateral; hence, they are more likely to release more credit to them. Furthermore, being cooperative or community member is expected to increase household's access to credit. This is supported by Oyedele and Akintola (2012) and Ugwuoke, Chinedu and Felix (2013) in Nigeria that being cooperative member or having frequent visit by extension workers increases access to credit by household. Similarly, Balogun and Yusuf (2011) assert that active group members that can attend meeting regularly have more chances to obtain credit than otherwise. In addition, Mpuga (2010) and Akudugu (2012) support the finding that non-active group members or farmers without associational membership are less likely to demand credit than active members. Okten and Osili (2004) further explains that those who participate in local activities are more likely to demand loan than non-participants. In this case, group formation or participation could be one of the requirements especially for the microfinance banks in order to ensure repayment ability through social mechanism.

Notwithstanding, empirical survey from Ghana indicates that households with deposit account (current or savings accounts) are more likely to demand financial services (Bendig *et al.*, 2009). Because it may be possible that the prime motive for savings or having accounts with the banks is to benefit from the range of the financial services including credit. Therefore, it was found that having savings account with banks

increases the probability of credit supply (Akudugu, 2012; Kasirye, 2007). Doan *et al.* (2010) further explain that lack of savings means lack of accumulated wealth, and this is likely to result in credit rationing. Other factors such as availability of formal credit (Shah *et al.*, 2008), being self-employed or unemployed (Bendig *et al.*, 2009) and time lag before the credit disbursement and being in urban centres (Doan *et al.*, 2010) were found to increase the demand for credit. While being full-time farmer (Kumar *et al.,* 2010) and access to extension services (Qureshi & Saleem, 2012) will decrease the demand for borrowing.

3.4.4 Wealth of the Farmers

Demand for credit is likely to be affected by wealth of a household such as household's assets and total income. Numerous studies in Ghana, Pakistan and China have found that as total income and net wealth of a farmer increases, his preferences towards credit will also increase (Bendig *et al.*, 2009; Shah *et al.*, 2008; Turvey *et al.*, 2010). According to Amao (2013), total income or asset of the households should always be considered by the lending agencies before given out loans, in order to ensure repayment possibilities. This view is supported by Atieno (1997), Kasirye (2007) and Mpuga (2010) that households with more wealth or asset that can serve as collateral are not only likely to demand credit, but also demand higher amount of loans and their applications are likely to succeed. Because lending agencies might consider them as risk neutral customers with high probability of repayment. Other studies that proxy net wealth with household's expenditure also confirmed the story (Okten & Osili, 2004; Okurut *et al.*, 2005). In contrast to these findings, Swain (2007), Doan *et al.,* (2010) and Turvey and Kong (2010)

found that an increase in net wealth implies a decrease in borrowing, and if at all, the probability of obtaining a higher credit amount would decrease. It follows that as an individual acquires more wealth and become economically independent; his preference towards credit will fall.

Apart from this, ownership of asset such as bicycle and cell phones are associated with borrowing. Doan *et al.* (2010) found that ownership of phone which proxy for individual wealth and better endowments by means of the capability to pay call bills, and also indicates a social connection, is positively related to participation in the credit market. This shows that wealthier farmers are less likely to be deny the chance of participation in formal credit market. In support of this, Kapoor and le Blanc (2008) argue that possession of consumer durables that reflect economic wellbeing of households such as automobile, television and furniture are more attributed to households living in formal housing setting.

Similar to ownership of assets, existing literature suggests that lack of financial literacy is associated with individual over-indebtedness, decrease in savings as well as low stock market patronage in Russia, U.S. and Netherlands (Klapper, Lusardi, & Panos, 2011; Lusardi & Tufano, 2009; Lusardi, 2009; Van Rooij, Lusardi, & Alessie, 2011). For example, Chen and Volpe (1998) argue that individuals with low financial literacy are likely to involve in costly transaction; hence become more indebtedness that may lead to economic confusion. Stango and Zinman (2009) report that households with low financial education are bound to be trapped by systematic miscalculation of long-term saving's returns.

Besides the higher vulnerability of abuse and fraud, lack of financial awareness could misguide a household's financial conduct that upsurges credit fragility. Well financially informed household exercise some degree of novelty-enhancing demand on the financial products; and play a significant supervising role in the credit market that could assists to increase the level of honesty and transparency in formal financial sectors. Moreover, lack of financial literacy tends to be predominantly severe for the specific consumer group such as female, poor households, illiterate aged households and ethnic minorities in Russia and U.S. (Klapper, Lusardi, & Panos, 2012; Lusardi & Mitchell, 2008, 2007).

Bendig *et al.* (2009) maintain that consumers' choice for insurance loans and savings are interrelated with financial literacy. This implies that households with more financial education have better knowledge of the working of financial services that may able them to exploit the utility benefit associated with different financial product than financial illiterate. Generally, financial literacy in many European countries have impacted on their savings behaviour (Le Blanc, Porpiglia, Teppa, Zhu, & Ziegelmeyer, 2015). In this regard, field studies from some Euro areas and U.S. found that financial literacy has positive and significant impact on better choice of different financial products for the individuals with better understanding on the working of financial services (Le Blanc, Porpiglia, Teppa, Zhu, & Ziegelmeyer, 2014; Lusardi & Mitchell, 2007).

Similarly, studies in Russia show that households with more financial awareness are more associated with reporting more spending capacity and more availability of monthly

unspent income. However, the greatest effect of this relationship where found during the economic downturn, indicating that financial education can served as a shield to households in observing macroeconomic shocks (Klapper *et al.*, 2012). Going within the literature, financial illiteracy will be an important variable that can be tested in the agricultural credit market.

3.5 The Concept of Credit Rationing

Broadly, credit rationing is defined as a condition whereby demand for credit exceeds supply (excess demand), or below the Walrasian equilibrium (Kochar, 1997; Petrick, 2004a; Stiglitz & Weiss, 1981, 1992). According to Guirkinger and Boucher (2008), credit constrained households are those whose participation in the agricultural credit market is restricted because of asymmetric information. In addition, Kumar *et al.* (2012) define credit constraints as situations where formal credit market fails to supply farmers with desired amount of credit in a timely, and at reasonable rate. Indeed, some households who are willing to borrow more for economic reasons are unable to do so while others can get the desired amount. This type of rationing are sometimes called pure credit rationing (Jaffee & Stiglitz, 1990), or quantity rationing (Boucher, Guirkinger, & Trivelli, 2009).

Reyes and Lensink (2011) contend that those who either received below their needs or being completely rejected are called credit constraints. In this way, Duong and Izumida (2002) explain that a farmer is said to be credit rationed if he demands more credit than what formal and informal markets are willing and able to supply. Secondly, if he needs credit but involuntarily excluded for a different reason, such as having no access to credit

facilities or market; because of having no asset-based collateral, or being discourage by the administrative bottleneck. However, a household with no economic demand for loan will not be regarded as credit constrained farmer.

Undeniably, the use of microcredit arrangements in developing nations specifically SSA replicates the evidence of credit rationing in the rural and urban centres. Though these are institutional and non-institutional innovations that are trying to reduce the extent of financial exclusion (Oluyombo, 2012). To sum up, various factors have been identified in the literature as the constraints to credit which includes: dual and high-transaction costs from both the lenders and borrowers (Diagne *et al.*, 2000; Foltz, 2004; Nuryartono *et al.*, 2005), distance from the side of borrowers and dispersed geographical settings (Godquin & Sharma, 2005; Papias & Ganesan, 2010; Winter-Nelson & Temu, 2005), covariate risk of rural income (Duong & Izumida, 2002; Tang *et al.*, 2010; Yu, 2009), information asymmetries between lenders and borrowers (Kuri & Laha, 2011a; Papias & Ganesan, 2010; Stiglitz & Weiss, 1981, 1992; Teppa, Ziegelmeier, Blanc, & Zhu, 2013), absence of asset-based collateral, environmental circumstances and idiosyncratic risk that affect the repayment probability, and asset holdings of rural dwellers (Datta, 2004; Diagne *et al.*, 2000; Kumar *et al.*, 2012; Yu, 2009), poor infrastructure and lack of legal enforcement mechanism (Andrews, 2006; Besley, 1995a; Diagne & Zeller, 2001; Disney *et al.*, 2012; Guirkinger, Fletschner, & Boucher, 2007; Kochar, 1997; Madestam, 2014; Okpara, 2010; Zeller, 1994).

In spite the importance of social and economic impacts of capital in the development of rural sectors, a lot of studies have acknowledged the fact that rural dwellers, specifically those with low income and middle households, are being challenged by credit rationing. For example, Barham, Boucher and Carter (1996) found that 69 percent of rural households surveyed in Guatemala, were restraints in the credit market. Similar results are found in Philippines and rural Ghana (Akudugu, 2013; Godquin & Sharma, 2005). The constraints conditions were much severe in Pakistan, Nigeria, Indonesia and India were 88.4 percent, 79 percent, 78.5 percent and 73 percent, respectively, are found to be constrained in the credit market (Fatima, 2009; Kuri & Laha, 2011a; Muayila & Tollens, 2012; Nuryartono *et al.*, 2005; Omonona, Jimoh, & Awoyinka, 2008). However, the extent of credit constraints varies across the countries, owing to the socio-economic differences and time effects. This is evidence from the work of Reyes and Lensink (2011) in Chile that constraints to credit decreases from 16.4 percent in 2006 to 13.6 percent in 2008. Moreover, Winter-Nelson and Temu (2005) and Doan *et al.* (2010) indicate that only 56 percent and 26 percent in Vietnam and Tanzania are found to be credit constraints in a survey among farmers.

Different types of credit rationing or constraints have been identified by various scholars. These includes non-price, price rationing, risk and transaction cost rationing (Boucher, Carter & Guirkinger, 2008, Boucher *et al.*, 2009; Guirkinger & Boucher, 2008; Jaffe & Stiglitz, 1990). Credit rationing to Jaffee and Stiglitz (1990) are simply classified as interest rate rationing, divergent views rationing and pure credit rationing. Interest rate rationing is a situation whereby a farmer receives credit lower than his request at the

prevailing price. Whereas divergent views rationing is a condition whereby some households cannot participate in the credit market because the price of a loan is higher than the return of that loan, due to the fear of being default (credit phobia). Pure credit rationing is said to occur, when some households obtain credit while others do not, though they are willing to borrow at exactly the same conditions. This category of rationing is often called quantity rationing. Another type of rationing according these authors is redlining rationing. Redlining rationing is said to occur when the cost of lending is higher than the expected return of capital. This is due to the cost of screening, monitoring and supervision by the creditors.

However, Boucher *et al.* (2009) have gone beyond pure-credit rationing or what Boucher's called quantity-rationing but also introduced transaction cost and risk-rationing. According to them, an individual is said to be transaction-cost rationed if he ceases to participate in the credit market due to the monetary and time costs (non-interest price rationing). In other words, transaction-cost rationing is a state whereby the cost of transportation and administrative charges are too expensive, in such a way that farmers are involuntary excluded from participation in the credit market; or if there is no demand for loan due to costs of borrowings. While risk-rationed farmers are those that cannot afford to bear the risk of sacrificing their holdings as collateral, in order to participate in the credit market, even if there is economic demand (another form of non-interest price rationing). With this type of rationing, a household may prefer to embark on a safe but lower-return project for which no credit is required, instead of a higher-return but risky investment, for which a credit is needed. This problem arises because the loan contract

forces, allow the debtors to accommodate a few risks through collateral engagement, due to absence of coordinated market (insurance markets) in a rural economy.

In this regard, Boucher *et al.* (2009) categorised borrowers into five groups, based on their constraints status. That is: price rationed borrowers and non-borrowers, quantity rationed, transactions cost rationed, and risk rationed borrowers. Priced rationed borrowers and non-borrowers are those that are not affected by credit limit, from both formal and informal financial sectors, with only difference being that the former obtained the requested amount of credit. While the latter does not borrow, because it has no economic demand, or viable profitable investment, which requires credit. However, those affected by binding credit limit among the farmers, because the loan procedures and requirement could not be met, or their credit application is being rejected; or getting a lower amount of loan than their demand, are called quantity rationed. Transaction cost rationed farmers according to these authors, do not face any binding credit limit; however, they do not pursue any formal loans, because the costs associated with borrowing are too expensive to them. Although risk rationed farmers are not bound by any forms of credit limit, yet they do not seek a formal credit, due to the risk of collateral loss.

Evidence from an empirical survey across Latin America establishes that between 15 percent and 20 percent of the rural farmers are risk rationed. Hence, they misallocate farm resources to low-profitable ventures (Boucher *et al.,* 2008). Along the line, Petrick (2002) found that over 40 percent of the sampled farmers in Poland are credit rationed,

and of that percentage, 80 percent were found to be constrained by shadow price. Similar result was also reported by Khantachavana, Chiu, Turvey and Kong (2012) that 6.5 percent and 35 percent are risk rationed, 14 percent and 10 percent are quantity rationed, and 80 percent and 55 percent are price rationed among the Chinese and Mexican farmers.

3.6 Theories of Credit Rationing

This section explains both the underpinning and other relevant theories that have been used in the previous literature. Though this research dwelled on some few theories such as information asymmetric theory (sometimes called credit rationing theory) and random utility theory, but other theories are also crucial in the study.

3.6.1 Asymmetric Information Theory

Information asymmetry in credit markets generally arises because borrowers have superior information about their investment than creditors (Stiglitz & Weiss, 1981). Asymmetry of information might be "ex ante" or "ex post". The former refers to a situation whereby lenders cannot distinguish between good borrowers and bad borrowers before the credit contracts which may leads to an adverse selection problem. Adverse selection is a condition whereby the lenders has little information about their clients. Consequently, they cannot differentiate between desired and riskiest or undesirable borrowers as such they tend to increase the level of interest rate, which indirectly leads to exclusion of safe borrowers from the contract. This problem leads to rationing of potential borrowers irrespective of their repayment ability (De Aghion & Morduch, 2005; Stiglitz & Weiss, 1981).

On the other hand, asymmetric of information is said to be "ex post" when the financial providers cannot observe or measure the profits returns of the borrowers. The creditors are mostly in a difficult position to know whether the debtors' losses or made profits, and mostly the mechanism to reinforce the repayment capacity is weak, especially in the

developing economies. Consequently, this leads to a moral hazard problem. Moral hazard arises when a borrower engages in riskiest ventures that will decrease the repayment probability (De Aghion & Morduch, 2005). Thus, adverse selection in credit market raise the odds that the credit will be made to bad borrowers, while on the other hand, moral hazard decreases the likelihood of credit repayment. Subsequently, lenders might decide to ration some borrowers and credit rationing may occur. Credit rationing is a condition where some applicants may receive a smaller loan than their request; or may be denied loan at all, though they are ready to pay a higher interest rate (Stiglitz & Weiss, 1981).

This theory as developed by Stiglitz and Weiss (1981) assumes that the price of loan has direct effects on the quality of loan due to the adverse selection and moral hazard. The adverse selection effect of interest rates is as a result of different loan applicants have different repayment probabilities. The price of a loan (interest rate) an applicants are willing to pay may serve as a screening device, but the borrowers who are willing to take loans at high price might likely be the worse borrowers. This type of borrowers are ready to accept higher interest rate because they perceive that the repayment probability of a loan is very low. However, there exists an interest rate that increases the expected return to the lenders and beyond which the lenders will not release loans. Thus, will make the supply-curve of loans to bend backwards, and lead to equilibrium with credit rationing.

Stiglitz and Weiss (1981) explain that the effect of information asymmetry as overwhelmed in the credit market might result in credit rationing, especially if the lenders refused to raise the interest rate to clear the excess demand. Though raising the interest

rate higher than the prevailing price, due to fear of information asymmetry, may invite the riskiest customers. It may also induce firms to embark on the most difficult and riskiest ventures with the greatest variability in profit return. Therefore, lenders in some circumstances have an incentive to ration loan rather than to increase interest rates when there is too much demand for credit. In summary, the presence of information asymmetry causes rationing in the credit market. Therefore, changes to the information structure and borrowers' attributes which may guarantee repayment are likely to reduce credit rationing. Following this circumstance, lenders minimise problems of moral hazard and adverse selection by rationing credit on different basis other than the interest rate (Freel *et al.,* 2012).

On the other side, in the presence of information asymmetry, some borrowers do not apply for loans, though they have viable projects to undertake. These are what Jappelli (1990) called "discouraged borrowers". This type of borrowers are regarded as good borrowers (creditworthy) even though they do not apply for loans because they feel that their application are likely to be rejected (Han, Fraser, & Storey, 2009; Kon & Storey, 2003). Zeller (1994) contends that improper credit screening mechanism of applicants would give biased signal to potential borrowers that could discourage them from loan applications. This type of rationing is called demand-side credit rationing.

Zeller (1994) and Petrick (2004a) observe that improper credit screening device would raise biased signal to borrowers and lead them to abandoned loan application since they believe that they will not be considered. In support of this, Boucher *et al.* (2008) and

Khantachavana *et al.* (2012) argue that risk of borrowing, high cost of transaction and cost of loan contract would possibly discourage households from credit participation.

According to theory of discourage borrowers, an important determinants of discouragement is the unobservable borrowers' attributes (Jappelli, 1990; Kon & Storey, 2003). Ideally, lenders might like to discourage bad borrowers and encourage good borrowers, but they are in a difficult condition to know exactly the borrowers' attributes because of information asymmetry. Thus, an important determinant of credit rationing based on this model include age, gender, marital status, farm size, family, information, relationship, distance, education and location (Crook, 1999; Han *et al.,* 2009; Mama, & Ewoudou, 2010).

3.6.2 The Contract Theory

The contract theory was derived from the Walrasian demand-supply equilibrium (Stiglitz & Weiss, 1992), though the Walrasian equilibrium was found to be inappropriate to explain transaction in the agricultural credit market (Diagne *et al.*, 2000). This theory deviates from the traditional credit market where the interest rates will intervene to settle the demand and supply of credit between the borrowers and lenders. Instead, this theory follows rationing process to arrive at equilibrium due to the enforcement and contractual problems, moral hazard and adverse selection associated with credit market. From the initial point, an individual decides on the amount that he want to borrow, and the lender would decide on the borrowing limit of the client plus the cost of lending, before they offer the contract to a client which is subject to acceptance or rejection by client. The borrower may accept the contract if borrowing will yield a positive return on the

investment, and rejected the contract if the return on investment as a result of borrowing is zero. Once the credit is released, the actual repayment amount and the repayment time will be decided by a borrower, which is subject to his project success or his initial intent of the contract.

However, the lender's optimal choice of the maximum credit amount that a lender is willing to lend (that is credit limit), which is a proxy of the credit supply in this context, is not only a linear function of the total liquid at lender's disposal. But also a function of the lender's personal appraisal of defaulting probability and other personal attributes of a borrower. Nonetheless, this function does not represent credit-supply function in the Walrasian point of view, where the function of credit-supply denotes the agenda of what the lender is willing and able to lend at a prevailing price of interest rate; based on the assumption of price-taking behaviour of a lender. This classical credit-supply function is not defined in this context where a lender himself chooses the interest rate. Likewise, the optimum interest rate charged by a creditor is also a function of the borrowers' credit limit, the lenders' personal appraisal of non-repayment probability and the attributes of the borrowers (see Avery, 1981; Stiglitz & Weiss, 1981).

In contrast, the classical term and meaning of credit-demand function represent the borrowers' optimum choice of credit size. That is, the demand schedule of what the debtors are willing to borrow at different price of interest rate. Owing to the fact that the optimal lending capacity of the lenders is a function of borrowers' credit limit and their attributes in addition to being a function of lenders' subjective judgment on the

borrowers' and the interest rate is a meagre replication of the borrowing constraints. Though because of lack of contractual enforcement and adverse selection problems, the credit demand will not require to be a negative-sloping function of interest rate (Stiglitz & Weiss, 1981). Therefore, lenders would not use interest rate mechanism to screen the borrowers or ration their credit demand. The details of this theory and the concept of credit limit has been extensively discussed in the works of Diagne (1999) and Diagne *et al.* (2000).

3.7 Empirical Review on Credit Rationing

The presence of imperfect markets and asymmetries of information raise the possibility of defaulting by the borrowers. Consequently, lending agencies do not give out loan to every willing borrower, at the prevailing interest rate. Thus, the interest rate which is the price for a loan fails to clear the market, which will lead to market equilibrium with credit rationing (Stiglitz & Weiss, 1981). Several studies have reveal that households are rationed in the credit market, due to its owned attributes and institutional factors (Godquin & Sharma, 2005; Kofarmata, Applanaidu, & Hassan, 2016; Zeller, 1994).

At the institutional level, the banks may experience high-information costs to appraise the creditworthiness of the farmers, due to the meagre credit amounts and sparse location of the small-scale borrowers. This necessitate lenders to embark on strict measures such as collateral requirements that can serve as a screening mechanism and reduce the risk of default; hence, this process will constrained poor household from credit participation

(Akpan, Patrick, Udoka, Offiong, & Okon, 2013; Bakhshoodeh & Karami, 2008; Duy *et al.*, 2012).

3.7.1 Farmers Attributes

At the household level, the total income, accumulated wealth, residential location, business enterprises and other attributes were found to be important determinants of credit constraints (Barham *et al.*, 1996; Foltz, 2004; Nuryartono *et al.*, 2005). In an empirical survey in Nigeria and China, Oyedele, Akintola, Rahji and Omonona (2009) and Yu (2009) found that old farmers are more likely to be credit constraints than younger ones. This is in line with the intuitions of Omonona *et al.,* (2010) that younger farmers are more amenable to new technologies and aggressive to income generating activities, and, therefore, more likely to save or invest. Hence, they have fewer chances of being credit constraints. However, this contradict the findings of Okurut *et al.,* (2005) and Teppa *et al.* (2013) in Uganda and 15 Euro area countries that credit constraints decreases with being old. Likewise, being female-headed household increases constraints in the formal sector in Poland (Diagne, 1999; Petrick, 2002); and decreases in the informal sector in Malawi (Diagne & Zeller, 2001). Similarly, married individuals were found to be more likely to face credit exclusion than non-married ones (Omonona *et al.*, 2008) in Nigeria. Though it is yet to be conclusive, as some studies reveal that lending agencies might view married individuals as stable and more reliable; hence, they are less likely to be credit constraints in same Nigeria and Rwanda (Nwosu *et al.*, 2014; Papias & Ganesan, 2010).

Besides, Nuryartono *et al.* (2005) hypothesized that having more family members increases the risk bearing ability of the households, which implies that an increase in one family members will increase more risk to households, and, therefore, more likely to be

credit constraints. These findings is supported by Oyedele *et al.* (2009), Omonona *et al.* (2010) in Nigeria and Kuri and Laha (2011) in India, but contradict the findings of Doan *et al.* (2010) in Vietnam and Dong, Lu, and Featherstone (2012) in China that the probability of being credit rationed decreases with an increase in family size. In this regard, lending agencies might view households with higher male members as a reliable source of cheap labour that need to be engage in farming activities, and therefore more likely to release loans to them.

Moreover, human capital development indicators such as education was found to reduce credit rationing (Akram *et al.*, 2012; Briggeman, Towe, & Morehart, 2009; Godquin & Sharma, 2005; Nuryartono *et al.*, 2005; Omonona *et al.*, 2008, 2010; Papias & Ganesan, 2010). This finding is similar to those from Kuri and Laha (2011) and more recently by Akudugu (2013) and Teppa *et al.*, (2013) that households with more formal education are more amenable to risk taken than non-educated ones, and their chances to utilize and manage farm credit are very high. Hence, they are less likely to be credit rationed. However, the influence of education on credit constraints varies. For example, Pederson, Chung and Nel (2012) argue that credit demand for farmers with more qualification is higher than the available supply in U.S. Hence, it is possible for them to become quantity rationed.

Likewise, managerial skill which is proxy by years in the farming business were found to be negatively related with credit constraints (Omonona *et al.*, 2008). However, Reyes and Lensink (2011) in Chile found that those with farming experience are more likely to be

unconstrained non-borrower. It appears that an increase in farming years, other things being equal, will increase the probability of being risk and transaction cost rationed farmer.

In addition, households with main business in non-farming activities are found to be credit constraints in china (Tang *et al.*, 2010). This conclusion is consistent with those of Zeller (1994) in Madagascar, Diagne and Zeller (2001) in Malawi and Papias and Ganesan (2010) in rural Rwanda, but contrast the finding of Kochar (1997a) in India and Omonona, Akinterinwa and Awoyinka (2008) in Nigeria. It follows that those who diversified to other non-farming business were found to have more access to financial services (Kuri & Laha, 2011a). Because these diversified farmers have more access to business that can guarantee their repayment ability.

3.7.2 Farmers' Wealth and Farms Attributes

Total cultivated area or land holdings are found to be negatively correlated with being credit constraints (Akram *et al.*, 2012; Muayila & Tollens, 2012). Omonona *et al.* (2008) observe that majority of the constrained farmers are more attributed with small holdings, and lenders favour large holdings farmers because they have higher repayment capacity. This is in line with finding of Turvey *et al.* (2010) which confirmed the evidence of lending bias in favour of large farms on one side. On the other side, Oyedele *et al.* (2009) and Tang *et al.* (2010) found that an increase in land endowment will increase the probability of being credit constraints. It may also be possible that households with more holdings are regarded as economically sound, as such they will not be allowed to partake

in the credit market. Because most of the credit programs were skewed in favour of the poor (Fatima, 2009). Similarly, farm growth are found to be negatively related with credit constraints in U.S. (Hartarska, 2012). It follows that farm growth has reliably been used as a good criterion to screen borrowers in order to minimize the risk of defaulting by the lenders.

Moreover, wealth and total income are hypothesized to affect liquidity constraints of the households (Winter-Nelson & Temu, 2005). In view of this, several studies reveal that wealthier individuals among farmers are less likely to be credit constraints (Barham *et al.*, 1996; Kuri & Laha, 2011a; Oyedele *et al.*, 2009; Pederson *et al.*, 2012; Shoji, Aoyagi, Kasahara, Sawada, & Ueyama, 2012; Teppa *et al.*, 2013). These findings is supported by Okurut *et al.* (2005), Fletschner (2009) and Khantachavana *et al.*, (2012) in Uganda, Paraguay, China and Mexico that the probability of being credit rationed increases with being poor. Because from the lenders' perception, the repayment probability of a poor household is very low. While in an empirical survey in Pakistan, Akram, Hussain, Sial and Hussain (2008) and Fatima (2009) found that households with more income are less likely to demand credit, and therefore, more likely to become unconstrained non-borrowers. This class of households seem to achieve economic independence, which decreases their preference to borrow credit.

In addition, household with more neighbours or family members who participate in the credit market is likely to have more credit information. Consequently, it is expected that the chances of being demand-side rationed with that particular household is likely to

reduce. Besides, according Guirkinger and Boucher (2008), neighbourhoods with institutional borrowing skills could guide individuals how to process loan applications, thus decreasing their transaction cost. In respect to this, using Peruvian data, Boucher *et al.* (2009) found that households without credit borrowing experience tend to exaggerate the notion that credit participation is only possible with collateral intervention. It follows that neighbourhood with credit participants might lead to a negative downward appraisal of contractual credit risks and hence is likely to reduce households being risk rationed.

Apart from this, studies in China and Vietnam shows that social capital proxy by social status or village cadre has been consistently found to affect the activities in the credit market (Li, Li, Huang, & Zhu, 2013; Nguyen & Luu, 2013). Li *et al.* argue that those with state cadre among the individuals are obviously more advantageous than otherwise. Consequently, formal lenders are eager to offer credit to this category of borrowers. In view of this, Rui and Xi (2010) disclose that relationship with lenders is likely to increase the supply of loan to the borrowers.

Similarly, Zhang (2008) observes that access to institutional credit by private firms in China could be determined by their local and political connections. As a result, government credit intervention in the form of subsidies has been now used to increase political influence from a specific group. In this regard, Jia, Heidhues, and Zeller (2010) found that individuals who aligned themselves with local elites in rural communities are less inclined to be credit constraints borrowers in China. This indicates that local elites have more chances to participate in the credit market and likely to be given higher

amount of loans. However, the story is different in Vietnam were credit access is independents of whether the firms' owner belong to the ruling political party or otherwise (Nguyen & Luu, 2013).

3.7.3 Institutional Attributes

It was hypothesized that both interest rate and non-interest price such as transactions cost, lack of insurance facilities and bureaucratic bottleneck seems to ration households in the credit market (Boucher *et al.*, 2008). In an empirical survey in Peru, Honduras, and Nicaragua, the authors found that lack of insurance would increase the chances of farmers to become risk-rationed. This category of farmers is rationed in the credit market due to fear of losing their collateral, because of the lack of insurance facilities and the presence of moral hazard that might not permit them to insure their possession. Instead, they prefer to use their savings that promise them higher utility with a lower profit. In addition, Akram *et al.* (2008); Akram *et al.* (2012) and Ugwumba, and Omojola (2013) found that the probability of being credit rationed increases with an increase in interest rate. Similarly, poor household are found to be affected by non-price rationing in the credit market (Barham *et al.*, 1996). Evidence from the empirical works in Ghana, Tunisia, China and Madagascar show that the bureaucratic bottleneck, tedious paperwork and high-transaction cost increase the chances of being credit constraints by farmers (Acquah & Addo, 2012; Akudugu, 2012; Foltz, 2004; Tang *et al.*, 2010; Zeller, 1994).

Moreover, researchers persistently found that the more the distance from the lending agencies the higher the credit rationing (Akudugu, 2013; Godquin & Sharma, 2005; Nuryartono *et al.*, 2005; Papias & Ganesan, 2010). Nuryartono *et al.* and Akudugu assert

that farmers who are very far away from the credit suppliers are more likely to be excluded in the credit market. This explain by the fact that due to the presence of banks in the urban areas, high transaction cost such as distance would rise the cost of communication, follow-ups and cost of travelling for borrowers, which might cause monitoring difficulties by the lenders. Thus, an increase in the distance to a lender is likely to increase the chances of borrowing constraints. Similarly, Bakhshoodeh and Karami (2008) report that farmers who are leaving very far away from the banks are more likely to face high levels of transaction costs, making them unlikely to demand credit in rural Iran. It appears that the chances of credit participation rises with living closer to the lenders. Put differently, distance to the lending agencies is one of the significant determinants of having poor credit access.

Apart from this, it has been established that constraints to credit is negatively related to wealth of the borrowers (Foltz, 2004; Ibrahim & Bauer, 2013). Likewise, the higher the liquidity ratio at the hand of the lenders the more the supply of loanable fund (Dohcheva, 2009). In a survey research of informal lenders in Southern Nigeria, Nwaru (2011) found that as the liquidity of the lenders increases the supply of credit is also likely to increase. This is consistence with finding of Pham and Lensink (2008) in Vietnam that credit disbursement by the informal lenders to borrowers is positively related to the liquidity ratio. In this regard, Karim, Harif, and Adziz (2006) report that lending activity is one of the foremost activities that reflect the role of commercial banks as the principal funds supplier to the private sector in the Malaysian economy. In fact, commercial banks have been regarded as a welfare enhancing mechanism in the economy through the improved

liquidity (Bhattacharya, Boot, & Thakor, 1998). Besides, Saidenberg and Strahan (1999) argue that banks have continually perform an important role through the liquidity supply to several organizations, especially during economic crises. By means of stocking huge quantities of cash, and channel it to clients with liquidity shortages. This liquidity holding in the name of deposits allows for the banks to supply credit to perspectives borrowers at minimal cost.

Furthermore, Barham *et al.* (1996) argue that credit groups appear to encourage formal lenders to supply more credit to the poor households, by helping lenders to overcome the obstacles associated with information asymmetry and decrease the monitoring cost for small borrowers. In support of this, many studies in Malawi, Tanzania and China have found that group membership seems to lessen credit constraints status for many considerable households that were rationed before (Diagne, 1999; Winter-Nelson & Temu, 2005; Yu, 2009). This suggests that group formation lowers transaction costs and overwhelms informational barriers that hitherto caused lenders to rationed credit. Similarly, Omonona *et al.* (2008) and Muayila and Tollens (2012) found that an increase in access to extension services is likely to lower the rate of rationing in the credit market. It appears that access to extension services by farmers is likely to reduce the informational barriers associated with borrowing. Additionally, it was hypothesized that having social network tends to decrease the odds of being credit rationed (Lawal, Omonona, Ajani, & Oni, 2009; Muayila & Tollens, 2012; Omonona *et al.*, 2008). It follows that social relationships, improve households' access to credit and financial inclusion, while it increases financial exclusion for those individuals with no connections.

For this reason, there is no surprise if the local elites among the farmers often go away with bigger loans (Dinh, Dufhues, & Buchenrieder, 2012).

Apart from this, having collateral is expected to have influence on credit rationing (Fhima & Bouabidi, 2011). In view of this, several studies have demonstrated that constraints to credit decreases with an increase in collateral possession (Foltz, 2004; Godquin & Sharma, 2005; Hartarska, 2012; Lawal *et al.*, 2009; Nuryartono *et al.*, 2005). This indicates that availability of collateral can signal a borrowers' credit worthiness and decreases moral hazard (Boucher *et al.*, 2009). Therefore, lenders are willing to release credit if the households could able to pledge with collateral to guarantee repayment.

Similarly, availability and accessibility of loan will stimulates technology adoption, lessen credit constraints, and improve farming production (Acquah & Addo, 2012). In this view, Godquin and Sharma (2005) in Philipines, Oyedele *et al.* (2009) in Nigeria and Akram *et al.* (2012) in Pakistan found that additional source of loan or access to another credit would reduce credit constraints to farmers. Likewise, previous participation in the credit program, creditworthiness of the households, having an account with bank and access to remittance facility are consistently found to reduce barriers associated with credit (Akudugu, 2013; Dong *et al.*, 2012; Lawal *et al.*, 2009; Muayila & Tollens, 2012; Omonona *et al.*, 2008; Papias & Ganesan, 2010).

3.8 Credit Constraints Detection

This section deals with the methodological issues relating to credit constraints detection. Several methods have been identified in the literature (Diagne *et al.*, 2000; Petrick, 2005): such as (i) direct measurement using transaction costs of credit; (ii) credit constraint detection by directly asking respondents, that is, Direct Elicitation Method (DEM); (iii) detection of credit constraints using credit limit; (iv) detection of credit constraints through spill-over effects. But the most important one based on this study is DEM to identify the constraint status. Researchers either implicit or explicit have favoured DEM in credit constraints detection more than any other methods (Diagne *et al.*, 2000; Diagne, 1999). This method of credit constraints detection collects information directly from individuals on their experiences in the credit market to assess their credit constraint status. In reality, individuals are categorised as credit constraints or otherwise, based on their responses to numerous questions (qualitative) concerning their loan applications during the period of study. Then, this classification is used to investigates the determinants of the probability of an individual being credit rationed in reduced regression equations. Jappelli (1990) was the first to use this econometric modelling in U.S. and subsequently by Zeller (1994) in Madagascar, and also extensively been used by Mushinski (1999) in Guatemala. The underlying theoretical explanation for the use of the direct method will be found in the extended version of the life-cycle and permanent-income hypothesis that explicitly allows to model the probability of being credit constraint (Diagne & Zeller, 2001).

Therefore, based on this methodological review, there is still need for more econometric household model within the agricultural credit framework. The usual grouping of

households into constrained and unconstrained in reduced econometric equations will not provide a satisfactory result (Diagne *et al.*, 2000). Based on that, this research modify and extend the models developed by Jappelli (1990) and Baydas *et al.* (1994) to model the chances of being credit rationed within the context of agricultural credit market in Nigeria as one of the contributions of this research.

3.9 Conclusions

Based on the reviewed literature, it is evident that considerable efforts have been made by prior studies to provide explanations on credit market participation and rationing. However, there is inconclusive evidence among different researchers from different domains. Though some researchers have related this to the varying characteristics of individuals, financial agencies, socio-economic and geographical differences (Kofarmata *et al.*, 2016; Zeller, 1994). Hence, more research is needed for further clarification. In addition, there is also seeming shortage of literature on agricultural credit, especially in Western Africa; and studies on farm credit remain scant in the literature. A more general contribution of this study not only specifically to the Nigeria but to the general literature in the field, is the ability of the research to recognize the effects of some variables in relations to credit participation and credit rationing that have been bypassed in the literature. The recognition of these variables such as credit information, financial literacy, commercial and subsistence farming, traditional tools, neighbourhood credit participation, farms' profit, bookkeeping and marketing staff highlights the importance of this research in the literature. Besides, based on the available literature for now, this research is one of its kind that applies rigorous econometric tools to model the probability of credit participation and credit rationing. Similarly, partial proportional odds model has

been introduced in the research. The details of this model has been discussed in Chapter Four, Section 4.7 for further elaborations. Based on the foregoing, this study is primarily motivated by certain gaps that have been noticed in the literature.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter centred on the method in order to answer the research questions and achieve the objectives of the study. Discrete choice models are employed in this study, which are considered appropriate to examines relationship among variables. In addition, this chapter demonstrates on the theories that are directly related to study upon which all the models were grounded. It also contains research framework, specification of models and tools of data analysis as well.

4.2 Theoretical Framework

The research framework is developed in this section. Apart from model specifications presented in section 4.4, this section also contains some important theories that justify the reasons of credit participation and rationing in the agricultural market within the economic framework.

4.2.1 Theory of Demand for Loan

It has been observed from the previous studies that credit demand function could be deduced from the theory of consumer behaviour (Mpuga, 2010). The derivation of demand theory from this theory allows different variables in this research to model as a function of credit participation. Therefore, this research will embark the used of this theory based on the empirical data as one of the theories to investigate credit participation

and its constraints. Bade and Parkin (2002) observe that many scholars had worked on the traditional theory of demand; yet, the first thorough and complete statement of the theory was set out by Alfred Marshall in 1890 on his monumental work, *Principles of Economics*.

Mankiw (2007) documents that the modern version of this theory recognizes a wider range of determinants of demand, which includes credit availability, population, preferences, income, price of related good, and more can play a significant role to affect the demand of a particular commodity or service. Therefore, the driving assumption for this study is that, farmers' decision to participate in the credit market (or otherwise), is subject to their demographic and other socio-economic variables.

Thus, in order to model the probability of participation in agricultural credit market based on this theory, the starting point is to ask a farmer if he obtained agricultural credit in the 2014/2015 farming season. Then the amount of credit obtained is defined as the total credit demanded by a farmer. Therefore, his total utility function would be represented in Equation [4.1] following (Mpuga, 2004, 2010):

[4.1] $$U_i = U(X_1, X_2, X_3, ..., X_n)$$

where U_i is the farmer's total utility function, which is supposed to be a function of profit or commodities obtained from farming activities and $X_1, X_2, X_3, ..., X_n$ is the farmer's demand function for commodities. If $P_1, P_2, P_3, ..., P_n$ represents the prices of different

goods and services; then the farmer's total spending most be equal to his income which is subject to his budget constraints and it is represented in Equation [4.2]:

[4.2] $$Y_i = (P_1X_1 + P_2X_2 + P_3X_3 + \ldots.. + P_nX_n)$$

where Y_i is the total reservation income of a farmer. In this case, a farmer would not have the opportunity to spend beyond his budget line, however, with the presence of agricultural credit market, a farmer could spend beyond his budget constraint. Thus, credit availability enhances farmer's ability to consume more commodities and engage many factors into agricultural production (investment opportunities inclusive). So if PCM_i represents demand for loan by farmers, and P represent both price and non-credit price of loan, then $PCM_i = P_i(r^0,\ r^1) = (H_i, I_i, R_i)$ would represent participation in the credit market as a function of farmer's and institutional characteristics, as presented in Equation [4.3]:

[4.3] $$PCM_i = f(H, I, R)$$

where PCM_i is participation in agricultural credit market, H represents farmers' attributes such as educational qualification and occupational choice. I represents farm and institutional characteristics such as traditional farming tools, availability of credit information and other requirement. R represents regional locations of a farmer. Mpuga (2010) uses this theory to model credit participation and choice of credit market as a function of age, education, gender, marital status, household size, value of household assets, dummies for dwelling characteristics and location. Following Mpuga's model with some medication, the present study has added farming system, traditional farming tools, information, participation of neighbour or family, profit and possession of radio and

television in both credit participation and credit choice models. Similarly, bookkeeping, possession of vehicle, financial literacy, presence of lenders and subsistence farming have been added in the model of the amount of credit received by farmers, and the explicit form of the extended models are provided in Section 4.4.

4.2.2 Life Cycle Hypothesis

Keynes (1936) were the first to identify various savings motives. Subsequently, down-payment motive (Browning & Lusardi, 1996); precautionary saving; housing motive and a bequest motive (Carroll, 1997; Gourinchas & Parker, 2002; Hayashi, Ito, & Slemrod, 1988; Hurd, 1987; Skinner, 1988); were now added into the theory. The traditional version of the model places the old-age saving motives as the principal savings motive, that people save money while working in their early life for the purpose of supplementing decline in income at retirement age (Modigliani & Brumberg, 1954). However, Deaton (1991) predicts that the presence of credit constraints is another reason for savings. In the absence of capital market, many households may not smooth consumption and bound to consume lower than optimal level. However, apart from the public safety nets, households may depend on the informal credit sources such as friends and family to counterbalance shocks (Boersch-Supan & Lusardi, 2003).

Therefore, individual can reallocate his future resource to present consumption through credit (Glewwe & Hall, 1998). This process permits credit access to replace consumption insurance (Besley, 1995b; Eswaran & Kotwal, 1989). According to Sawada (2006), credit use for consumption or production purpose is the logic behind the life cycle/permanent income hypothesis notion of consumption smoothing. Though these theories were based

on the assumption that there is always perfect capital market to borrow, despite the indications that many poor individuals in less developed economies lack access to credit due to the cost of information and insufficient collateral (Carter, 1988; Stiglitz & Weiss, 1981). For this reason, Karlan and Morduch (2009) argue that life cycle theory requires some violations for it to suit the multi-dimensional environment which are very common in developing economies. Thus, the violations of this theory allow in this research to model farmer's participation in the credit market and rationing.

Following Zeldes (1989) and Sawada (2006), non-credit constrained and credit constrained are represented in Equation [4.4] and Equation [4.5], respectively.

[4.4] $$C_i \leq A_i + y_i$$

[4.5] $$C_i = A_i + y_i$$

In the case where an individual is being hit by adverse income shocks, y_i, (the flow of income) that has been found in many developing economies (Alderman, 1996), may continually be very less and, so, the individual's asset A_i, may become null. Therefore, Equation [4.5] is satisfied if the constraint is binding. In this case consumption level will drastically fall.

Constraints Model

Therefore, by letting optimal consumption (no constraints) to be represented by $C^*, C<C^*$ if the loan constraints are binding; and $C=C^*$ in the absence of binding constraints. Thus, *G* will represent the gap between C^* and C, as $G=C^*-C$.

Following Hayashi (1985), Jappelli (1990) and Sawada (2006), the model assume that the conditional expected desired consumption (that is optimal consumption), C^*, could be approximated as a function of observables present variables, such as age, wealth and other demographic qualities. In addition, the maximum borrowing amount is also hypothesized to be a function of these variables. Hence, the reduced form regression equation will become:

[4.6] $$G_i = A_i \beta_i + \varepsilon_i$$

where A_i represents wealth in the form of assets and income in the Equation [4.6], and it is also the determinants of optimal consumption, production and the amount of loan, and ε_i is an error term that will take care the measurement error and unobserved elements in the model, and G_i equal to:

[4.7] $$G_i = \begin{cases} 1, & if \quad C^* > C \\ 0, & if \quad C^* < C \end{cases}$$

However, the conventional pragmatic approach to estimate this model, is to splits the respondents into two groups: that is, between those expected to be credit constrained and those not likely to be constrained as a function of their observable characteristics (Jappelli, 1990; Morduch, 1990; Zeldes, 1989). Zeldes divide the respondents on the basis of the ratio of wealth-to-income. According to him, availability of credit might depend on the collateral possession and perfect information. Though according Carter (1988), because of imperfect information between lenders and borrowers, lenders might select borrowers based on their land holdings. Therefore, one reasonable way is to divide

groups according to cultivated land: large-scale, medium-scale, small-scale, and none (Morduch, 1990). However, this approach has problem, because it is not likely that only one variable, for example, ratio of income-to-wealth will serve sufficiently to model consumers' and producers' borrowing ability (Garcia, Lusardi, & Ng, 1997). Lenders screen borrowers through multiple factors. An alternative approach to overwhelm this problem is to construct a categorical response model with endogenous credit constraint, through defining an indicator to represent credit constraint variable that will assume a value of 1 for non-credit constrained borrowers and 0 for constrained borrowers. Such binary model was first used by Jappelli (1990) in the U.S., and the reduced form of the regression equation is represented by Equation [4.8]:

[4.8] $$Y_i^* = \beta_i X_i + \mu_i$$

Note that Y_i^* is the dichotomous variable for credit constraints, that takes a value of 1 in the presence of credit and 0 otherwise, β_i is the slope coefficients. X_i represents the attributes of farmers, financial institution and regional qualities such as wealth, farming expertise and demographic qualities and μ_i is the error term assume to be logistically or normally distributed. Subsequently, this model was expanded by Baydas *et al.* (1994) to multinomial model with endogenous credit constraints as a function of age, education, household heads, farming experience, checking accounts, ownership enterprise, new business, household's dummies for dwelling characteristics and regions. Following this model with some modification based on the observable attributes in the study area, the present study has included profit and subsistence farming as new variables to model

credit rationing among farmers. The extended version of the model is presented in Section 4.4.

4.2.3 Microeconomic Household Model

A theoretical framework for credit participation and credit access based on micro-economic household's model is developed in this section. A household will participate in the credit market if the utility of borrowing is higher than his reservation income. Reservation income is defined as the highest utility, or the best alternative to a formal borrowing. Though it is subject to lender's marginal cost and revenue of the credit contract. In this case, the extent of credit constraints will be determined by both the borrowers and lenders. Because analysing credit participation equation alone will not be able conclusively to determine whether the patterns of loan allocation represent external rationing by the supply-side or internally (self-selection) by the demand-side (Baydas *et al.*, 1994; Zeller, 1994). This decision-making process can be analysed below.

4.2.3.1 The Decision of the Borrowers

This framework is formalized and modified below following random utility models forward by Greene (1977). A farmer can decide to borrow from credit lender or resort to self-finance, and the model assumed that a farmer will choose for the alternative that yields higher returns on farming investment. A dichotomous variable, *P*, is represented as:

$P_i = \{1$ if farmer *i* decide to participate in credit market credit; and 0, otherwise$\}$

Thus, the process of decision-making can be expressed as:

[4.9] $$P_i = f\{\pi_i^0(R), \pi_i^*(B)\}$$

$$P_i = 1 if\ \pi_i^*(B) > \pi_i^0(R)$$

$$P_i = 0 if\ \pi_i^*(B) < \pi_i^0(R)$$

where $\pi_i^0(R)$ is the returns of farming investment if a farmer used his reservation resource or self-financing, and $\pi_i^*(B)$ is the profit obtained if farmer *i* participate in the agricultural credit market. The model assume that each farmer has some savings (self-financing) that he could use it as an alternative to a formal borrowing, where the first best alternative could be self-financing, and the better it is, the less probable a farmer will use a formal borrowing. Therefore, the profit that could be deduced from credit participation can be express as (Kochar, 1997; Mushinski, 1999):

[4.10] $$\pi_i^*(B) = prob(L, W, X)^* \pi_i\ (L, P, W, X) - \pi_i\ (T) + \{1 - prob\left(L, W, X\right)\}^* \pi_i^0(R)$$

where $prob(L, W, X)$ is farmer *i*'s self-estimation of the likelihood of credit participation. *L* is a set of variables representing credit terms, *W* is a set of wealth-related variables, *X* is a set of demographic variables, $\pi_i(L, P, W, X)$ is the profit if the loan is granted, *P* is a set of variables connected to the productivity while $\pi_i\ (T)$ is the reduction of profit as a result of borrowing transaction costs. So, for a farmer who choose to participate in the credit market, his profit is a weighted average of the profit of credit participation (receiving loan), and his reservation profit for the self-financing. The weights are the likelihood of credit participation or otherwise.

Credit participation might be motivated by production or consumption purposes. The latter could include children's school fees, medical bills, house-building weddings and other ceremonies. The former includes cultivation, seeds, fertilizers, labour bills, agricultural machinery, farm development and husbandry. A household with relatively low endowments or income is likely to have more utility of consumption loans, given that they are in a needs of consumption-smoothing (Ghatak, Morelli, & Sjosrom, 2002). While in terms of production, one may expect that a household with higher agricultural output would enjoy a greater utility from credit because of a higher return on investment (Feder, 1985).

The probability of receiving a loan is determined by the terms of the loan *(L)*, and personal commitments such as collateral and other guarantees, the level of wealth *(W)*, and household characteristics *(X)*. *Ceteris paribus*, a farmer, will consider himself more likely to be offered formal credit if the loan is small and for the purpose of production (Feder, 1985). In addition, poorer farmers will regard themselves to be less advantageous than richer farmers when applying for loans with the same terms (Getter, 2002). Transaction costs are very crucial factor that discourages a farmer from applying for a loan (Beck, Demirgüç-Kunt, Laeven, & Maksimovic, 2006). In a formal credit market, these types of costs includes charges beyond interest payments on the loan collected by the banks (application and processing charges), bribes, compulsory buying of other product by the banks, proximity to lenders or travelling expenses and the time cost of the borrowers (Petrick & Latruffe, 2003).

In summary, returns on farming investment as a result of using reservation capital differs among farmers. The profit that a farmer will enjoy from credit participation is affected by the uncertainty of getting the credit and the cost of obtaining the credit. Thus, a farmer will choose to participate in the agricultural credit market if the total profit of the farm loan is higher than the profit of using his reservation capital.

4.2.3.2 The Decision of the Lenders

On the other hand, lenders might decide to grant a loan to a farmer if the marginal revenue of the credit is higher than the marginal cost $(MR^F > MC^F)$. For simplicity, the theoretical model assumes that a loan applicant either receives his requested amount or totally rationed from participation in the credit market. Like borrower's decision-making process, a dummy variable, *S* defined as: $S_i = \{1$, if lender *i* grant loan to the borrower *j*; and 0, otherwise$\}$

In this case, the framework of marginal revenue and cost that applies in this analysis is grounded in the work of Kochar (1997), and also formalized following Greene's (1997) cost-benefit calculations.

[4.11] $$S_i = f\{MR, MC(L,W,C,P,X)\}$$

$$S_i = 1, if\ MR > MC(L,W,C,P,X)$$

$$S_i = 0, if\ MR < MC(L,W,C,P,X)$$

where MR equal to marginal revenue of the lender, $MC(L,W,C,P,X)$ is the marginal cost of offering credit, *C* is a set of variables related to the history of the farmer, and *L*, *W*, *P* and *X* have been defined in paragraph four, Section 4.2.3.1. For the formal lender,

the marginal revenue of the credit is the exogenously fixed interest rate and other cost associated with contract. Though this interest rate which is the price for a loan is set by the monetary authority and is not allowed to differ with the size of a credit (Kochar, 1997).

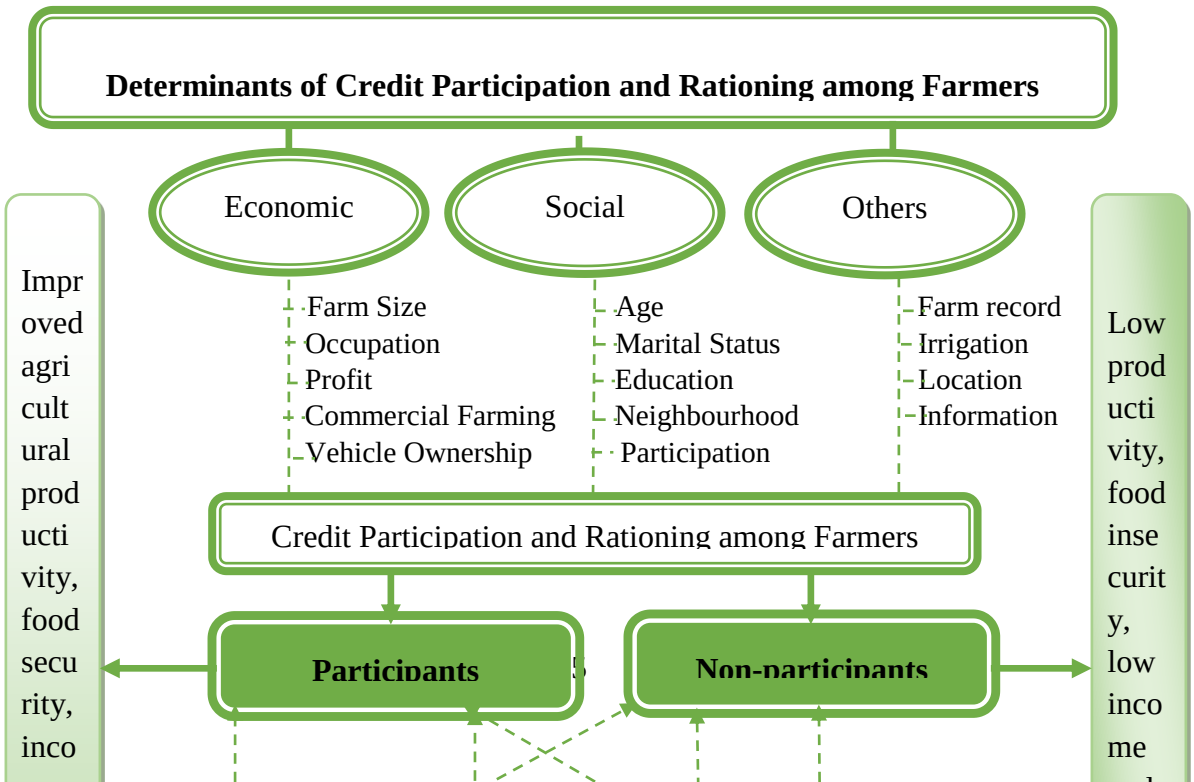
Numerous types of costs are involved in transaction costs of lending which includes administrative costs (screening and monitoring cost of loan applicants, processing costs, delivering and administering loans) and risk of default (Atieno, 2001). Bigger loans and long amortization will decrease administrative costs because of economies of scale. Thus, the terms of the contract *(L)* will affect the marginal cost of credit. Defaulting risk is dependent on the farmer's credit history *(C)* and solvency which is influenced indirectly by borrower's wealth *(W)* and the project for which the purpose of the loan is requested (Briggeman *et al.*, 2009; Omonona *et al.*, 2008). Duy *et al.* (2012) found that formal lenders grant a higher proportion of credit to richer individuals than poorer ones. This indicates a wealth bias in the literature of credit rationing by formal lenders. With regards to production loans, productivity of agriculture *(P)* will play a significant role in determining the level of loan return, and consequently, the repayment capacity of a farmer.

In summary, the marginal cost of credit is affected by administrative costs and the default risk, such that lenders may choose to offer loan to borrowers if the benefit of lending is higher than the marginal cost of the credit contract. While for the government and interest

groups, lending is possible if the benefit outweighs the cost. Based on this argument, the models are specified in Section 4.4, while the conceptual framework is presented below.

4.3 Conceptual Framework

A farmer's credit participation model or rationing can best be understood by analysing its credit choice decision in a constrained utility optimization framework. Where credit participation is a subject to a set of economic and non-economic factors. These include: financial literacy; information; ownership of vehicle; presence of lenders; farm size; irrigation; farming system; traditional farming tools; profit; occupation; farm record; age; education; experience and location. The conceptual framework of credit participation and rationing model is presented in Figure 4.1. This framework will help to understand and analyse how various factors influence credit participation. It is expected that variables such as financial literacy, information and commercial farming increases credit participation and decreases credit rationing. Thus, improve productivity and general welfare.



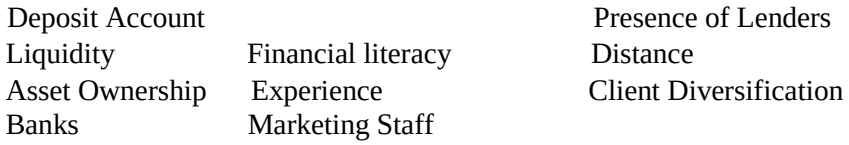


Figure 4.1
Conceptual Framework

4.4 Model Specifications

Participation in credit market starts with a theory of demand where a farmer wants to maximise his profit or utility by participating in the credit market. Therefore, the decision to participate in the credit market is a rational choice based on demand theory. However, Stiglitz and Weiss (1981) shows that the theory of demand alone would not be sufficient to explain the behaviour of credit participation, in which some borrowers are rationed under information asymmetric. They further explain that lenders may not rely on interest rate alone or market prices to charge the borrowers based on the size of the credit. This is because lenders have inadequate information on the different default risk of the borrowers, and owing to the fact that formal lenders cannot raise the price beyond the equilibrium in the market, so they tend to ration some borrowers. Put differently, the flow of loan does not follow the conventional demand-supply theory, but rather follows rationing process where a farmer will apply for a loan, and then the lenders will

determine how much loan to be allocated to the applicant based on the borrower's creditworthiness.

Several empirical studies either implicitly or explicitly use McFadden's (1973) theory of discrete choice to discuss credit participation. McFadden's theory creates a relationship between utility and the individual's choice, where an individual maximises his utility corresponding to a set of alternative. This theoretical groundwork has been applied in numerous fields which include transportation, housing and consumer choices (McFadden & Train, 2000; McFadden, 1978). It can also be expanded to model the choice behaviour of farmers in the credit market. This can be done under the assumption that an individual obtain credit to maximise his profit or utility, the demand for loan is then derived from the qualities of choice that are specific to the individual decision and his socio-economic characteristics (Jappelli, 1990). Alongside, it also depends on the lenders' assessment on the viability of the loan contract and the borrowers' creditworthiness (Boucher *et al.*, 2009; Stiglitz & Weiss, 1981).

Therefore, as specified in Sub-section 4.2.1 through Sub-section 4.2.3, both credit participation decision by farmers and rationing process by lenders are the functions of farmers' attributes, farm qualities and attributes of the financial institutions. Then the empirical models are presented from Equation [4.12] through Equation [4.16].

[4.12] $$PCM_i = \beta_{0i} + \beta_1 COM_i + \beta_2 TOL_i + \beta_3 INF_i + \beta_4 ACC_i + \beta_5 PNE_i + \beta_6 TTL_i + \beta_7 TRD_i + \beta_8 RTV_i + \beta_9 REG_i + \mu i$$

[4.13] $$CAF_i = \alpha_{0i} + \alpha_1 AGE_i + \alpha_2 MAS_i + \alpha_3 QLF_i + \alpha_4 OCC_i + \alpha_5 FSZ_i + \alpha_6 EXP_i + \alpha_7 SUB_i + \alpha_8 PRF_i + \alpha_9 GRF + \alpha_{10} REG_i + \varepsilon_i$$

[4.14] $$ACR_i = \alpha_{0i} + \alpha_1 AGE_i + \alpha_2 MAS_i + \alpha_3 QLF_i + \alpha_4 OCC_i + \alpha_5 FSZ_i + \alpha_6 EXP_i + \alpha_7 SUB_i + \alpha_8 PRF_i + \alpha_9 GRF + \alpha_{10} REG_i + \varepsilon_i$$

[4.15] $$ACD_i = \rho_{0i} + \rho_1 AGE_i + \rho_2 QLF_i + \rho_3 MOB_i + \rho_4 TNR_i + \rho_5 SUB_i + \rho_6 REC_i + \rho_7 LEN_i + \rho_8 LIT_i + \rho_9 REG_i + \mu_i$$

[4.16] $$CRS_i = \varphi_{0i} + \varphi_1 LIQ_i + \varphi_2 MKS_i + \varphi_3 PRF_i + \varphi_4 DIS_i + \varphi_5 EXP_i + \varphi_6 ACC_i + \varphi_7 TRD_i + \varepsilon_i$$

where PCM_i is participation in agricultural credit market and takes a value of 1 for those participate and 0 otherwise; and CAF_i is the choice of agricultural finance which include loans from commercial banks, agricultural banks, microfinance banks, friends and relatives and self-finance. While ACR_i represents non-applicants, satisfied-borrowers, loan-size rationed borrowers, and credit constrained-borrowers among farmers, ACD_i is the amount of credit received by farmers from small credit to higher loans. CRS_i represents the total amount of loans supplied by microfinance banks; and the rest of the variables are defined in Section 4.5 while the details of the econometrics process are provided in Section 4.7 of this chapter.

4.5 Justification of the Variables

This section deals with the definitions and measurement of the variables. The section also develops the hypothesis and explains the relationships between dependents and explanatory variables that are included in the models. The selection of the variables that are included in these models was based on the economic theories and literature.

4.5.1 Age of the Farmers

Age of the farmer (*AGE*) is measured in numbers. Available evidence from the literature reports that farmer's age has a mixed effect with regard to credit participation and rationing (Akanni, 2007; Akudugu, 2012; Masoud & Mwirigi, 2013; Ngan *et al.*, 2008). Though the farm life cycle theory postulates that younger farmers with an ambition to earn profit, are expected to be more active in term of savings or investment in order to amass wealth. Therefore, the young may tends to borrow more for investment while the older ones may be less inclined to borrow and are more likely to rely on their wealth accumulated from past income earnings, in order to smooth their consumption (Mpuga, 2010). Therefore, it is hypothesized that both access to credit and participation in the credit market are likely to increase with age, and young farmers are less probable to face credit obstacles.

H1 *AGE* is related to credit participation and rationing of farmers in the credit market.
H2 *AGE* is related to amount of credit received by farmers.

4.5.2 Marital Status of the Farmers

Marital status (*MAS*) is a social position of either being married or single, and it is used to motivate farmers to work harder with a zeal to satisfy the needs of the family. *MAS* is a

binary variable with a value of 1 for a married individual and 0 otherwise. Married individuals are more likely to be stable and viewed by the financial agencies as more reliable to allocate credit. Because they are considered more mature, this category of farmers are more likely to participate in agricultural credit market compared to the unmarried ones (Akudugu, 2012; Nwosu *et al.*, 2014; Omonona *et al.*, 2008; Papias & Ganesan, 2010). Therefore, it is hypothesized that marital status of a farmer is likely to affect his choice regarding the source of agricultural finance and credit rationing.

H3 *MAS* is related to credit participation and rationing of farmers in the credit market.

4.5.3 Educational Qualification of the Farmers

Educational qualification of the farmer (*QLF*) is a systematic instructions received in a position attained by the respondent and measured as continuous and categorical variable. Human capital variables such as education are expected to be positively related with individual's productive capacity. In addition, farmers with higher qualifications are more likely to engage in economic activities, and more likely to have access and participate in the credit market (Godquin & Sharma, 2005; Nuryartono *et al.*, 2005; Teppa *et al.*, 2013). Similarly, the importance of human capital development in agriculture has also been stressed by many scholars (Dickson & Islam, 2007; Islam, Yew, Abdullah, & Viswanathan, 2011). Therefore, it is hypothesized that this category of farmers could able to process loans quickly, and they are less likely to be intimidated by the credit officers. These considerations suggest that every additional year of schooling will increase the amount of credit demanded and decrease the extent of credit obstacles. It follows that

those with higher degrees of education among farmers are less likely to face credit rationing because they are more manageable to risks than those with lower qualification.

H4 *QLF* is related to credit participation and rationing of farmers in the credit market.

H5 *QLF* is related to amount of credit received by farmers.

4.5.4 Farm Size

Farm size (*FAS*) represents the size of landholdings and its building or equipment under one management for cropping or rearing of animal measured in hectare (Akram *et al.*, 2008; Petrick & Latruffe, 2003). Landholdings that can act as collateral have been found to affect credit market participation and the choice among different source of agricultural credit (Bakhshoodeh & Karami, 2008; Mpuga, 2010; Tang *et al.*, 2010). However, it is reported that farmers with more assets are unlikely to engage in borrowing due to their reservation capital (Barslund & Tarp, 2008). Thus, it is expected that farm size is likely to influence participation in the credit market and credit rationing.

H6 *FAS* is related to credit participation and rationing of farmers in the credit market.

4.5.5 Occupation of the Household

Occupation (*OCC*) of the household could either be primary or secondary occupation. Primary occupation is an occupation of the first importance or the fundamental to an individual in terms of either earning or time consuming. While secondary occupation is an occupation next to the primary occupation or of secondary importance to the households. This consists of full-time farmers and part-time farmers which include

labourers, civil servants and traders; hence, it is considered as categorical variable (Kumar *et al.*, 2010; Mpuga, 2010). Some of these activities might need higher amounts of resource while others demand less. Previous studies reveal that as off-farming business increases farmers' preferences to credit falls, and the sequential effect would lead to the voluntary exclusion in the credit market (Gandhimathi, 2011; Swain, 2007). Though it was found that lenders may prefer to grant loans to the farmers with high off-farming commitment, because their repayment capacity are very high (Kuri & Laha, 2011a). Therefore, it is hypothesised that major occupational interest of farmers would have an effect on the credit participation and credit rationing.

H7 *OCC* is related to credit participation and rationing of farmers in the credit market.

4.5.6 Farming Experience

Farming experience (*EXP*) is a practical acquaintance with facts or events in the farming activities, which is determined by the length of the period the respondents spent in the business, and is a proxy of managerial skills of farmers which is measured in numbers (Akanni, 2007; Nguyen & Luu, 2013; Turvey *et al.*, 2010). Because of practical experience, knowledge and longevity in farming businesses, those with farming experience acquired more skills and manoeuvres that can able to manage financial problem internally (Barry & Robison, 2001; Rand, 2007). Therefore, farmers who spent more years in farming are less likely to apply for loans even though they may not likely be part of the credit constraints.

H8 *EXP* is related to credit participation and rationing of farmers in the credit market.

4.5.7 Deposit Account

By deposit account (*ACC*), it means to have an account with a bank, and it is measured as binary variable indicating 1 for having account and 0 otherwise. Relationships with the lenders and the creditworthiness of a farmer which is a proxy by the amount of money saved or having an active bank account has been found to influence access to credit market (Badiru, 2010; Bhattacharya *et al.*, 1998; Ismael, 2013; Karlan & Goldberg, 2007; Okurut, 2000). It is therefore hypothesized that farmers with bank account are less probable to be credit constraints and more likely to obtained higher amount of credit. In addition, lending agencies will be more willing to supply loans to borrowers whom they

have relations with (Akudugu, 2012; Cole, 1998). Therefore, having a bank account will increase both the supply of funds and the credit access to the farmers.

H9 *ACC* is related to participation of farmers in the credit market.

H10 *ACC* is related to credit supply to farmers by microfinance banks.

4.5.8 Political Affiliations of the Farmers

Farmer's political affiliation (*POL*) in this research refers to whether or not a farmer is affiliated to one political group in the study area. Following the empirical studies, this variable is considered as binary indicating a value of 1 if a farmer is belong to any group and 0 otherwise. Farmer's group affiliation is hypothesized to increase his access to credit market and increase his credit limit by means of providing social collateral and guarantees (Akudugu, 2012; Kumar *et al.*, 2012; Li *et al.*, 2013; Zander, 1994). In addition, it has been observed that some political appointees are found to divert government subsidized credit in favour of their sympathizers or their political allies (Li *et al.*, 2013). But when it comes to loans regarding the political members, most loans of this nature are often regarded as a political gift from the political fathers, and hence, the repayment chances are very low. Therefore, it is expected that group affiliations and those with social title are likely to have access to farm credit.

H11 *POL* is related to credit participation and rationing of farmers in the credit market.

4.5.9 Ownership of Vehicle

Ownership of vehicle (*VEH*) in this context refers to a farmer who possess automobile (car, lorry etc.) and is measured as 1 for the owners of vehicle and 0 otherwise (Kapoor & Le Blanc, 2008). Ownership of physical assets or consumer durables such as television, mobile phone, furniture and bicycle was attributed to formal credit participants (Bendig *et al.*, 2009; Kapoor & Le Blanc, 2008). With this consideration, it is hypothesized that those who owned vehicle are likely to participate in the credit market and have fewer chances of been credit rationed. Because ownership of the durable assets such as car is an indication of better economic wellbeing and proxy of wealth endowments; hence, farmers of this kind are likely to be respected by the lenders and receive loans in a large amount.

H12 *VEH* is related to amount of credit received by farmers.

4.5.10 Ownership of Radio and Television

Possession of television and radio (*RTV*) refers to a farmer who owned these assets and measured as 1 for those with television and radio, and 0 otherwise. Previous studies found that demand for insurance, credit and savings are associated with households' possession of assets such as mobile phone, refrigerator and bicycle (Bendig *et al.*, 2009). Whereas ownership of such assets according Sarma and Pais (2008) increase individual's access to financial information, hence increase financial inclusion. Therefore, it is hypothesized that possession of these assets are likely to result of farmers being included in the credit market.

H13 *RTV* is related to credit participation of farmers in the credit market.

4.5.11 Farm Profit

Farm profit (*PRF)* in this context refers to whether a farmer has experience growth or profit in his previous farming business, and the variable is regarded as binary taken a value of 1 for those experience profit and a value of 0 otherwise. It has been found that firm growth is positively related to credit access (Beck *et al.*, 2006), which consequently increases household's welfare (Badiru, 2010). Atieno (2001) postulates that even if causality cannot be established between business growth and credit access, the significance of enterprise growth on access to credit is highly emphasized while decrease in the business growth is likely to influence financial rationing (Hartarska, 2012; Ismael, 2013). Therefore, those who experience profit in their farming business are expected to participate in the credit market based on risk-balancing hypothesis and trade-off theory, or unlikely to participate in the credit market if pecking order theory is considered. It is, therefore, hypothesized that farmers who experience business profit are likely to get higher amount of loans, and very unlikely to become credit rationed borrowers. The same goes to microfinance banks, where those among the microfinance banks that benefit from lending are expected to increase farmers' access to credit.

H14 *PRF* is related to credit participation and rationing of farmers in the credit market.

H15 *PRF* increases farmers' access to microfinance loans.

4.5.12 Farming System

Farming system (*COM* and *SUB*) in this context refers to a farmer either being engaged in commercial farming or subsistence farming, as such the variable is considered as

categorical variable. Petrick (2004a) asserts that households with large lands are more likely to receive higher loans. Following Bamiduro and Gbadeyan (2011), it is hypothesized that small-scale farmers are less likely to demand higher amount of credit compared to large scale farmers. Because most of the small-scale holders employ traditional farms' implements for agricultural production that might likely discourage large-scale farming, leading to low output. Thus, the chances of commercial farmers to participate in agricultural credit market is very high, due to their high demand of modern farm implement, inputs and labour. In fact, the cost of buying fertilizer; hire more labour and purchase of machineries are likely to necessitate commercial farmers to demand more loans than subsistence farmers. Consequently, this type of farmers are less likely to be credit rationed borrowers. Therefore, the influence of both farm size and to some extent cash crops will be reflected in this new variable. Whereas subsistence farmers are less likely to be favoured in the credit market. Because survival farming specifically productions of food crops is the ultimate goal for subsistence farmers making them less likely to be attractive by the lending agencies. Same goes to farm implements where it is expected to affect the activities in the credit market. It is interesting to note that commercial farming is a good variable in this study that can explain credit participation due to commercial farming orientation associated by framers in the study. This is reflected by the production of both cash crops and food crops associated with farmers in the study area as highlighted in Chapter One, Section 1.7.

H16 *COM* and *SUB* are related to credit participation and rationing of farmers.

H17 *SUB* is related to amount of credit received by farmers.

4.5.13 Farm Record

Farm record (*REC*) refers to the farmers who have a record of all the farming activities within a particular season. Following the empirical studies, the variable is considered as binary with a value of 1 for those with farm record and 0 for those without farm record (Petrick & Latruffe, 2003). The fact that proper accounting record is a sign of managerial expertise, commercial orientation and firms' creditworthiness make it possible for such kind of firms to demand external borrowing (Nguyen & Luu, 2013; Petrick, 2004b). Ismael (2013) argues that firms with no bookkeeping record are very likely to face difficulties in meeting the lending criteria, thus making their credit participation unlikely. It is therefore, expected that farms with accounting record are not only more likely to participate in the credit market but also have higher chances of getting higher amount of credit.

H18 *REC* is related to amount of credit received by farmers.

4.5.14 Presence of Lenders

Just like any other product, credit participation and amount borrowed are likely to be influence by the presence of lenders (*LEN*). The variable is included to represent access and availability of credit in the model. Conditional with other factors, availability of lenders may stir up credit market participation (Mpuga, 2010). Specifically, with reference to supply leading approach and famous Say's law of market – the presence of lenders is hypothesized to attract credit market participation and the amount borrowed by the farmers.

H19 *LEN* is related to amount of credit received by farmers.

4.5.15 Number of Marketing Staff

Number of marketing staff (*MKS*) is the total number of marketing staff of the particular microfinance bank in the study area and is a proxy for bank branches measured in numbers. Following the assertion that lack of bank branches in the rural areas is positively related to high transaction cost, causing individuals to be discourage from credit participation (Bakhshoodeh & Karami, 2008). Thus, availability of banks which is proxy by number of marketing staff is likely to reduce the cost of borrowing and the consequential effects will increase the supply of credit. Kuri and Laha (2011a, 2011b) used number of bank branches as a proxy for the availability of banking services and financial inclusion in India. Therefore, number of bank staff is expected to increase the supply of credit.

H20 *MKS* is related to credit supply to farmers by microfinance banks.

4.5.16 Distance to Lending Agencies

Distance (*DIS*) is the interval between lending agencies and farmers measured in kilometres. Previous studies found that the more the further away from lending agencies the higher the transaction costs (Akpan *et al.*, 2013; Atieno, 2001; Ejaz & Khan, 2011; Godquin & Sharma, 2005; Iqbal, 1981; Kasirye, 2007; Oboh & Kushwaha, 2009; Shoji *et al.*, 2012). Given this condition, households are expected to have limited access to farm credit. Because transaction cost increases with an increase in distance between borrowers

and lenders, making lending to become unviable from the lenders' perspectives. Accordingly, this variable might appear negatively related with credit supply, whereas, access to credit is likely to be low as individual is far away from the lenders. Therefore, similar to other studies such as Akudugu (2012) and Ho (2004), this variable is included to account for the credit availability due to the presence of formal lenders in the province.

H21 *DIS* is related to credit supply to farmers by microfinance banks.

4.5.17 Liquidity of the Lenders

Liquidity (*LIQ*) refers to the total amount of liquid asset that lenders will hold for the purpose of meeting the demand of borrowers; and is measured using monetary value. Several studies have support the hypothesis that the higher the liquidity at the hand of banks the more the supply of credit (Nwaru, 2011; Saidenberg & Strahan, 1999). Therefore, liquidity excess is hypothesized to increase the supply of credit; which will decrease the credit limit of some farmers and permit them to produce optimally.

H22 *LIQ* is related to credit supply to farmers by microfinance banks.

4.5.18 Neighbourhood or Family Credit Participation

Neighbourhood or family credit participant (*PNE*) refers to a farmer having a neighbourhood or member of his family who participate in the agricultural credit market (Diagne, 1999). The variable is measured as dummy. Following the empirical studies by Boucher *et al.* (2009) and Guirkinger and Boucher (2008), participation of neighbourhood or at least one family member is hypothesized to increase awareness and

information to farm credit, thereby increasing both access to credit and participation in the agricultural credit market by the farmers. This issue of learning from neighbour is also stressed by Conley and Udry (2010). Besides, the importance of social capital will be found in other studies (Dickson & Islam, 2007; Islam *et al.*, 2011; Islam & Yew, 2013). Therefore, neighbourhood or credit participation of a family member is likely to increase farmers to participate in the agricultural credit market.

H23 *PNE* is related to credit participation by farmers in the credit market.

4.5.19 Financial Literacy of the Farmers

Financial literacy (*LIT*) is the ability of the farmers to be well aware with the working of credit market, and the variable is included as dummy assigning 1 for those with the financial awareness and zero otherwise. Empirical studies suggests that financial literacy is associated with the choice among different financial services (Bendig *et al.*, 2009; Klapper *et al.*, 2012; Lusardi & Tufano, 2009; Lusardi, 2009; Van Rooij *et al.*, 2011). For instance, Klapper *et al.* found that financial literates are abound to be more manageable to shocks during economic crises. Whereas, consumers' choice regarding financial product are more affected by their financial knowledge, with financial literate being consistently found to benefit from the range of financial services. With these in mind, those who are finically literate among farmers are more likely to demand higher amount of credit than their counterparts.

H24 *LIT* is related to amount of credit received by farmers.

4.5.20 Irrigation System

Farms that are either located at lowland areas or have irrigational facilities (*IRR*) are characterized as 'inputs intensive' (Udry, 1994), due to its higher yields. Therefore, farms of this nature are more likely to attract owners to participate in the credit market than otherwise. Similarly, having irrigational facility could be a clear indication for a farm household's commercial orientation, and lenders may consider this type of farmer as creditworthy and possibly might release credit in large quantity to him.

H25 *IRR* is related to amount of credit received by farmers.

4.5.21 Location of the Farmers

Location of a farmer (*REG*) is a categorical variable that take care with the regional location of farmer in the form of semi-urban (*RE1*), urban (*RE2*) and rural (*RE3*) areas; or regional endowments. These regional dummies will differentiate between more densely and sparsely populated regions, and developed commercialized areas as well. It will also control and detect the impact of locational variations in prices, infrastructure, types of soil, and rainfall (Ballivian & Sickles, 1994; Bell, Srinivasan, & Udry, 1997). Therefore, household's location is hypothesized to affect the activities in the credit market (Briggeman & Akers, 2010; Datta, 2003; Datta, 2004; Kochar, 1997a; Shoji *et al.*, 2012).

Similarly, farmers who reside either in urban or semi-urban areas are found to have more chances of financial inclusion than those reside in remote areas, suggesting the presence of urban bias in terms of opportunities (Ho, 2004). Though some literatures suggest that participation in the credit market were more of rural dwellers than urban residents

(Briggeman & Akers, 2010). Likewise, credit participation is likely to be affected by regional productivity and the facilities available in the region (Kochar, 1997a). But this regional variation can be best properly accounted by categorical response variable that can allow for the farmers' response to vary across the alternatives. With this consideration, it is hypothesized that farmers who reside in Dambatta Province (urban) have more access to banking and other financial facilities and expected to have more access to farm credit than those at elsewhere. While those residing at Rano Province (semi-urban) have better access to industries, residents of Gaya province (rural) may likely benefit from their agricultural commitment and the presence of agricultural banks.

H26 *REG* is related to credit participation, rationing and of amount of credit received.

4.6 Data and Sample

This section contains information on the study area, sampling process, data collection procedure, type and sources of data. It also describes the population of the study.

4.6.1 The Study Area

This research was conducted in three agricultural zones of Kano State, Nigeria namely, Dambatta Zone, Rano Zone and Gaya Zone, respectively. Kano which is the most irrigated State in Nigeria has over three million hectares of arable land with large number of farmers producing both cash crops and food crops. Information with respect to agricultural production and the detail of the state was provided in Chapter One, Section 1.7. Kano State is chosen for the study because it has a very long history of agricultural activities, import and export in the country, since prior to colonial rule to the present

time. For this reason, it has been regarded as the centre of commerce and agriculture in the country. Moreover, the state is the second most industrialized state in Nigeria and the economic nerve centre of the entire northern region and some parts of Niger republic, Chad and Cameroon (KSEEDS, 2004). Olagunji and Ajiboye (2010) added that the history of agricultural loan in Nigeria started in this area where the Native Authority (NA) grant credit to mixed farmers in 1930. The fact that presently the state is the most populated city in the country (9,401,288 inhabitants) comprising forty-four (44) different local governments with the highest irrigation facility in Nigeria (NPC, 2006), further justify the selection of the state.

4.6.2 Population of the Study

Sekaran and Bougie (2013) define study population as the total group of people, things of interests or events that the investigator wish to study. Therefore, within the context of this research, three types of population have been identified. The first population of this research is the recognized farmers who are listed by the Kano State Agricultural and Rural Development Authority (KNARDA). Available evidence from the ministry indicates that there are 271,233 farming families in six local government areas across three agricultural zones in the state. The red shaded area in Figure 4.2 shows the three agricultural zones.

The second population on the other hand, consists of farmers who applied for loans to various outlets such as BOA in the 2013/2014 farming season. BOA is the largest agricultural bank not only in the state, but also in the country (Odi, 2013), with branches

in Kano Central, Dambatta, Doguwa, Gezawa and Wudil LGAs, respectively. It is estimated that about 411 farmers have benefitted from the loans (KNARDA, 2014). The third population consists of total microfinance banks in Kano State across the forty-four local government areas. Till the end of 2012, the state has recorded only eight registered micro-finance banks (MFB). Namely Freedom MFB; Gidauniya MFB; Women Development MFB; Kibiya MFB; Gwarzo MFB; Wudil MFB; Dambatta MFB; Integrated and Grass Root MFB. However, in a move by the government to revamp the economic activities in the state due to reduction in Federal Government subventions to states brought about by dwindling oil revenue and the economic downturn, 37 new microfinance banks were established and licensed by the CBN in addition to the existing eight, making a total of 45 microfinance banks (Vanguard, 2013). But this effort paid off due the fact that 10 out of 44 local governments in the state are without commercial banks in their territories. But as at 9th August, 2013, 20 more microfinance banks have started operations in the state. Today, there is microfinance bank in each one of the 44 local government (Citizen, 2013; News, 2013). Figures 4.2 shows the study area.

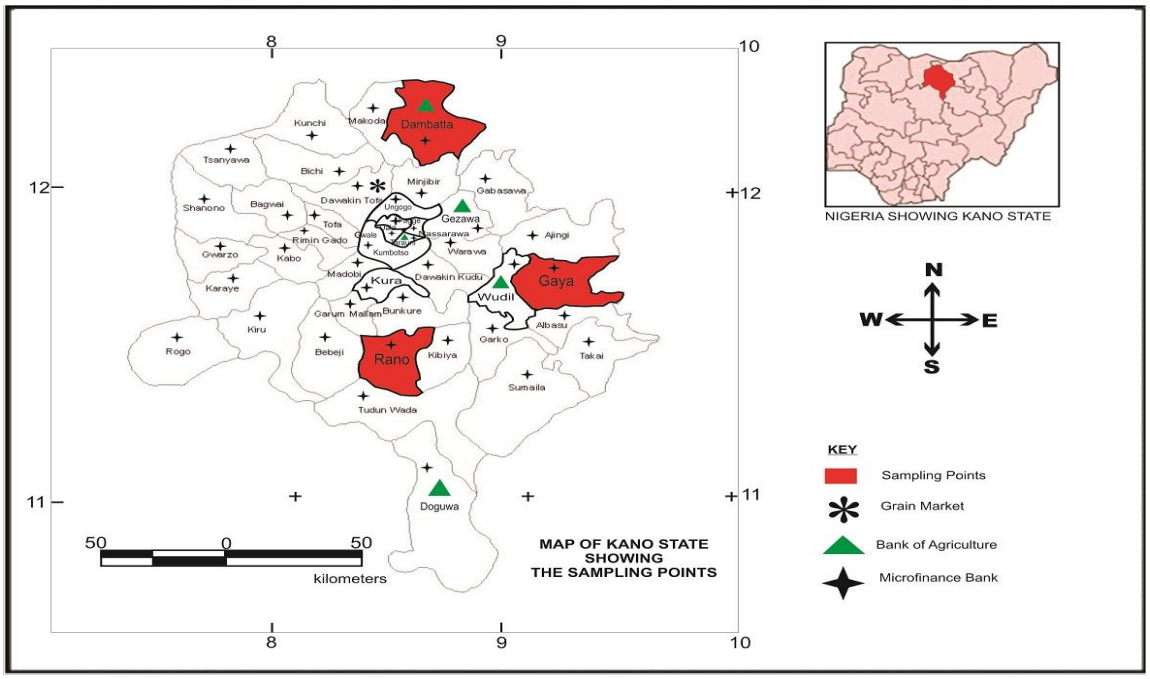


Figure 4.2
Map of Kano State Showing Sampling Points

4.6.3 Sampling Procedure and Sample Size

Sekaran and Bougie (2013) define sample as a subset of a population. In other words, a sample is a representation of the population. Therefore, this study used probability sampling technique. Because it allows for an equal opportunity and chances of being selected within the respondents in a particular population. From the beginning, respondents were stratified between those participate in credit market and non-participants, in addition to microfinance banks. The second stratification follows the agricultural zones strata for the selection of the respondents. For the first population, respondents were selected from six local governments namely, Minjibir, Ungoggo, Dambatta, Gezawa, Wudil and Kura was selected from three different agricultural zones. The selection of these agricultural zones is justified by the intention of the research to include different zones in the analysis. This is also augmented by the desire of the study to have different responses from urban, semi-urban and rural dwellers.

Moreover, this process creates an opportunity in the research to capture and control for the effect of regional opportunities and differences associated with each zone. For instance, Dambatta province is regarded as an urban area, because of large concentration of banks within the province and it is strategic location of being part of the metropolis. In addition to this, the largest agricultural market in Africa is residing in the area under Dawakin Tofa Local Government as indicated in Figure 4.2. While Rano province is stratified under semi-urban area, it has the largest area coverage of irrigation in the country, which give the opportunity for farming throughout the season. Gaya province is stratified under rural area, but farmers of this province are expected to benefit from the presence of BOA in their location. However, the selection of the farmers follows the random process. For example, based on the Dillman (2000), a population of 271,233 demand a sample size of 384 using the formula in Equation [4.17].

$$[4.17] \qquad n = \frac{(N)(P)(1-P)}{(N-1)(B/C)^2 + (P)(1-P)}$$

where n is the sample size of the study to be computed necessary for the level of precision, N is the size of the population, B is acceptable sampling error or precision, P is the ratio of population expected to choose, C is the Z statistic associated with a confidence level (1.96) corresponds to the 95 percent level. Thus, $N_1 = 271,233,\ p = 0.5, B = 0.05, C = 1.96$. Following the formula in Equation [4.17], a sample size of 383.62 was calculated. Noting that this sample size coincides with the recommendation of Krejcie and Morgan (1970). Though in line with Salkind (1997), the sample was increased by 50 percent and become 576 to avoid the problem of sample error and size distortion. Notwithstanding, a lower sample size of 178 was recommended

using Faul, Erdfelder, Lang, and Buchner's (2007) G*power statistical package as in Appendix 1. For the second population, all the 411 credit beneficiaries were taken in to consideration. It is interesting to note that all the beneficiaries were within the selected study areas. Same goes to third population were all the 45 microfinance banks in the state have taken into consideration. Figure 4.3 shows the population and sampling process.

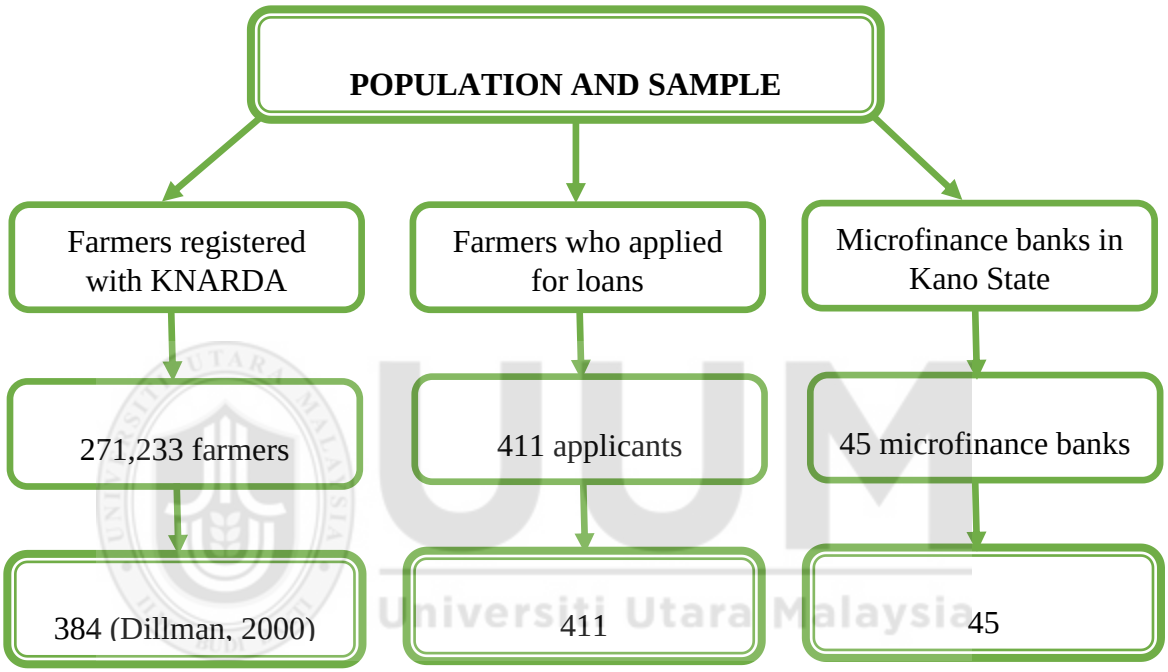


Figure 4.3
Population and Sample

4.6.4 Pilot Test

A pilot test was conducted in this study in order to test the validity and reliability of the survey instrument. Secondly, to get a glimpse of the real conditions of the farmers in the study area, which may allow a researcher to anticipate potential problems and adjust when embarking on the actual research. With this regards, a three-hour session was devoted on the questionnaire and problems encountered in the field-work (survey) with the selected research supervisors and research assistants in addition to extension workers and evaluation personnel from KNARDA. The feedback from these consultations was

used to produce the final version of the questionnaire that was administered among farmers in Kano State, Nigeria.

4.6.5 Data Collection

This research embarked upon the Direct Elicitation Method (DEM) for data collection using questionnaire instrument as explained in Chapter Three, Section 3.8. This process is considered as the best method to collect the necessary primary information from the respondents across the study area. The questionnaires (Appendixes 2 and 3) have been designed from the strand of literature; and have captured all the necessary information needed for the survey.

This information was collected between December 2015 and February 2016, even though a pilot survey was conducted prior to the stated period. A total of 1000 questionnaires were distributed with the help of extension workers and credit officers across the study areas as approved by the KNARDA. These extensions workers play a role of research assistants, were in each local government areas five personal were employed to administer the questionnaires and help the respondents to fill the answers provided. This is necessary in order to avoid loss of information due to illiteracy. In addition to one supervisor from each location, the number of research assistance that partake in the study was 36. Specifically, this method is considered superior since the extensions workers have better knowledge on the terrains; and farmers are more willing to supply information to whom they know. Apart from this, they have vast experience in data collection and have better understanding on the working of the questionnaire. Because of

this strategy, 905 questionnaires were returned out of 1000 questionnaires that are administered by a team of extension workers, credit officers and evaluation personnel across the local governments. Subsequently, this makes the response rate of 90.5 percent.

Though for the third population of the study, the data was collected from all the 45 microfinance banks in the state using questionnaire with the assistance of the Association of Kano State Microfinance Banks. The questionnaire was organized in such a way that all the relevant information necessary for the analysis are included. After rigorous sorting the information manually using excel, some very few questionnaires were returned to the microfinance banks' managers to verify the ambiguous answers or multiple entries, till the data became fitted for the analysis. This is necessary in this research in order to have more observation, and to make sure that $n>30$. So that the research will meet the minimum observation criteria for multiple regression as suggested by some scholars (Gujarati & Porter, 2009).

4.6.6 Data Preparation

A simple data cleaning technique has been used in excel, by sorting the data and deletion of multiple entries, after removing the spoilt ones. This method has precedence in population census data collection (Aliyu, 2010). After careful screening, out of the 905 responses only 835 observations were used for further analysis making a true valid response rate of 83.50 percent. This sample size is considered adequate for maximum likelihood estimation which hypothetically demands an observations between 100 and 500 (Long, 1997). It is worth noting that the population data is from the latest census of

the farming families in Kano State, Nigeria. Even though this information was collected at the local government level, however, it cut across different agricultural zones in the state. This has made the data roughly to be consistent with population proportions. Such that after careful scrutiny of the information, it is concluded that the data does not suffered from sampling bias.

4.7 Method of Analysis

This section contains information on the econometric process and procedures that justify the selection of the tools of analysis for the research. The econometric details governing the discrete choice models have been provided.

4.7.1 Logit Model

A dichotomous choice model to explain the individual's credit market participation or otherwise has been applied in some studies, specifically, probit and logit models (Hashi & Toci, 2010; Wydick, Hayes, & Kempf, 2011; Zeller, 1994). Although in different form, researchers – Mahmud, Mohamed, Ismail, Shamsudin, and Hilton (2007), used logit model to assess the attitude and perception of microcredit-borrowers with respect agricultural diversification in Bangladesh. Additionally, scholars argue that non-linear models are superior to the linear probability model (LPM), because it describes the arbitrary choice and the predicted probabilities lie between zero and one (Gujarati & Porter, 2009). Therefore, for the objective one of this study, logit regression model is applied.

Part of the reasons for using a logit over probit model in this research is due to it is simplicity and mathematical convenience as reported in the literature (Greene, 2012; Gujarati & Porter, 2009). In fact, it has been employed in several empirical studies in U.S., Nigeria and Malaysia (Jappelli, 1990; Rahji & Adeoti, 2010; Rezai, Mohamed, Shamsudin, & Teng, 2011). Besides, this research will take the benefits of logit output, since it provides results that can easily be converted into odds ratios (Long & Freese, 2014).

Apart from these reasons, there is no theoretical ground for choosing a binomial logit over probit model. Because both models are similar, with only difference being that P_i (conditional probability) approaches zero or one at faster rate in probit than in logit. Because the random logistic distribution which is the basis for logit has slightly fatter tails. However, both models are qualitatively similar, but the outputs are quantitatively dissimilar, because they have equal mean value of zero but different variance (Gujarati & Porter, 2009). Therefore, care has to be taken in interpreting the estimated coefficients produced by the two models.

Following the model presented in Equation [4.12], to link credit participation, the research employed McFadden's (1973) discrete choice model. Therefore, in order to satisfy the first objective and model the rural credit market, first, credit participation is considered as derivative of the qualities of choice that are specific to the decisions of the farmers and the borrowers' attributes. Drawing lessons from Zeller (1994); Hashi and

Toci (2010); Wydick *et al.* (2011) and Rezai, Mohamed, and Shamsudin (2011), this idea can be presented in Equation [4.18].

[4.18] $$Y_i = \beta_i X_i + \mu_i$$

where Y_i represents credit participation and, it is, the actual observed dummy variable. Y_i defined as:

$Y_i = 1$ if farmer *i* participates in the agricultural credit market in rural Nigeria.

$Y_i = 0$ if farmer *i* does not participates in the agricultural credit market in rural Nigeria.

Equation [4.18] represents a binary choice model which involves the estimation of the likelihood of participation Y_i given a group of factors (X_i) which are independent to the farmers. This can be represented by Equation [4.19] and Equation [4.20]:

[4.19] $$P(Y_i = 1) = F(\beta' X_i)$$

[4.20] $$P(Y_i = 0) = 1 - F(\beta' X_i)$$

where X_i is a set of exogenous variables related with the i^{th} farmer, which determine the probability of participation in the agricultural credit market (P), while β is a vector coefficient of parameters in the model. Since the F (function) in this case follows logistic distribution function, otherwise popularly called Logistic Cumulative Distributive Function (LCDF), P can be calculated by Equation [4.21] and Equation [4.22]:

[4.21] $$P_i\left(Y=1\right)=\frac{e^{\beta' X}}{1+e^{\beta' X}}$$

[4.22] $$P_i\left(Y=0\right)=1-\frac{e^{\beta' X}}{1+e^{\beta' X}}=\frac{1}{1+e^{\beta' X}}$$

Equation [4.21] and Equation [4.22] is the probability of an event to occur or otherwise. However, since this model can be regarded as a regression of the conditional probability of *Y* on *X*, it can be presented in Equation [4.23] as in Greene (2012):

[4.23] $$E(Y/X)=1[F(\beta' X)]+0[1-F(\beta' X)]=F(\beta' X)$$

However, it is interesting to note that like any other non-linear models, the parameters of this regression may not necessarily be the marginal effects of various regressors in the equation. Therefore, differencing Equation [4.23] with respect to X_{ij}, the effect of each one of the exogenous variables on the likelihood of credit participation will be obtained, and this will produce Equation [4.24] (Greene, 2012):

[4.24] $$\frac{\partial P_i}{\partial X_{ij}}=\left[\frac{\gamma^{\beta' X}}{\left(1+\gamma^{\beta' X}\right)2}\right]\beta=F\left(\beta' X\right)\left[1-F\left(\beta' X\right)\right]\beta$$

Thus, Equation [4.24] can be represented as in Equation [4.25]:

[4.25] $$\frac{\partial P_i}{\partial X_{ij}}=F\left(\beta' X\right)\left[1-F\left(\beta' X\right)\right]\beta$$

An empirical model for the logit estimation is specified by Equation [4.26]:

[4.26] $$L_i = log\frac{P_i}{1-P_i} = \beta_1 + \beta_2 X_1 + \varepsilon_i$$

$ln\frac{P_i}{1-P_i}$ is the log (odds) in favour of credit participation, β_1 is the intercept and β_2 is the slope parameters which reflect the impact of changes in the X_1 on the likelihood of credit participation and ε_i is the logistic random variable. Equation [4.26] assumes that farmers are bound to choose between two alternatives; that is to participate in agricultural credit market or to use their personal resources for agricultural productions (reservation capital). In this research, it is hypothesized that the probability of the farmers to decide on a particular outcome depends on their attributes. Thus, the estimable equation becomes:

[4.27] $$ln\frac{PCM_i}{1-PCM_i} = \beta_{0i} + \beta_1 COM_i + \beta_2 TOL_i + \beta_3 INF_i + \beta_4 ACC_i + \beta_5 PNE_i + \beta_6 OFF_i + \beta_7 TTL_i + \beta_8 RTV_i + \beta_9 REG_i + \mu_i$$

where PCM_i is a dummy variable taking a value of 1 if an individual participates in credit market, and 0 otherwise; *COM* is the commercial farming; *TOL* is the application of traditional farming tools; *INF* is the credit information, *ACC* is the bank account; *PNE* is neighbourhood or family credit participation; *TRD* is the farmers' entrepreneurial ability or farmers being engaged in other off-farm businesses; *TTL* is the traditional title or a member of community decision circle; *RTV* is the ownership of radio and television, *RE2* is the regional dummy representing urban, semi-urban and rural areas; and μ_i is the random variable assuming logistic distribution.

According to Cameron and Travedi (2009), the natural estimator for regression with exogenous covariates or models with dummy dependent variables other than LPM is Maximum Likelihood Method (MLM). This estimation process relax the flaws related with other estimation procedures such as the Ordinary Least Square (OLS). It restricts the conditional expectation of credit participation to lies between zero and one. The log-likelihood function of binomial logit model is given as:

[4.28] $$p_i = \begin{cases} \Pr(y_i = 1 | x_i) & if \ \ y_i = 1 \\ 1 - \Pr(y_i = 1 | x_i) & if \ \ y_i = 0 \end{cases}$$

where p_i will take the actual value of y_i, and $Pr\left(y_i = 1 | x_i\right) = F\left(\mathrm{X}\beta\right)$ and F is the logistic CDF. The chances of observing an event given **x** is the cumulative density evaluated at $\mathbf{x}\boldsymbol{\beta}$. If the observation is independent, the likelihood equation will be (Long, 1997):

[4.29] $$L(\beta | y, \mathrm{X}) = \prod_{i=1}^{N} p_i$$

Combining Equation [4.28] and Equation [4.29], will give Equation [4.30]:

[4.30] $$L(\beta | y, \mathrm{X}) = \prod_{y=1} \Pr(y_i = 1 | x_i) \prod_{y=0} [1 - \Pr(y_i = 1 | x_i)]$$

where the index for multiplication indicates that the product is only for those cases where $y_i = 1$ and $y_i = 0,$ respectively, and Π is the product operator. By incorporating the β's into Equation [4.30], it will yield Equation [4.31]

[4.31] $$L(\beta \mid y, \mathrm{X}) = \prod_{y=1} F\left(\mathrm{X}_i \beta\right) \prod_{y=0} [1 - F\left(\mathrm{X}_i \beta\right)]$$

After taking logs, the likelihood equation becomes:

[4.32] $$\ln L(\beta \mid y, \mathrm{X}) = \sum_{y=1} \ln F\left(\mathrm{X}_i \beta\right) + \sum_{y=0} \ln F[1 - \left(\mathrm{X}_i \beta\right)]$$

These estimates are asymptotically normal, efficient and consistent (Long, 1997).

4.7.2 Multinomial Logit Regression Model

In order to satisfy the second objective of this research, Multinomial Logit Regression Model (MNLM) is employed in order to determine the factors affecting the choice of agricultural finance among farmers in Nigeria. The choice among the different types of agricultural finance in Nigeria depends on the probabilistic response or dependent variable; which is typically a discrete choice, and it has a general structure of a multinomial variable (unordered polytomous response). The MNLM is seen as relevant case of a generalized model for utility maximization. However, the central theme behind MNLM is to model the relationships between an endogenous polytomous response and a set of regressors using random utility maximisation model (Cameron & Travedi, 2009; Long & Freese, 2014). Following McFadden's (1973) discrete choice model, the theory assumes that farmers are expected to choose the alternative with the highest profit that yield higher utility; donated as $F(U)$. But this utility function depends on the attributes of the farmers and the qualities of the alternatives, and has a stochastic (ε) and deterministic components $(\boldsymbol{X\beta})$. If to say, a utility for a farmer *i* facing *j* alternatives to choose alternative *m* is given in Equation [4.33]:

[4.33] $$U_{im} = X_i \beta_m + \varepsilon_{im}$$

Then, according to Greene (2012), the probability of a farmer *i* choosing alternative *m* over *js* alternatives is when:

[4.34] $$P(Y_i = m) = Prob\left[U_{im} > U_{ij}\right] \qquad \forall j \neq m$$

Therefore, if the stochastic term (ε_i) in Equation [4.33] is independently and identically distributed with Weibull distribution (Boucher *et al.,* 2009), or type I extreme value (i.e. Gumbel) distribution denoted in Equation [4.35] as (Greene, 2012):

[4.35] $$F(\grave{o}_{im}) = \exp(-e^{-\grave{o}_{im}})$$

Then the multinomial logit model for choice of agricultural finance will be written in Equation [4.36].

[4.36] $$Prob(Y_i = j) = \frac{e\left(X_i \beta_j\right)}{\sum_{j=1}^{J} \mathrm{e}\left(X_i \beta_j\right)} \qquad j = 1, 2, 3, \ldots, m$$

where *j* is the different source of agricultural finance in Nigeria such as self-finance, commercial banks, government loans, microfinance banks and loans from friends and relatives (informal source).

However, all the parameters in the model are unidentified. As such, more than one set of parameters would produce the same chances of the observed outcomes until the model are restraints. This can be achieved by setting the values of the some of the parameters to be equal to zero. For instance, those in the first category (first choice), that is for all

$J = 1$ to be = 0 (Greene, 2012; Long, 1997). These parameters are then used as the reference category that can be compared with other choice. Following this normalization, the probabilities in Equation [4.36] is presented in Equation [4.37] and Equation [4.38] as:

[4.37] $$Prob(y_i = 0) = \Pr ob(y_i = 1 \mid X_i) = \frac{1}{1 + \sum_{j=1}^{J} e(X_i \beta_j)} \quad and \;\; j = 1, 2, 3, ..., m$$

[4.38] $$Prob(y_i = j \mid X_i) = \frac{e(X_i \beta_j)}{1 + \sum_{j=1}^{J} e(X_i \beta_j)} \quad \text{with} \;\; \beta_1 = 0 \;\; for \;\; all \;\; j \neq m$$

where $Prob(y_i = j \mid X_i)$ is the probability that farmer *i* chooses alternative *j* given X, X_i is a vector of attributes of farmer i, J is the number of nominal alternatives, β_j measures the contribution of farmer's characteristic to the likelihood of choosing alternative *j*. However, the log-likelihood function for the MNLM is generally given as:

[4.39] $$\ln L = \sum_{i=1}^{n} \sum_{j=0}^{J} d_{ij} \ln \frac{e(X_i \beta_j)}{\sum_{j=1}^{J} e(X_i \beta_j)}$$

where $d_{ij} = 1$, if farmer *i* chooses alternative *j*; otherwise $d_{ij} = 0$ (Greene, 2012). This log-likelihood is a generalisation of the binomial logit. Following Mohamed, Shamsudin, and Rezai (2013), the coefficients are interpreted using the odds ratios. An odds ratio above one shows that the odds of a particular *J* increases with an increase in regressor. While an odds ratio below one signifies that the odds of a regressand decreases with a decrease in

explanatory variable. However, an odds ratio equal to one leaves the odds of choosing a particular alternatives unaffected. It is worth noting that odds ratios are not different measurement of the relationship of variables included in a particular model. But odds ratios are more informative and manageable, as it can be interpreted in different ways (Menard, 2002; Pampel, 2000). The odds ratios are presented in the following equations.

[4.40] $$\log\left(\frac{P}{1-P}\right) = e^{\ln[odds(Y=1)]}$$

Equation [4.40] can be expanded to Equation [4.41].

[4.41] $$\log\left(\frac{P}{1-P}\right) = e^{(\alpha+\beta_1 X_1+\beta_2 X_2+...+\beta_n X_n)}$$

However, since the more distance of the coefficient estimates from one in either direction, the higher the effect in altering the odds; Pampel (2000) advises the use of a simple transformation that can ease the interpretation and convert the size of the odds in to probabilities by using the formula in Equation [4.42].

[4.42] $$\%\Delta = (e^{x} - 1) * 100$$

where $\%\Delta$ is the percentage change and e^{x} is the exponent or antilog of the coefficients. Equation [4.42] yields the percentage change as a result of a unit or discrete change in the independent variables.

This model is usually motivated by a Random Utility Model (RUM) where a farmer is expected to choose alternatives that increase his profit which will leads to utility maximisation. In this context, the RUM framework is appropriate because farmers are

allowed voluntarily to choose the source of agricultural finance across the different categories. Thus, MNLM can simply be used to model the structure of probabilities on the different outcomes. This particular model is of interest (MNLM), since it can capture the relationships between the explanatory variables and the outcomes, and sum the probabilities within the limit of zero and one (Cameron & Travedi, 2009). In general, the model has been used in multiple-choice studies such as occupational choice, urban travelling mode and choice of corporate bonds (Greene, 2012). Following Mpuga (2010), the estimable model is written in Equation [4.43].

[4.43]
$$ln\frac{pr(CAF=j)}{pr(CAF=m)} = \alpha_{0i} + \alpha_1 AGE_i + \alpha_2 MAS_i + \alpha_3 QLF_i + \alpha_4 OCC_i + \alpha_5 SUB_i + \alpha_6 EXP_i + \alpha_7 FSZ_i + \alpha_8 POL_i + \alpha_9 PRF_i + \alpha_{10} RE2_i + \varepsilon_i$$

where *CAF* is a source of finance associated with agriculture in *j* categories (self-finance, commercial banks, government loans, microfinance banks and loans from friends and relatives) and *m* is the base outcome (self-finance), *AGE* is the age of the farmers, *MAS* is the marital status; *QLF* is education in years; *OCC* is the farmers' occupation (full time farmer, trade, civil service); *SUB* is the subsistence farming; *EXP* is the years of farming business, *FSZ* is the farm size, *POL* is the dummy for political party affiliation; *PRF* is the profit from farming; *RE2* is the regional dummy representing urban areas and ε_i is the random variable assuming logistic distribution.

4.7.3 Multinomial Logit Model for Credit Rationing

For the purpose of objective three, another MNLM is employed in this research. This is necessary in order to take care with four different categories of rationed farmers in the

agricultural credit market in Nigeria. Such as non-applicants' farmers, satisfied borrowers (non-rationed applicants), loan-size rationed borrowers (partially-rationed farmers), constrained-borrowers (quantity-rationed borrowers) (Jaffee & Stiglitz, 1990; Jappelli, 1990; Mushinski, 1999). Drawing lessons from Baydas *et al.* (1994), in order to analyse the probability of being in one of the four categories; and to avoid econometric replication; Equation [4.34] will be redefined here as Equation [4.44]:

$$[4.44] \qquad Prob\left(Y_i = j \mid X_i\right) = \frac{e\left(X_i\beta_j\right)}{\sum_{j=1}^{J} \mathrm{e}\left(X_i\beta_j\right)} \text{ with } \beta_1 = 0 \text{ for all } j \neq m, \text{ and } j = 1,2,3,..,m$$

where *J* consists of non-applicants' farmers, non-credit rationed farmers (satisfied-borrowers), unsatisfied borrowers (loan-size rationed or partially-rationed) and credit-rationed borrowers (constrained-borrowers). However, those in the first category are normalized as benchmark (comparison groups), then the econometric model becomes:

$$[4.45] \qquad ln\frac{pr(ACR=j)}{pr(ACR=m)} = \omega_{0i} + \omega_1 AGE_i + \omega_2 MAS_i + \omega_3 QLF_i + \omega_4 OCC_i + \omega_5 SUB_i + \omega_6 EXP_i + \omega_7 FSZ_i + \omega_8 POL_i + \omega_9 PRF_i + \omega_{10} RE2_i + \varepsilon_i$$

where *ACR* is the set of outcomes associated with agricultural credit application in *j* categories, that is, non-applicant farmers, non-credit rationed farmers (satisfied-borrowers), unsatisfied borrowers (loan-size rationed or partially-rationed) and credit-rationed borrowers (constrained-borrowers) and *m* is the base outcome. However, the

reminder of the variables included in the model, and ε_i are as defined in Section 4.7.2. Similar to previous model, the log-likelihood function is stated in Equation [4.39].

It is worth noting that, the model in Equation [4.45] provides extension over the models developed by Jappelli (1990), Mushinski (1999) and Le Blanc *et al.* (2015). Aside from this, MNLM model has been used to model the credit market failure (credit rationing) as it has been done in the previous studies (Boucher *et al.*, 2009; Reyes & Lensink, 2011).

4.7.4 Ordered Models

Equation [4.18] would provide sufficient information on the likelihood of participation in agricultural credit market or the probability of non-participation in the market, and thus, it will capture the first objective of this research. But it would not provide information on the determinant of the amount of credit received by farmers. Therefore, in order to satisfy the fourth objective of this study, ordered models are required. Having found that some farmers do not participate in the credit market which make them to have zero-credit, while others have positive credit expenditure in hierarchical order, suggest an evidence of categorical ordinal responses in the data, which is the basis for ordered models (Wooldridge, 2002).

Therefore, following Beck *et al.* (2006), in order to draw inferences on the variables responsible of the amount of credit received, ordered models are employed for this objective, due to the ordinal nature of the dependent variable. The endogenous variables

are ranked between those who do not receive any amount of loans to those who receive the maximum amount of loan. Thus, the model can be stated as in Equation [4.46]:

[4.46] $$y_i = \beta' X_i + \varepsilon_i$$

where y_i is the observed, and exact dependent variables (exact amount obtained by the farmers in hierarchical order); coded as $0,1,\ldots\ldots n$, X_i is the vector of the regressors, β is the vector of parameters to be estimated and ε_i is the logistic random variable for the ordered logit model with:

$$F(z) = \frac{e^z}{\left(1+e^z\right)}$$

and it also assumed to be normally distributed with the standard normal cumulative distribution function donated by $F(\cdot) = \Phi(\cdot)$, with 0 mean and unit variance for the ordered probit model (Greene, 2002). Supposing that y is observed, then the categories of y responses would take the forms of $0,1,2,3$ and are captured by Equation [4.47] through Equation [4.50] (Wooldridge, 2002):

[4.47] $$y_i = 0 \quad if \ \ y_i \leq 0,$$

[4.48] $$y_i = 1 \quad if \ 0 \leq y_i \leq \mu_1,$$

[4.49] $$y_i = 2 \quad if \ \mu_1 \leq y_i \leq \mu_2$$

[4.50] $$y_i = 3 \quad if \ \mu_2 \leq y_i$$

The ordered models would then use the observations on y_i to fit the vector of parameter β, and μ_1 and μ_2 are the cut points (Greene, 2012). Given a set of data, farmer *i* may fall in category m if $\mu_{m-1} < y < \mu_m$. Consequently, the magnitude of credit participation *y* is related through the cut points or threshold μ_m, and $m = 0\ldots,3$. Assuming from Equation [4.46] that:

[4.51] $y_i = \beta' X + \varepsilon_i = Z_i$ and Z_i defined as:

[4.52] $Z_i = \beta' X + \varepsilon_i$

then, the conditional probabilities $P(Y=0 \mid X), P(Y=1 \mid X), P(Y=2 \mid X)$, and $P(Y=3 \mid X)$ can be written as:

[4.53] $P(y=0) = P(z \le 0)$

[4.54] $P(y=1) = P(0 \le z \le \mu_1)$

[4.55] $P(y=2) = P(\mu_1 \le z \le \mu_2)$

[4.56] $P(y=3) = P(\mu_2 \le z)$

For instance, if the score on the observed variable say y_i is 0, means that a household does not participate in the credit market. However, if the score of y_i is any positive number let say up to ₦70, 000 ($50-$350), $y_i = 1 =$ low; and if the score of y_i is up to ₦ 200,000 ($351-$1,000), $y_i = 2 =$ medium, and above ₦ 200,000 ($1001 and above),

$y_i = 3 =$ high; means that households receive different size of credit. Then the estimated model is written as:

[4.58] $$Y_i = \rho_{0i} + \rho_1 AGE_i + \rho_2 QLF_i + \rho_3 SUB_i + \rho_4 TNR_i + \rho_5 VEH_i + \rho_6 LEN_i + \rho_7 REC_i + \rho_8 LIT_i + \rho_9 REG_i + \varepsilon_i$$

where Y_i is the dependent ordered variables summarized as: $0\,(y_i = 0), \text{low}\,(y_i = 1)$, medium $(y_i = 2)$ and high $(y_i = 3)$. *AGE* is the age of the farmers in years; *QLF* is the years of education; *IRR* is the irrigation dummy; *VEH* is the ownership of car or bus; *TNR* is the dummy representing type of landholding; *SUB* is the dummy representing subsistence farming system; *REC* is the dummy of bookkeeping; *LEN* is a dummy indicating presence of lenders; *LIT* is the credit awareness and financial literacy; *RE2* and *RE3* are the regional dummies representing urban, semi-urban and rural areas; and ε_i is the random variable assuming normal distribution. However, the usual OLS would not be a consistent estimate of the model; hence both models (ordered logit and ordered probit) are estimated using the MLM. So, if the probability model is specified as:

[4.59] $$\Pr(y_i = m \mid \mathbf{x}_i) = F(\mu_m - \mathbf{x}_i\boldsymbol{\beta}) - F(\mu_{m-1} - \mathbf{x}_i\boldsymbol{\beta})$$

But in calculating $Pr(y = 1 \mid \mathbf{x})$, the right-hand side will be drop out from the model, since $F(\mu_0 - \mathbf{x}\boldsymbol{\beta}) = F(-\infty - \mathbf{x}\boldsymbol{\beta}) = 0$; however, for the $Pr(y = J \mid \mathbf{x})$,the first term equals to one; since $F(\mu_j - \mathbf{x}\boldsymbol{\beta}) = F(\infty - \mathbf{x}\boldsymbol{\beta}) = 1$. Thus, either the model's intercept ($\boldsymbol{\beta}_0$) or the threshold ($\boldsymbol{\mu}$) will be constrained to 0 for model identification; and then inserted in to

Equation [4.59]. By taking the log and if the observations are identical and independent; then the log-likelihood will be:

[4.60] $$\ln L(\beta, \mu \mid y, \mathbf{x}) = \sum_{j=1}^{J} \sum_{y_i = j} \ln\left[F\left(\mu_j - \mathbf{x}_i\boldsymbol{\beta}\right) - F\left(\mu_{j-1} - \mathbf{x}_i\boldsymbol{\beta}\right)\right]$$

[4.61] $$\ln L(\beta, \mu \mid y, \mathbf{x}) = \sum_{j=1}^{J} \sum_{y_i = j} \ln\left[\phi\left(\mu_j - \mathbf{x}_i\boldsymbol{\beta}\right) - \phi\left(\mu_{j-1} - \mathbf{x}_i\boldsymbol{\beta}\right)\right]$$

where F is for logistic CDF and ϕ for the normal CDF. Equation [4.60] and Equation [4.61] could be maximized using numerical method to estimate the μ*'s* and the β*'s*. These estimates are asymptotically normal, efficient and consistent (Long, 1997).

The justification of using ordered models has precedent in the literature, as it have been used by many economists (Beck *et al.*, 2006; Beck, Demirguc-Kunt, & Peria, 2007; Greene, 2012; Rezai, Mohamed, & Shamsudin, 2015; Rosli, Rahim, Radam, & Abdullah, 2013; Wooldridge, 2002).

However, since these models have violated the parallel line assumptions as presented in Table 5.23. An alternative parameterization was found using the Generalized Ordered Logit Model (GOLOGIT2); also known as partial proportional odds model (Williams, 2006). The model is written thus:

[4.62] $$P(Y_i > j) = \frac{\exp(\alpha_j + X_i\beta_j)}{1 + [\exp(\alpha_j + X_i\beta_j)]}, \qquad \text{j} = 1, 2, ..., \text{M} - 1$$

where M is the number of groups of the ordinal regressand. From Equation [4.62], it could be deduced that the likelihood that Y_i will take on each of the values $1, \ldots, M$ equals to:

[4.63] $$P(Y_i = 1) = 1 - g(X_i\beta_j)$$

[4.64] $$P(Y_i = j) = g(X_i\beta_j - 1) - g(X_i\beta_j) \qquad j = 2, ..., M-1$$

[4.65] $$P(Y_i = M) = g(X_i\beta_M - 1)$$

In case that $M = 2,$ the generalized ordered logit model is equivalent to the binomial logit model. However, in a situation that $M > 2,$ the GOLOGIT2 model will correspond to a sequence of binomial logistic regressions where different categories of regressand are merged. Like in this case $M = 4$ $(0,1,2,3),$ then for $J = 0,$ category 0 will be contrasted with those in 1, 2, and 3; for $J = 1$ it will contrast with 0 and 1 against 2 and 3 categories and so on.

Given Equation [4.62], both generalized ordered logit and parallel regression model are equal, with the exception that in the parallel-line models the β's (but not the α's) are equal for all the different values of j. Then Equation [4.62] would be expressed as:

[4.66] $$P(Y_i > j) = \frac{\exp(\alpha_j + X1_i\beta 1 + X2_i\beta 2 + X3_i\beta 3_j)}{1 + [\exp(\alpha_j + X1_i\beta 1 + X2_i\beta 2 + X3_i\beta 3_j)]}, \; j = 1, 2, ..., M-1$$

One of major breakthrough of the new version of generalized ordered logit (GOLOGIT2) as in Equation [4.66] is the flexibility of the model to allow some of the β's to be equal

for all the values of j's, while others could differ. For example, given Equation [4.66], the β's for *X1* and *X2* are the same for all values of j, however, the β's for $X3$ are free to vary. Thus, it can estimate the partial proportional odds model. This contrast the parallel-lines model where the β's are constraint to be equal for all different values of j's.

4.7.5 Tobit Regression Model

Tobit regression model is employed in order to analyse the determinants of credit supply by microfinance banks in the study area. Though due to the risk associated with agricultural lending (Barry & Robison, 2001), it is discovered that not all of the microfinance banks have observable loans, hence the possibility of censoring. Therefore, in order to solve this problem in line with econometric modelling, Tobit model otherwise called a censored model or limited dependent variable regression model has been employed in this study (Amemiya, 1984; Gujarati & Porter, 2009; Tobin, 1958; Wooldridge, 2002). Following Fair (1978); Greene (2012); Mailena, Shamsudin, Radam, and Latief (2014); Mcdonald and Moffitt (1980); and Rosli *et al.* (2013); the Tobit model could be expressed thus;

[4.67] $$y_i = \mathbf{x}_i\boldsymbol{\beta} + \varepsilon_i \quad if \quad \mathbf{x}_i\boldsymbol{\beta} + \varepsilon_i > 0$$

[4.68] $$y_i = 0 \quad if \quad \mathbf{x}_i\boldsymbol{\beta} + \varepsilon_i \leq 0$$

$$i = 1,2,3,\ldots\ldots N$$

where y_i is the dependent variable which is defined as the amount of credit disbursed by the microfinance banks to the farmers, X_i is the vector of independent variables, N is

the total observations, β is the vector of the coefficients in the model, and ε_i is the error term which is assumed to be normally distributed with zero mean and constant variance $\sigma^2 \left[\varepsilon \sim N\left(0, \sigma_\varepsilon^2\right)\right]$. The model is estimated using MLM, given as:

$$[4.69] \quad LL_{Tobit} = \sum_{0} ln\left[I - \gamma\left(\frac{\beta_i x_i}{\sigma_i}\right)\right] + \sum_{+} ln\left[\frac{I}{\sigma_i} \propto \left(\frac{y_i - \beta_i x_i}{\sigma_i}\right)\right]$$

The "0" indicates the total sum of the zero observations in the sample $\left(y_i = 0\right)$, "+" represents the total observations over the positive observations $\left(y_i > 0\right)$, "γ" stands for the standard normal random variable cumulative distribution function (CDF); "$\propto$", represents the standard probability normal density function (PDF). It is worth noting that maximisation of likelihood function with respect to σ and β will give the maximum likelihood estimates of the parameters, and then the empirical model is presented in Equation [4.70]:

$$[4.70] \quad CRS_i = \varphi_{0i} + \varphi_1 LIQ_i + \varphi_2 MKS_i + \varphi_3 PRF_i + \varphi_4 DIS_i + \varphi_5 EXP_i + \varphi_6 ACC_i + \varphi_7 TRD_i + \varepsilon_i$$

where CRS_i represents the total amount of agricultural credit supplied by the microfinance banks. For those who do not supplied credit, CRS_i cannot be quantified and is, therefore, set to zero (Guiso, Jappelli, & Terlizzese, 1996; Mpuga, 2010).

[4.71] $$CRS_i = \begin{cases} y & if \quad y^* > 0 \\ 0, & if \quad y^* \leq 0 \end{cases}$$

LIQ_i is the liquidity of the bank; MKS_i is the number of marketing staff in the microfinance bank; PRF_i is bank's profit; DIS_i is the distance between farmers and microfinance banks in kilometres; ACC_i is dummy for farmer with a bank account; TRD_i represents the entrepreneurial ability of a farmer; EXP_i is the years of business experience by the microfinance bank; and ε_i is normal random error term.

The coefficients $\varphi_1, \varphi_2, \ldots, \varphi_7$ will provide a suitable adjustment in order to obtain consistent estimates of the effects of changes in the independent variables on y_i for those who supplied loans. It will also indicate the ratio of the total effects as a result of the induced changes in the behaviour of those who supplied credit (Mpuga, 2010). The empirical justification of Tobit model using cross section is grounded in the literature (Akudugu, 2012; Brown, Jappelli, & Pagano, 2009; Gbadebo *et al.*, 2013; Mailena *et al.*, 2014; Olagunji & Ajiboye, 2010; Rosli *et al.*, 2013).

4.8 Conclusion

This chapter discusses issues related to the theoretical framework, justification of the variables included in the models and tools of data analysis. Theory of consumer behaviour and life cycle hypothesis together with the microeconomic household model have been extended to model credit market participation and rationing within the microeconometric framework. Moreover, the literature has been used to justify the inclusion of the variables in the different models governing the study. In addition, the econometric procedure that guides the selection of the tools for data analysis within the

economic framework has been thoroughly discussed. In this regard, Logit regression, multinomial logit models, ordered models and Tobit regression are used for the objective one to five, respectively. Moreover, the chapter also contains issues related to data of the study, population and sampling procedure.

CHAPTER FIVE

ANALYSIS AND DISCUSSION OF THE RESULTS

5.1 Introduction

The socio-demographic profile of the respondents and correlation analysis are presented in this chapter. More importantly, the chapter presents the analysis of credit market participation and rationing among farmers in Kano State, Nigeria. Specifically, the effects of regressors relative to credit participation and rationing have been thoroughly analysed.

5.2 Socio-demographic Profile of the Respondents

The socio-demographic profile of the respondents is presented in Table 5.1. Table 5.1 shows the age bracket of 20 years and below accounted for 1.56 percent; age bracket of 21 – 29 and 30 – 39 years accounted for 8.14 percent and 29.46 percent, respectively. While that of 40 – 49 years was found to be the majority (43.11 percent); and 50 and above accounted 17.72 percent of the respondents. This indicates that out of 835 sampled farmers more than 70 percent were within an active age ranging from 30 to 49, implying that most farmers in the study area fall within the productive age. This help in the decision making with regards to income, risk management and labour. Similarly, statistical evidence from Table 5.1 reveals that 88.86 percent of the respondents were married. This implies that majority of them are likely to succeed for their effort to satisfy their marriage obligations. It also indicates the potential for the respondents to possess ready–made labour that could have motivate them to employ more resources for

productive activities. However, those who are widowed and divorced among respondents were only 2.64 percent.

In addition, family size gives clue on the consumption pattern, other expenditures and availability of labour for farming activities. As shown in Table 5.1, the family size of 5 and below were 29.48 percent; 6 – 10 were 32.86 percent; 11 – 15 were 22.86 percent; 16 and above were 14.80 percent. These imply that more than 85 percent of the farmers in the study area have enough man power of 1 – 15 within the members of the family. Although studies show negative influence of household size on farmers' efficiency due to the value of farm products that could be sold for reproduction, might be consumed by a household. Nonetheless, large family size gives room for cheaper and free labour.

Table 5.1 presents the education level of the respondents in the study area. Result indicates that 6.52 percent has no education whereas 25.97 percent has No formal education and 34.3 percent attended primary and secondary schools. While 30.68 percent has attendance at tertiary institution, 2.54 percent attended vocational schools only. This predicts that about 31 percent of the respondents have no both formal and non–formal education whereas about 65 percent of them attended at least one form of educational training. This implies that farmers in the study area acquired skills and manoeuvre that might assists them to manage their farm and accept new farming technology more easily. The socio–demographic table indicates that only 22.75 percent of the respondents solely depend on farming. However, all different classes of occupations have proportion in the farming industries, which are unskilled labourers, traders, civil servants and students with 12.57 percent, 19.88 percent, 34.49 percent, 34.49 percent and 10.3 percent, respectively.

This figures show that civil servants and traders formed more than 50 percent of the proportion of respondents in the study area.

Result in Table 5.1 indicates that 6.59 percent of the respondent have less than six years of experience in farming business; whereas 18.92 percent; 18.20 percent; 27.43 percent and 28.86 percent recorded 6 – 10; 11 – 15; 16 – 20; and more than 20 years farming business. Therefore, cumulatively, the finding reveals that more 70 percent of the sampled respondents have experience of over 10 years in agricultural business. This has important implication, because there is no doubt that years of experience has influence on productive efficiency and high precision in decision making due to the knowledge of local production condition.

Moreover, different type of land tenure system operates in the study area as indicted in Table 5.1. These are rent, purchase and gift or inheritance which accounted for 33.25 percent, 31.93 percent and 34.82 percent, respectively. This indicates that either directly or in directly about 65 percent of the farmers are in the study area were paying for the land usage. This will motivate them to work harder for them to settle farm charges and other farm obligations.

Evidence from Table 5.1 reveals that 46.23 percent of the respondents are using traditional farming tools, 36.77 percent were semi mechanized farmers, compared to only 17.01 percent of the respondents who were using mechanized farming system. This finding has important implication for agricultural production in the study areas in the near future. Because farmers are ready to adopt changes associated with new farm implements

as more than 50 percent use some kind of mechanized farming system. This might be attributed to level of literacy of farming families in the study area.

Table 5.1
Socio–demographic Profile of the Respondents

Variable	Frequency	Percentage
Age		
20 and Below	13	1.56
21 – 29	68	8.14
30 – 39	246	29.46
40 – 49	360	43.11
50 and Above	148	17.72
Married		
Single	71	8.5
Married	742	88.86
Divorced	12	1.44
Widowed	10	1.20
Family Size		
5 and Below	245	29.48
6 – 10	273	32.85
11 – 15	190	22.86
16 and above	123	14.80
Education		
No Education	54	6.52
No Formal Education	215	25.97
Primary & Secondary	284	34.3
Tertiary	254	30.68
Vocation	21	2.54
Occupation		
Farming only	190	22.75
Unskilled Labourer	105	12.57
Trader	166	19.88
Civil Servant	288	34.49
Student	86	10.3
Farming Experience		
5 and Below	55	6.59
6 – 10	158	18.92
11 – 15	152	18.20
16 – 20	229	27.43
21 and above	241	28.86
Land Tenure		
Rent	276	33.25

Purchase	265	31.93
Gift/inheritance	289	34.82

Table 5.1 (Continued)

Variable	Frequency	Percentage
Farming Tools		
Traditional	386	46.23
Semi Mechanized	307	36.77
Mechanized	142	17.01
Group Affiliation		
No Affiliation	319	38.2
Member	516	61.8
Irrigation		
No Irrigation	442	52.93
Irrigation	393	47.07

Similarly, an inspection in Table 5.1 shows that majority of the respondents in the study area (61.8) were affiliated to farmers group while 38.2 percent of them are without any group affiliation. In practice, group affiliation assists farmers in accessing relevant information quickly which include new production technique, finance, storage, extension services, marketing strategy and information on new farming technology.

Moreover, descriptive evidence from Table 5.1 shows that nearly half of the respondents (47.07 percent) have access to irrigation in their farm while the rest of farmers (52.93 percent) have no irrigational advantage. Irrigation facilities give room for farmers to cultivate in both wet and dry seasons and earned more revenue due to increase in output.

Evidence from Figure 5.1 indicates that 61.68 percent which represents majority of the respondents does not partake in any type of borrowings. However, only 38.32 percent of the respondents are with agricultural loans. Yet, even among those with farming loans, 20

percent have secured moderate credit amount, whereas, 12.34 percent receive lower amount of loans, with only 5.98 percent managed to go away with higher amount.

But, in terms of credit source, descriptive evidence from Figure 5.2 indicates that 33.66 percent of the loans were from the microfinance banks, followed by loans from friends and relatives which represents 27.85 percent; however, the remaining 16.95 and 16.46 percent were from the government credit programs and commercial banks, respectively. As indicated, private money lenders are unimportant source of agricultural finance and therefore accounted only 5.06 percent. The a priori expectations that majority of the loans in developing countries were from friends and relatives has been defeated with the increasing activities of microfinance banks in Nigeria.

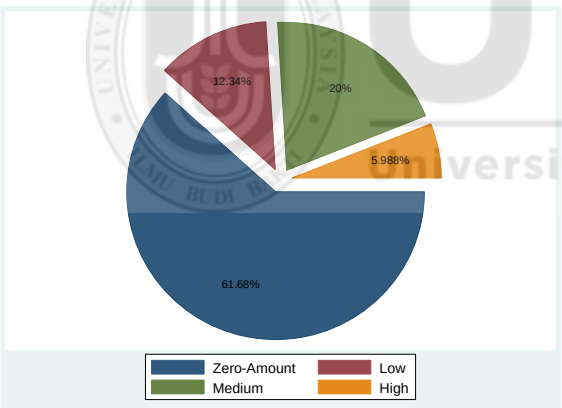


Figure 5.1
Amount of credit Obtained by Farmers

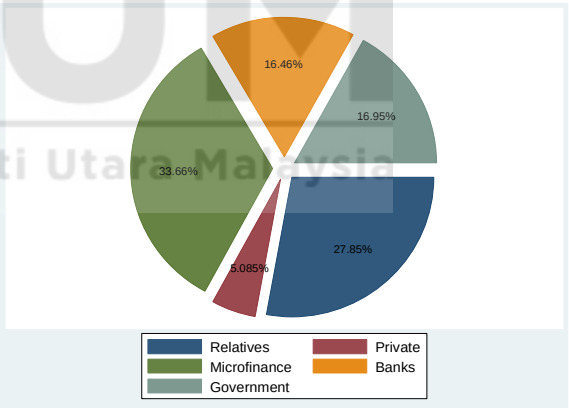


Figure 5.2
Credit Obtained from Different Source

Turning to the microfinance banks, descriptive evidence from Figure 5.3 infers that having off-farming business and a bank account by farmers are very important determinants of credit supply, with the greatest relevance being found for deposit account. Even though having engaged in other off-farm business matters, but microfinance banks are more willing to lend money to those with operational bank

accounts. Besides, statistical evidence predicts that those with off-farming commitment and bank account will be more favourable by these banks. However, a brief look at Figure 5.4 shows that non-profit making banks could not take risks and supply credit to those that could not be able to present a surety while profit-making microfinance banks do. In this case, profit-making microfinance banks are able to engaged in riskier but more profitable lending. This suggests that profit-making banks use different measures such as social mechanism to guarantee repayment.

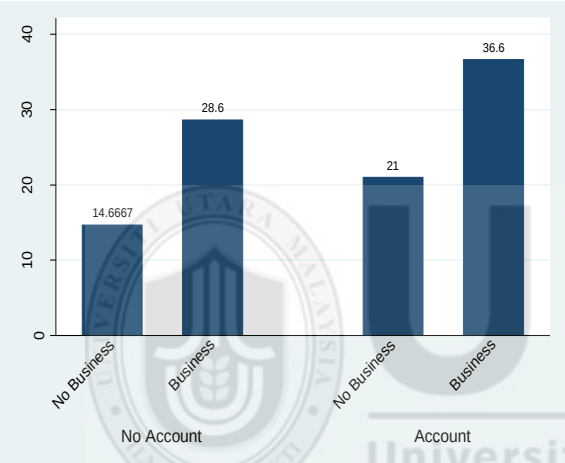


Figure 5.3
Credit Supply by Off-farm and Account

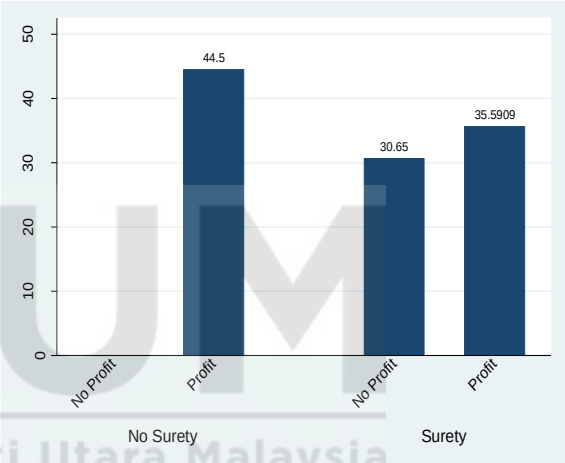


Figure5.4
Credit Supply by Profitability and Surety

Apart from that, an inspection on Table 5.2 indicates that the average amount of credit supplied by the microfinance bank is ₦33, 559,990 ($167,799.95) with an average business experience of 3.02 years. In addition, each of these banks has an average of three marketing staffs that can able to cover up to an average area of 71.77 kilometres to mobilize customers. However, farmers with high off-farming activities such as trading and those with bank account seem to be more favourable clients of these banks.

Table 5.2
Descriptive Statistics

Variables	**Mean**	**Standard Deviation**	**Skewness**	**Kurtosis**
CRS	33.56	20.96	0.97	3.33

EXP	3.02	0.73	1.32	3.34
MKS	3.11	0.49	0.15	3.00
DIS	71.77	39.40	-0.36	1.58
LIQ	28.64	16.26	1.21	3.14
TRD	0.89	0.32	-1.46	3.12
PRF	0.55	0.50	-0.18	1.03
ACC	0.83	0.39	-1.19	3.24

5.3 Correlation Analysis

As a culture of econometric modelling, some key variables are examined with a view to check the correlation between them. In addition, it gives out preliminary understanding of the potential problem of the presence of multicollinearity among variables. The correlation coefficients among variables of different models of this study are presented in Table 5.3 through Table 5.7. Moreover, the strength of the correlation between regressands and most of the regressors are moderate.

Specifically, the regressand of credit participation model as presented in Table 5.3 is correlated to *INF* (0.366), *PAR* (0.257), *TTL* (0.155) and *RTV* (0.251), respectively. Similarly, Table 5.4 presents the correlations result of choice of credit market model with the highest associations being observed between different market choice and *RE2* (0.26) and *FSZ* (-0.12). Similar effect has been noticed in Table 5.5 for credit rationing model where the highest correlation was found for *AGE* (0.102), *FAM* (-0.132), *CSV* (0.211), *SYS* (-0.105), *EXP* (-0.138) and *FSZ* (0.131), respectively. These moderate correlations might be attributed to the complex nature of the regressands of these models. With respect to amount of credit received by farmers, Table 5.6 infers that the amount of credit received has been observed to be positively associated with *IRR* (0.232), *VEH* (0.202), *REC* (0.409), *LEN* (0.439) and *RE3* (0.230), respectively. But yet, a negative connection has been recorded in relations to *LIT* (-0.203) and *TNR* (-0.230). Whereas, statistical

inferences from Table 5.7 reveals that the amount of credit supplied by microfinance bank is negatively correlated with *PRF* (-0.349) and *ACC* (-0.138) while positively related with *EXP* (0.252).

Overall, these associations are considered moderate since conventionally a correlation of r=0.1 is a weak relationship, $r=0.3$ is moderate relationship while $r=0.5$ and above is considered as strong association (Acock, 2014).

However, in general, there is no statistical evidence of the presence of multicollinearity in Table 5.3 through Table 5.7, as all the coefficients across models are below the benchmark of 0.7 given by Bryman and Cramer (1997). Asides this, the multicollinearity analysis are presented from Appendix 4 through Appendix 8, although there is no evidence of multicollinearity among variables included in the entire models as evident from the variance-inflating factor (VIF).

Table 5.3
Pairwise Correlation Coefficients of Credit Participation Model

	PCM	**COM**	**TOL**	**INF**	**ACC**	**PAR**	**OFF**	**TTL**	**RTV**	**REG**
PCM	1.000									
COM	-0.017	1.000								
TOL	-0.053	-0.029	1.000							
INF	0.366	0.048	-0.036	1.000						
ACC	-0.076	-0.193	0.053	-0.310	1.000					
PAR	0.257	-0.021	0.083	0.407	-0.365	1.000				
OFF	0.027	-0.054	-0.012	0.046	0.234	-0.109	1.000			
TTL	0.155	-0.026	0.226	0.004	-0.051	0.130	-0.169	1.000		
RTV	0.251	-0.207	-0.229	0.240	-0.162	0.208	0.025	-0.030	1.000	
REG	0.021	-0.121	0.028	0.374	0.051	0.173	0.167	-0.123	0.048	1.000

Table 5.4
Pairwise Correlation Coefficients of Credit Choice Model

	CAF	**AGE**	**MAS**	**QLF**	**FAM**	**TRD**	**CSV**	**SYS**	**EXP**	**FSZ**	**POL**	**PRF**	**REG**
CAF	1.000												
AGE	0.044	1.000											
MAS	0.028	0.524	1.000										
QLF	-0.056	-0.168	-0.098	1.000									
FAM	-0.037	0.125	0.052	-0.215	1.000								
TRD	0.070	-0.013	0.019	-0.072	-0.236	1.000							
CSV	0.051	0.081	0.147	0.391	-0.365	-0.381	1.000						
SYS	-0.026	-0.114	-0.100	-0.195	0.110	0.024	-0.292	1.000					
EXP	-0.051	0.577	0.319	-0.193	0.216	-0.021	-0.075	0.016	1.000				
FSZ	-0.117	0.250	0.237	0.054	-0.055	0.061	0.175	-0.286	0.160	1.000			
POL	0.022	-0.043	0.083	0.099	-0.055	0.000	0.161	-0.168	-0.024	0.163	1.000		
PRF	0.057	-0.011	0.029	0.075	-0.003	0.046	0.040	-0.153	-0.132	0.063	0.034	1.000	
RE2	0.262	0.094	0.058	-0.018	0.183	0.068	-0.083	-0.037	0.063	-0.050	0.102	0.029	1.000

Table 5.5
Pairwise Correlation coefficients of Credit Rationing Model

	ACR	**AGE**	**MAS**	**QLF**	**FAM**	**TRD**	**CSV**	**SYS**	**EXP**	**FSZ**	**POL**	**PRF**	**REG**
ACR	1.000												
AGE	0.102	1.000											
MAS	0.050	0.524	1.000										
QLF	0.005	-0.168	-0.098	1.000									
FAM	-0.132	0.125	0.052	-0.215	1.000								
TRD	-0.009	-0.013	0.019	-0.072	-0.236	1.000							
CSV	0.211	0.081	0.147	0.391	-0.365	-0.381	1.000						
SYS	-0.105	-0.114	-0.100	-0.195	0.110	0.024	-0.292	1.000					
EXP	-0.138	0.577	0.319	-0.193	0.216	-0.021	-0.075	0.016	1.000				
FSZ	0.131	0.250	0.237	0.054	-0.055	0.061	0.175	-0.286	0.160	1.000			
POL	0.110	-0.043	0.083	0.099	-0.055	0.000	0.161	-0.168	-0.024	0.163	1.000		
PRF	0.086	-0.011	0.029	0.075	-0.003	0.046	0.040	-0.153	-0.132	0.063	0.034	1.000	
RE2	-0.061	0.094	0.058	-0.018	0.183	0.068	-0.083	-0.037	0.063	-0.050	0.102	0.029	1.000

Table 5.6
Pairwise Correlation Coefficients of Credit Demand Model

	AMT	**AGE**	**QLF**	**IRR**	**VEH**	**TNR**	**SYS**	**PRF**	**REC**	**BNK**	**LIT**	**REG**
AMT	1.000											
AGE	0.167	1.000										
QLF	-0.015	-0.177	1.000									
IRR	0.232	0.032	-0.039	1.000								
VEH	0.202	0.185	0.168	0.018	1.000							
TNR	-0.230	-0.188	-0.030	-0.170	-0.109	1.000						
SYS	-0.159	-0.114	-0.202	0.055	-0.119	0.161	1.000					
REC	0.409	-0.023	0.130	0.261	0.132	-0.141	-0.036	1.000				
BNK	0.439	0.083	0.117	0.161	0.148	-0.258	-0.113	0.286	1.000			
LIT	-0.203	-0.069	-0.127	-0.091	-0.083	0.038	0.190	-0.279	-0.338	1.000		
RE2	-0.010	0.092	-0.026	-0.114	0.062	0.129	0.004	0.142	-0.050	-0.192	1.000	
RE3	0.230	0.104	-0.080	-0.042	0.024	-0.134	-0.091	-0.088	0.088	0.123	-0.696	1.000

Table 5.7
Pairwise Correlations Coefficients of Credit Supply Model

	LIQ	**MRK**	**PRF**	**DIS**	**EXP**	**ACC**	**TRD**
LIQ	1.000						
MRK	-0.048	1.000					
PRF	-0.349	0.102	1.000				
DIS	-0.073	0.085	0.277	1.000			
EXP	0.252	-0.045	-0.012	0.153	1.000		
ACC	-0.138	0.053	-0.064	-0.006	-0.150	1.000	
TRD	-0.005	0.042	-0.031	-0.116	0.112	0.386	1.000

5.4 Results of Agricultural Credit Market Participation

This study adopts Logit regression model in order to satisfy objective one of the study. More interestingly, together the reported coefficient estimates in Table 5.8 turned out clear to explain the relationships between participation in agricultural credit market and the explanatory variables included in the model.

5.4.1 Estimation and Discussion for Credit Market Participation

Different Logit models have been presented in Table 5.8 with some key variables that have not been examined in the Nigerian agricultural credit market. The dependent variable for all the models are measured by a dummy variable that takes a value of 1 if a farmer participates in agricultural credit market, and a value of 0 if otherwise. The coefficients of the estimated Logit model (full model) are presented in the second column of Table 5.8, while estimates of the restricted Logit model are presented at the second to the last column. The last column of Table 5.8 presents the average marginal effects of the full Logit model. This is because estimates of the crude Logit model have no clear meaning, but rather the direction of the relationship of the variables included in the analysis. However, marginal effects can be a very revealing means for briefing how changes in response is related to changes in the covariates. It is also worthy to note that for categorical variables, the impact of discrete changes is computed, and all the interpretations are based on marginal effects as presented in Table 5.8.

The results presented in Table 5.8 show that all the variables are consistently significant in all the models at different levels with an exception of *RE3* dummy. The coefficient of *COM* is positively significance at five percent indicating that all things being equal,

commercial farmers are more likely to participate in agricultural credit market than subsistence farmers. It follows that as farmer changes from subsistence to commercial farming his chances of obtaining agricultural credit increases. But to what extent the success of a farmer being in commercial farming outweigh the predicted success of subsistence farmer with regard to credit participation has been provided by marginal effects. Therefore, the average marginal effects suggest that given two different type of farmers the predicted probability for commercial farmer to participate in agricultural credit market is 0.09 percentage points higher than a subsistence farmer.

In contrast, the coefficient of *TOL* systematically appears negative in Table 5.8, albeit significant at one percent. The negative appearance of this variable predicts that the probability of receiving agricultural credit for traditional tools users are likely to goes down by 0.08 percentage points compared to mechanized farmers.

In support of these findings, Bamiduro and Gbadeyan (2011) argue that agricultural stagnation could be related with small scale farming, because of the fact there is little production at relatively high cost, due to the application of traditional tools; as such the cultivation system is exposed to traditional methods which discourage economies of scale. In addition, the importance of modern farm implements has been observed by Zeller (1994) in Madagascar where on average more than a three-quarter of institutional loans were spent on inputs for crop production, off-farm enterprises and farm implements among others. Therefore, in line with the expectation, the probability of participation in credit market increases with agricultural commercialization, and decreases with the

application of traditional tools. Even though similar findings to compare or contrast with this result are rarely found in the literature, as the variables has been included to add value to existing knowledge.

Of notable importance among explanatory variables in Table 5.8 is the statistical significance of *INF* at one percent. The positive sign of this variable implies that the probability of credit market participation increases with an increase in credit information. More specifically, the likelihood of a farmer being supply with farm credit is 0.20 percentage points higher if he is aware with different source of credit than those without credit information. This finding coincide with the assertion of Balogun and Yusuf (2011) that the width of the unserved credit by the institutional financial lenders is large due to the lack of credit information. Most farmers in Nigeria are financially discriminated due to lack of access to basic information and awareness regarding farm credit. Evidence shows that only less than 1.5 percent farmers in Nigeria were covered by extension services (Odi, 2013). This indicates that agriculture in Nigeria is paralyzed with missing information; hence, the probability of a farmer being served by the lending agencies increases with an increase in information. Even though base on the available literature information as a variable has not been used in similar model in general, particularly in agricultural credit modelling in Nigeria, but the finding may be comparable to other studies. More specifically, is consistent with panel and cross-sectional estimates of Brown, Jappelli and Pagano (2009) that credit availability increases with an increase in information sharing among firms in transition countries. Besides, the importance of

information has been stressed in consumer confidence studies (Mohamed, Shamsudin, & Rezai, 2013).

As expected, the positive and statistical significance of *ACC* coefficient at five percent suggests that bank-account holders among farmers are more likely to participate in agricultural credit market than non-account holders. However, the probability that account holders would participate in credit market is 0.041 percentage points higher than non-account holders. It follows that lending agencies will be more willing to supply loans to farmers whom they have relations with in order to ensure repayment. Because it may be true that the prime motives for having a bank account is to benefit from the range of financial services including credit. This finding stands with position of Kasirye (2007) that having saving account motivates rural household to apply for credit; and the result is consistent with Akudugu (2012). This finding is important specifically in agricultural credit modelling in Nigeria.

Table 5.8
Logit Regression Coefficients

Variables	Coefficients	St. Errors	*p*-value	Odds-R	Restricted	M. Effects
COM	**1.218**	0.454	0.007***	**3.382**	0.782	**0.093**
TOL	**-1.015**	0.283	0.000***	**0.363**	-0.472	**-0.077**
INF	**2.571**	0.364	0.000***	**13.085**	2.153	**0.196**
ACC	**0.533**	0.225	0.018**	**1.704**	0.463	**0.041**
PNE	**0.535**	0.313	0.087*	**1.708**	0.872	**0.041**
TRD	**0.922**	0.347	0.008***	**2.514**		**0.070**
TTL	**0.580**	0.303	0.056*	**1.786**	1.205	**0.044**
RTV	**1.819**	0.399	0.000***	**6.165**	1.809	**0.139**
RE2	**2.881**	0.779	0.000***	**17.827**		**0.234**
RE3	0.569	0.774	0.462	1.767		0.026
Constant	**-7.410**	0.991	0.000***	**0.000**	-5.789	

Note: The Models in the third and second to the last column are odds ratios of the full Logit model and the restricted Logit model; while the model in the last column is the marginal effects estimated from the full Logit model. Credit participation is the dependent variable with a value of 1 for those participate and 0 otherwise. *COM* is the commercial farming (1=if commercial farmer), *TOL* is the application of traditional tools (1=traditional tools), *INF* is the credit information (1=if aware with different source of credit), *ACC* is the dummy for bank account holding (1=for having bank account), *PNE* is the credit participation of neighbour or family (1=neighbour or family participant), *TRD* is the farmers' entrepreneurial ability or farmer being engaged on other off-farm business (1=if engaged in other off-business

or trade), *TTL* is the traditional title or being part of community decision circle (1=if part of the community decision circle or traditional title), *RTV* is the ownership of radio and television (1=if possessed radio or television), *RE2* is the regional dummy representing urban areas (1=if residence of Dambatta Zone or Zone 2) and *RE3* is the regional dummy representing rural areas (1=if residence of Gaya Zone or Zone 3). ***, **and * donate statistical significance at 1%, 5% and 10% respectively.

Turning to the neighbourhood credit participant, some interesting effect has been noticed. With statistical significance of *PNE* at 10 percent, result in Table 5.8 re-validates the role of social relations and network in Nigerian credit market. Though it is marginally significance, however, the positive sign of this variable envisages that a higher fraction of neighbours or family with a particular farm credit increases the probability of a farmer having the same loan. This suggests that in a setting where financial assets and human capital has been harshly undersized, these social network appears to play a fundamental role with reference to information access on politics, social and economic opportunities. Moreover, given the extent of interpersonal trust that prevails at communal level, neighbours and family relate well in such a way that within themselves circulates vital information with respect to loan opportunities and screening procedure.

Going by that, it is inferred from the statistical evidence that an increases in the fraction of one neighbour or family credit participant increases the chances of credit market participation of a farmer by 0.04 percentage points than other competitors. It is worthy to note that this finding has captured some observable credit phenomena through social ties that has not been captured before in agricultural credit market participation. However, the finding is consistence with other field studies elsewhere (Okten & Osili, 2004; Udry, 1990; Woolcock & Narayan, 2000; Wydick *et al.*, 2011).

In accordance with expected prediction, the positive statistical significance coefficients of *TRD* implies that the more the diversification from the agricultural sector, the higher the

likelihood to participate in credit market. Therefore, an increase in off-farming business, increases the probability of credit participation by 0.07 percentage points higher than full-time farmer. This is interesting, because applications of credit by household that engaged in other business in addition to agriculture is more likely to be granted by the lenders in comparison to household solely in agricultural sector. Because of the negative shocks which usually affect farming businesses, this type of farmers could be seen by the lending agencies as capable to guarantee repayment from other source. This is not surprising bearing in mind that Nigeria is a typical country characterized by week legal framework where the contractual enforcement is very poor. As such, lenders favoured clients with diversified economic activities. This finding supports the position of Kuri and Laha (2011) and Mpuga (2010), but disagree with the position of some empirical studies who found that an increase in non-farming activities decreases the demand for credit (Gandhimathi, 2011; Swain, 2007).

With the significance of *TTL* at 10 percent, result indicates that having traditional title in your family or being part of the community decision circle has a positive impact on credit market participation. Even though the coefficient has moderate statistical precision, but it predicts that social capital is very critical in Nigeria's rural credit market. It follows that the probability of a farmer being in the community decision circle to obtain loan is 0.04 percentage points compared with other competitors. This shows that loan application of farmers at high social stratum often has very clear advantages over their counterparts. It appears that lending agencies are generally more willing to release credit to households with high social cadre. As such, community leaders in urban and rural areas find it easier

to borrow credit from lending agencies. This is not surprising in Nigeria because the decision to seek traditional title or part of the community leadership is mostly driving by the aspiration of getting economic advantage including access to financial services. Even though finding like this has contribute to the literature of agricultural credit market. But the result may be comparable with other studies that network help to improve credit access (Akudugu, 2012; Li *et al.*, 2013).

Similarly, the coefficient of *RTV* which is a proxy for luxury assets and wellbeing is significantly different from zero in the model. Therefore, possession of luxury items which signal a household wellbeing impact positively on credit participation. The significant coefficient of *RTV* at five percent infers that the chances of credit market participation increases with an increase in the possession of radio and television. This predicts that the probability of credit market participation increases by 0.14 percentage points with possession of radio and television compared to those without these items. It is interesting to note that in developing world like Nigeria, ownership of luxury assets which represents household fortune through the capability to afford connection fees and electric bills, and also represents household's wellbeing positively affects credit participation. Because possession of television and radio is advantageous in updating households to acquire information about different source of institutional credit. Noting that the introduction of this variable in the agricultural credit market participation link well with the prior studies which reveal that ownership of durable assets is positively related to credit access (Doan *et al.*, 2010; Wydick *et al.*, 2011). The finding also concurs

with those of Sarma and Pais (2008) that physical infrastructure such as telephone and road-network are likely to increase someone's financial inclusion.

The systematic connection between residents of urban areas and credit market participation remains outstanding. The statistical positive significant coefficient of *RE2* at one percent predicts that farmers in big provinces such as Dambatta Zone rely heavily on borrowing as the accessibility of lending institutions is widespread rather than own capital, relative to households at Rano Zone (reference group). Put differently, in comparison to households located at Rano Zone, the probability of a household to participate in agricultural credit market is 0.23 percentage points higher if he is located in Damabatta Zone. Besides, this finding corresponds to those of Mpuga (2010) and Nguyen and Luu (2013), and it reflects the capability of farmers in large province to obtain credit within their complex networks, to benefit from the available bank branches. The inclusion of this variable has yields an interesting finding with respect to location in relation to credit market participation in accordance with the theoretical expectations.

5.4.2 Marginal Effects at Representative Values

Marginal effects at representative values obtained from the logit estimates on Table 5.9 might therefore often be more informative especially with regard to specific variables. It could be instinctively meaningful while explaining how the impacts of some variables vary by other attributes of the households.

Estimates from Model 1 of Table 5.9 infers that on average a farmer who engaged in extra business activities has predicted 9.3 percent chance of credit market participation. This indicates that by virtue of engaging in extra off-farming business this type of

household has an additional 1.7 percent chance of securing loan compared with result in Table 5.8. It might be explained that diversified farmers were encourage to undertake large scale production through agricultural mechanization. However, the predicted probability of a farmer who possessed radio and television is 11.2 percent on one hand. It appears that the chances of participation in credit by this type of farmers decreases by 2.7 percent than before. On the other hand, the probability of being included in the credit market increases slightly only by 0.6 percent for traditional tools users among farmers who reside in big province like Damabatta Zone, due to the demand and long queue associated with urban borrowing. However, the chances of securing loan for those with access to different source of credit information increases from 19.6 percent in Table 5.8 to 21.4 percent in Table 5.9 provided that they are part of the mechanized farmers. Interestingly, these farmers have gained an extra 1.4 percent to their odds due to their information regarding agricultural loans. However, it is worth noting that the coefficient of *TTL* is statistically not different form zero with respect to other varying characteristics. This might be explained by the fact that too much preferences were given to the community leaders initially making their probability to receive credit inelastic with respect to changes on other explanatory variables.

Table 5.9
Marginal Effects at Representative Values

Model (1) at TOL= 0.368	**Coefficients**	**Standard Errors**	***p*-value**
TRD	**0.093**	0.030	0.002***
TTL	0.036	0.025	0.153
Model (2) at TOL = 0.368			
RTV	**0.112**	0.023	0.000***
RE2	**0.237**	0.038	0.000***
RE3	0.014	0.031	0.660
Model (3) at COM = 0.099			

INF	**0.214**	0.030	0.000***
RTV	**0.113**	0.022	0.000***

Note: dy/dx for factor levels is the discrete change from base level while Note: *** represents 1% level of significance

5.4.3 Diagnostic Tests for Credit Participation Model

This section presents in detail the diagnostics tests such as; model fitness and specification to ensure that the model is correctly specified and fit. According to Hair, Black, Babin and Anderson (2010), VIF values above 10 (which correspond to tolerance value below 0.10) indicates a multicollinearity problem. The VIF values are presented in Appendix 5, however, it shows no evidence of multicollinearity problem as the values fall below 10 for all the predictors.

Similarly, different R^2 have been computed in Table 5.10. For instance, the credit participation model's goodness of fit could be assessed by count, McKelvey and Zavoina, Cragg-Uhler and Nagelkerke and pseudo R^2, where some of them may be comparable to the R^2 in the ordinary least square model. More specifically, the percentage of determination accounted by McKelvey and Zavoina R^2 is attractive. Because 57.90 percent of the variations in the regressand has been explained by the model. This fitness is higher than McKelvey and Zavoina reported in Kaplan and Prato (2012). Similarly, the Pseudo R^2 is another measure of fit where 37.10 percent is an indication of a good model in cross section of binary regressand model. Additionally, the percentage of both Effron R^2 and Count R^2 further validate the fitness of the model.

Moreover, the results of model fit tests are reported in Table 5.10. The model's overall goodness of fit was tested using the likelihood ratio (LR) χ^2 (1). The model's LR χ^2 (1)

statistic is different from zero at one percent indicating goodness of fit for the whole model. Similar to likelihood ratio χ^2 (1), the Wald χ^2 statistics also test the hypothesis that all parameters are simultaneously equal to zero. Indeed, it test the overall model's goodness of fit. This test is similar to *F*-test in linear regression model. Table 5.10 shows that the Wald χ^2 statistics is significance at one percent, rejecting the null hypothesis that all parameters are simultaneously equal to zero. This indicates that at least one of the coefficients in the model has effect on the dependent variable. In addition, the LR test of smooth constraint has been conducted. This test is worth conducting due its ability to provide a χ^2 contrast between restricted and unrestricted model. However, the LR χ^2 (2) is statistically different from zero at one percent suggesting the goodness of the full model, and also indicates that the restricted model nested in the full model.

Other information criteria such as Bayesian Information Criterion (BIC) is also another different measures of model fit. This information was computed from the fit statistics after the estimated models in comparison to nested model. The difference of 40.539 in BIC provides a very strong support for the full model (for BIC criteria see Raftery, 1996). Therefore, the estimates of the model fit the data at a highly acceptable level.

Moreover, a very comprehensive and accurate binary classification has been depicted by the Receiver Operating Characteristics (ROC). This curve predicts the ability of the model to distinguish between the two binary outcomes. The general rule suggests that a value between $0.8 \leq \text{ROC} < 0.9$ is considered as an excellent classification (Hosmer & Lemesbow, 2000; Hosmer, Lemeshow, & Sturdivant, 2013). Therefore, the ROC value of

0.858 indicates that the model has discriminates 85.81 percent between credit participants and non-participants, indicating an excellent discrimination among respondents. Similarly**,** the percentage of correct predictions (PCP) which was obtained from a classification table shows the predictive power of the model. This is usually done by assessing the model's ability in classifying the outcomes of the dependent variable. As indicated in the table, the percentage of cases correctly predicted is 89.58 percent. This is considered very high as Pampel (2000) suggests between 50 percent and 100 percent correctly predicted cases as a measure of predictive accuracy. Apart from model fitness, model specification check is also very important, as misleading inferences may result from inappropriate model specification. Therefore, in order to avoid bias and inconsistent results, Table 5.10 presents the result of the link-test. The test is based on the assumption that if a regression is properly specified, then any additional independent variable should be insignificant except by chance. Interestingly, result shows that the model is correctly specified as the *hat* is statically different from zero whereas the hat^2 was found to be insignificant (Pregibon, 1980).

Table 5.10
Diagnostics Test and R-squares

R^2	*p*-value	Difference	Percentage
Pseudo R^2	-	-	37.10
McKelvey and Zavoina R^2	-	-	57.90
Cragg-Uhler-Nagelkerke R^2	-	-	46.70
Efron R^2	-	-	37.00
Count R^2	-	-	89.60
Diagnostic Tests:	-	-	
Likelihood Ratio χ^2 *(1)*	0.000	-	-
Likelihood Ratio χ^2 *(2)*	0.000	-	-
Wald χ^2	0.000	-	-
Hat	0.000	-	-
Hat^2	0.319	-	-
BIC	-	40.539	-

ROC	-	-	85.81
PCP	-	-	89.58

5.4.4 Robustness Check for Logit Credit Participation Model

In an attempt to validate the results of credit participation model in Table 5.8, three explanatory variables were removed from the model of which two of them were strongly significant in the full model; namely *TRD, RE2* and *RE3*, respectively. But more excitingly, the omission of these variables do not affect the overall impacts of other explanatory variables in the model. Besides, together the explanatory variables included in the model turned out to be significant throughout the estimations. In other words, estimates under both restricted and unrestricted Logit models appear very promising in explaining the activities with regard to credit participation. Moreover, the formal test for model selection as required (Long & Freese, 2001, 2014), systematically were skewed in favour of the full Logit model by the significance of LR χ^2 (2) at conventional level in Table 5.10. By and large, statistical inferences from Figure 5.5 suggest that the regression equation has successfully discriminate between credit participants and non-participants with high level degree of precision at 85.81 percent; which is also a clear indication of model fitness.

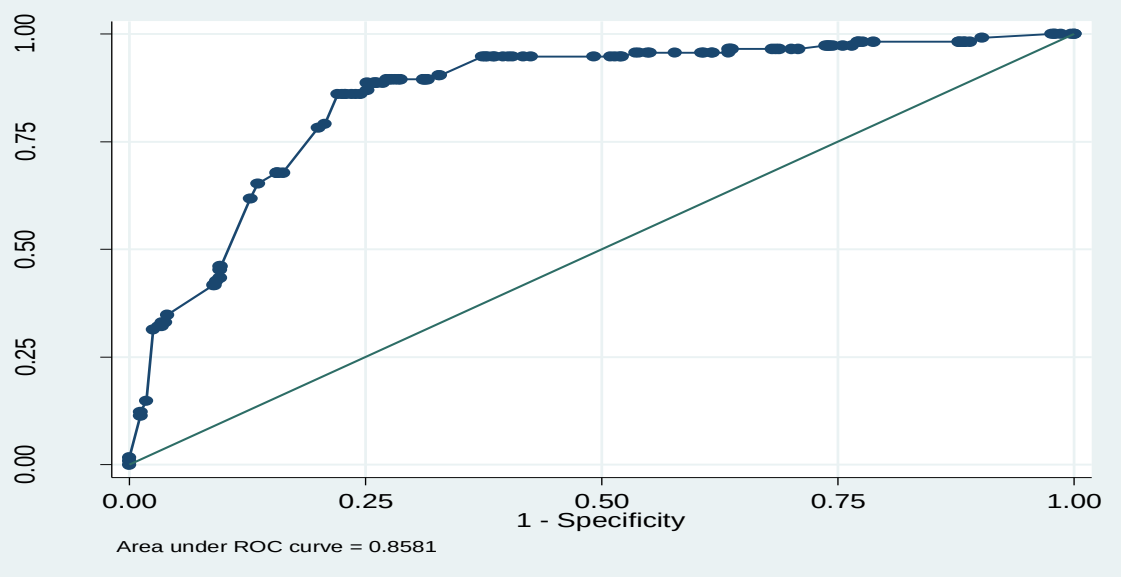


Figure 5.5
Receiver Operating Characteristics

5.5 Results of Credit Market Choice

This sections present the results of multinomial Logit regression model (MNLM) in order to achieve the objective two of this study. Several diagnostics and robustness checks were conducted in the analysis to ensure that the model is fit and correctly specified.

5.5.1 Estimation and Discussion of Credit Market Choice

The odds ratios of the MNLM are presented in Table 5.11. The coefficients indicate the influence of each explanatory variable on the different choice of agricultural finance relative to the base category (self-finance). Thus, the coefficient estimates compare the likelihood of different agricultural finance options; self-finance (1); relatives and friends (2); microfinance (3); commercial banks (4); and government finance (5). The Outcome level 1 (self-finance) is chosen as the base category, not only because it is the group with the highest outcomes which the software (Stata 13) chooses automatically, but also it is regarded as a unique way by which farmers can resort to finance their farming activities.

Because apart from the self-finance, all other choice like relatives and friends, microfinance, banks and government are different forms of loan.

Odds ratios as presented in Table 5.11 are the numbers which multiply the odds of choosing a particular alternative among different alternatives of agricultural finance relative to other alternatives. However, these odds ratios was converted in to percentages in Table 5.12 for analysis as suggested by Pampel (2000). It turned out from Table 5.12 that all the independent variables included in the model are statistically significant with respect to different outcomes at various level.

AGE is different from zero at five percent with respect to outcome (4) which is commercial bank. The positive and significant coefficient of *AGE* indicates that the odds of obtaining agricultural credit through commercial banks increases by 14 percent for a year increase in farmers' age relative to self-finance.

Because of the ability of old farmers to accrue assets that could serve as collateral, commercial banks considered them as creditworthy. As such, they are more probable to get loan from commercial banks. This correspond to the findings of Blancard, Boussemart, Briec, and Kerstens (2006) and Kebede and Abera (2014) that an increase in age is associated with an increase in farming business experience, income and wisdom, which make them more likely to obtain formal financial loan. However, it contradicts the findings of Masoud and Mwirigi (2013) that older individuals are less incline to uptake loans.

Similar to *AGE, MAS* is also positive and statistically relevance with respect to commercial banks loan only. The significance of this variable implies that married farmers are more likely to get credit than non-married ones. But the odds of obtaining credit by married farmers from commercial banks is 823.8 percent higher than non-married farmers relative to self-finance (reference group). This could be explained by the fact that married farmers are more likely to be stable and viewed by the financial agencies as more reliable to allocate credit. This category of farmers are more likely to obtain formal financial loans because they are considered more matured compared with the unmarried farmers. The finding that married farmers were not excluded from access to basic formal financial service is imperative for their welfare so that they could not be exposed to poverty and lack of financial opportunities. The result is similar to findings of Mpuga (2010) that married individuals are more likely to demand loan on one hand. But in particular they are more likely to obtain credit only from relatives, credit associations, government and cooperatives on the other hand. The result also stands in agreement with those of Akoten, Sawada, and Otsuka (2006) that banks in Kenya appear to apply social mechanism such as marriage for screening of applicants as consistently used by the informal lenders before credit advancement. Moreover, the finding is also consistent with the Kiplimo (2015) that married farmers who are together with their spouses are more likely to get loan, since formal lenders find them more negotiable to loan terms.

Human capital indicators such as educational qualification of the farmers was found to be very relevance in the analysis of credit market choice. The variable *QLF* is negatively significant at five percent with respect to loan from relatives and friends and

microfinance, but positively insignificant in relation to loan from banks and government. This implies that a year increase in the educational level of a farmer decreases his preference to demand loan from relatives and microfinance by 11.3 percent and 12.8 percent relative to self-funding than uneducated farmer. It follows that the preference to obtain loan from informal lenders is high for the uneducated farmers. However, the fact that loan from informal source such as relatives is very small, educated farmer may not need it as his personal human capital development is enough for him to sustain economic independence. This finding is in conformity with the idea of Muguchu (2013) that education obstructs accomplishment of entrepreneurial outcomes by decreasing the curiosity and risk-taking ability, which thought to foster conformism and small tolerance for entrepreneurial risk. This result can be comparable with those in Tang *et al.* (2010) that although the preference of credit for educated household is high for the formal loan, but it tends to be low for the informal loan. The finding also agrees with position of Zeller (1994) that informal lenders may not necessarily value education as an instrument for repayment ability. However, according to Mpuga (2010), educated farmers are more associated with borrowing from private money lenders, government, commercial banks and formal NGOs, but insignificant in relations with borrowing from local community, credit associations and relatives. But generally, the finding is consistent with Pederson *et al.* (2012).

Of notable importance in Table 5.12, are the statistical significance of occupational dummies; *FAM*, *TRD* and *CVS,* with respect to different choice of agricultural finance at various significant degrees. To start with households who have no any other engagement

except farming, the coefficient of *FAM* was found to be different from zero at one percent with respect to government source; however, statistically insignificant in relation to other source. On one side, *TRD* which represents the entrepreneurial engagement of a farmer is positively and statistically significant at one percent in connections to all source of loans except for commercial banks loans. On the other side, *CVS* which indicates farmer being in civil service or engaged in administration was also found to be positive and significance with respect to microfinance loan and government borrowing, albeit insignificant in relations to banks and family loans.

The positive significant coefficient of *FAM* with regard to government source predicts that the odds of obtaining loan for households with no any other engagement except farming is 29.6 percent higher for government loan with reference to self-finance than farmer with an additional commitment apart from farming. This is to say that a decrease in off-farming commitment increases the odds of farmer being confined only to cheap and subsidized government loan by 29.6 percent. This indicates the effect of lack of other means, as most of this households are subsistence farmers; that is why most of them were crowded out from the credit market making them only to wait for government intervention.

In contrast, the positive and significant coefficient of *TRD* at one percent infers that the odds of obtaining credit from governments, microfinance banks and relatives increases by 36.5 percent, 424.3 percent and 661 percent with an increase in non-farming business relative to self-finance. It follows that as off-farming business increases households tends

to consult associates to finance some profitable ventures. The fact that this type of farmers was encouraged for more diversification, government tends to gives them loans. On the other hand, the high level of their non-farming businesses give them an opportunity to acquire more assets that could enable them to access financial services including credit.

Moreover, the variable *CVS* is positive and statistically different from zero with respect to microfinance and government loans at conventional level, but statistically unimportant in connections to commercial banks and relatives borrowing, respectively. This implies that to every additional promotion in the civil service is accompanied with an increase of 204.9 percent odds of sourcing agricultural loans from government source than otherwise. But the preference for the civil servant to borrow from microfinance banks has double as the odds increases to 536.8 percent than non-civil servant. The fact that government is the major employer of civil servants and more upon channel their salary to microfinance banks as a strategy for these banks to survive, highlight its importance to civil servant as the major source of financial services. Generally, findings with respect to households' occupational choice are imperative with regards to choice of agricultural finance and has concurs with many studies. Mpuga (2010) found that those in trade and administration among households are more probable to demand loan from government, commercial banks and money lenders. Equally, those at the industrial segment are more likely to demand loan from relatives and friends, money lenders and associations, due to the increasing activities of informal lenders in Uganda. For the households who engaged in business activities, their preference to borrow from all the available credit sources

declines, in comparison to those engaged primarily in agriculture in same study. The result also corresponds with the findings of Kiplimo (2015) that those with salaried or employed outside agriculture among households are likely to obtain credit.

Similar findings was also reported by Awunyo-Vitor and Abankwah (2012) that there is significant and positive relationship between formal loan demand and engagement outside agriculture. They postulate that formal lenders relied more on other income activities of the farmers in case of crop failure to cover their loans. But this finding is different from Nagarajan *et al.* (1998) that the preference for household to demand credit falls with an increase in off-farming commitment. Their findings suggest that an increase in non-farming business increases an individual's income and opportunities for self-funding.

The variable *SUB* was found to be insignificant with respect to all the credit alternatives except for the microfinance banks at five percent. The negative statistical significance of this variable implies that the preference of the microfinance banks to release credit to farmers goes down by 81.6 percent for subsistence farmers than otherwise. This is plausible as this type of farmers virtually consume all what they produce, leaving no resource for future productive investment, making lenders to view them as potential risk borrowers with no repayment capability. It appears that the probability of being crowded out from the loan contract by microfinance banks increases for subsistence farmers relative to self-finance than commercial farmers. The introduction of this variable into agricultural credit market is generally important in the literature, since it justified that

commercial and mix farmers may likely have access to financial services including credit. Although studies that have analyse farming system in relation to farm credit are very rear.

However, a number of reasons may likely cause subsistence farmers to be crowded out from the credit market. Apart from the institutional factors such as communication hurdles and poor road network, Datta (2004) elucidates that poor farmers may lack the ability to take risks which may be one of the key factors for their unsuccessful entrepreneurships. The fear that the loan may not necessarily be repaid because they lack profitable ventures, poor farmers are largely running away from it. Consequently, they become risks averse farmers so that they would not be saddled with the liability that may lead them to depart with their property in the repayment process. Alongside with the exorbitant interest rate charges, together with unfriendly repayment process also demotivate this type of farmers from accepting credit. Though they may need a loan, but most of these farmers could not afford to bear the risks related with loan contracts.

Notwithstanding, the fact that the loan needed for the subsistence farmers is mainly for survival protection, lenders may not be enthusiastic to offer them. Because most of the bank's loan is promotional not for survival goal. Whereas promotional loan could be an important instrument that can enhance the productivity of commercial farmers. On the other hand, poor households who are susceptible to income shocks are seriously in demand of credit for survival and protection needs which is unlikely given by the banks.

Results in Table 5.12 show that the coefficient of *EXP* appears negatively significant at 10 percent with respect to borrowing from microfinance banks, albeit insignificant in connections with other borrowing alternatives. It appears that for every additional year in farming business, farmer's preferences to borrow credit from microfinance banks falls by 2.9 percent than an inexperience farmer. This suggests that a farmer who stay longer in the agricultural business has acquired skills and manoeuvres which make him economically independence, and therefore less likely to demand credit from the microfinance banks.

It is plausible that the experience a household has gained in farming practice would give him a practical knowledge on how to overcome the obstacles associated with loan. Such experience would help him to address his financial demand in better ways and less risky means. Thus, would probably reduce the risk of loan portfolio. However, the result contradict the findings of Nguyen and Luu (2013) that the characteristics of firm's owner such as professional experience influence his desire to seek institutional loan.

But the finding in Table 5.12 is similar to position of Wayne *et al.* (2000) that majority of the farm credit users are generally characterized by less years of farming experience. The result further concurs with those of Nakano and Nguyen (2011) that old farmers seem to be less willing to take risks as such they tends to use their assets rather than resorting to informal borrowing. It is also corresponds with the findings of Turvey, He, Ma, Kong, and Meagher (2012) that the longer a household stayed in farming business the likely that his elasticity of credit demand will fall.

Of notable importance in Table 5.12 is the negative statistical appearance of *FSZ* with respect to borrowing from relatives at five percent and microfinance banks at 10 percent, but negatively insignificant in relations to borrowing from banks and government. This implies that an increase in one hectare will decrease the odds of borrowing from the relatives and microfinance banks by 74.5 percent and 18.6 percent, respectively, relative to self-finance (the excluded category). These results suggest that landholding seems to play unimportant role on borrowing and choice of credit market; which may be partly associated with fact that the loan granted is too small for farmers with large holdings. But the results are in line with most of the government policy that favoured cheap credit instead of guaranteed credit (Petrick & Latruffe, 2006). The results also vindicate with the findings of some empirical studies (Barslund & Tarp, 2008) and contradict with those of Diagne (1999); Mpuga (2010) and Binswanger and Rosenzweig (1986).

Table 5.11
Odds Ratio of Multinomial Logit Model of Choice of Agricultural Finance

	(2)	**(3)**	**(4)**	**(5)**
Variables	**Relatives**	**Microfinance**	**Banks**	**Government**
AGE	1.079	1.031	1.140**	0.950
	(0.064)	(0.0269)	(0.070)	(0.047)
MAS	1.023	0.757	9.238***	1.110
	(1.207)	(0.407)	(6.450)	(1.367)
QLF	0.887***	0.872***	1.023	1.002
	(0.038)	(0.030)	(0.070)	(0.077)
FAM	0.464	1.705	0.176	1.296***
	(0.293)	(1.197)	(0.194)	(1.209)
TRD	7.610***	5.243***	2.391	1.365***
	(2.850)	(3.277)	(2.074)	(1.078)
CVS	0.996	6.368***	0.750	3.049***
	(0.750)	(3.925)	(0.735)	(1.920)
SUB	2.279	0.184**	1.735	0.694
	(1.314)	(0.131)	(1.122)	(0.606)
EXP	0.966	0.971*	0.959	0.984
	(0.040)	(0.016)	(0.033)	(0.028)
FSZ	0.255**	0.814*	0.560	0.505
	(0.173)	(0.091)	(0.219)	(0.212)

POL	0.375*	1.420	2.269	0.432
	(0.213)	(0.501)	(1.598)	(0.320)
PRF	1.5950***	2.687	1.624***	1.076
	(6.5760)	(2.921)	(1.296)	(1.052)
RE2	1.155	4.260***	9.623***	6.216***
	(0.627)	(1.460)	(7.411)	(2.602)
Constant	9.860***	0.017**	0***	0***
	(1.560)	(0.035)	(0)	(0)

Note: Robust standard errors in parentheses. ***, ** and * donate statistical significance at 1%, 5% and 10%, respectively. Outcome (1) which is self-finance was omitted because it is a reference group, while (2) to (5) are the estimates of the remaining outcomes (relatives and friends, microfinance banks, commercial banks and government subsidized loan). *AGE* is the age of the farmers, *MAS* is the marital status (1=married), *QLF* is education in years, *FAM* is the primary occupation (1=farmer), *TRD* is the entrepreneurial ability (1=if engage in trading), *CVS* is the dummy of administrative involvement (1=if civil servant), *SUB* is the farming system (1=if subsistence farmer), *EXP* is the years of farming business, *FSZ* is the farm size, POL is the dummy for political affiliation (1=if member of ruling party), *PRF* is the profit from farming (1=if farming is profitable), *RE2* is the regional dummy (1=if located in urban areas)

Nevertheless, the findings that an increase in landholdings decreases farmers' borrowing preference goes with the intuitions of Foltz (2004) that a wealthier household stand a chance to participate in credit market, but they are very unlikely to demand it. In fact, those category of farmers are likely to become source of informal finances in their communities, and the consequential effect will increase the supply of credit.

Table 5.12
Odds Ratios of Choice of Agricultural Finance in Percentage

	(2)	**(3)**	**(4)**	**(5)**
Variables	**Relatives**	**Microfinance**	**Banks**	**Government**
AGE	7.9	3.1	14.**	-5
MAS	2.3	-24.3	823.8***	11
QLF	-11.3***	-12.8***	2.3	0.2
FAM	-53.6	70.5	-82.4	29.6***
TRD	661***	424.3***	139.1	36.5***
CVS	-4	536.8***	-25	204.9***
SUB	127.9	-81.6**	73.5	-30.6
EXP	-3.4	-2.9*	-4.1	-1.6
FSZ	-74.5**	-18.6*	-44	-49.5
POL	-62.5*	42.0	126.9	-56.8
PRF	59.5***	168.7	62.4***	7.6
RE2	15.5	326***	862.3***	521.6***

Refer to Table 5.11 for definition of the variables and asterisks.

This suggests that land holdings as foreseen by Foltz increases supply more than credit demand, and the benefits of landholdings with respect to credit supply might be sturdier than the extent to which it rises the investment desire.

At 10 percent level of significance, result in Table 5.12 indicates that the coefficient of *POL* is statistically relevance in relations to borrowing from relatives and friends. The systematic negative appearance of this variable infers that in comparison to self-finance being member of ruling political party decreases the odds of borrowing from relatives and friends by 62.5 percent. This means that the preferences to borrow falls by 62.5 percent as farmer increases his political commitment. This is unexpected from the study's prediction, but the result shows that political party members are intermediate links between government and its sympathizers making them to become source of finance for their political alliance. Though they stand for a better chance to be granted loan, indeed they are less likely to demand it, which may probably lead to more supply. However, this result is different from the relationship found in Akudugu (2012) and Nguyen and Luu (2013). Besides, Zhang (2008) argues that firms who are politically connected in Chengdu of China have more chances of using formal loan than self-finance.

However, the finding that political connections is a criterion for credit access has adverse consequences on the credit repayment, due to the notion that this type of household may likely regard credit as political gifts from the political mentors. Apart from this, it also points out the extent of credit market imperfections in these economies, which may likely be different from Nigeria that may serve as a rational for this outcome on one hand. The

finding that members of ruling party has less preference to borrow from the informal source highlight the effect of contextual differences; and heterogeneity in the demand for credit and preferences in borrowing choice on the other hand.

The positive significant coefficient of *PRF* at one percent with respect to borrowing from the informal and formal lenders validates the importance of profit in farming business with the greatest impact being found for banks' borrowing. In comparison to non-profit farming, a one percent increase in farming profit increases the odds of borrowing from relatives and commercial banks by 59.5 and 62.4 percent, respectively, compared to self-finance. In this case, borrowing preference for the household is little higher for the bank's loan due to the low interest rate charge by the formal lenders than to invites friends and relatives to invest in the business, where they may likely demand substantial amount in the profit-sharing formula. It may also be explained by the fact that either with usury or otherwise, loans from relatives and friends are usually small, whereas bank's loan may be substantial enough to finance big project which promised more returns. Besides, this finding is consistent with some previous empirical studies in different economic sectors (Beck *et al.,* 2006; Fhima & Bouabidi, 2011; Hartarska, 2012; Klinefelter & Penson 2005; Nguyen & Luu, 2013). Moreover, the finding implies that a household who make profit from farming activities seems to wisely solve his financial obstacles by combining both informal and formal loans. Due to the bottleneck of formal credit and the borrowing limit of informal source, farmers are unlikely to satisfy their financial need through solely prone to commercial bank' loan, informal loan or owner's capital. In fact, the finding is in agreement with the those of Rand (2007) that profit making firm is of the highest need

for external capital. The finding also corroborates with those of Hashi and Toci (2010) that prospective firm that in need for expansion, tends to be more likely source finance from the bank. This suggests that adverse selection might not be problematic to this type of farmers, since less prospect farmers are very unlikely to participate in the agricultural credit market and further worsening the application process. Besides, the introduction of this variables justified its importance in agricultural credit modelling.

More interestingly, farmers' location infers another story with respect to choice of credit market. *RE2* dummy is found to be significant with respect to all different alternatives of agricultural finance except borrowing from relatives and friends at conventional level with the strongest impact being found for bank's borrowings. The positive statistical evidence of this variable implies that urban farmers had a greater opportunity to borrow from microfinance banks, commercial banks and government as well, compared to farmers living elsewhere. Indeed, farmers living in urban province (Dambatta Zone) are closer to microfinance banks and other formal financial lenders which may facilitate loan applications quickly. Whereas, farmers living far away from the city are unlikely to have greater access to variety of formal lenders. That is why the odds of borrowing preferences from microfinance banks, commercial banks and government for households living in urban areas (Dambatta Zone) increases by 326 percent, 862.3 percent and 521.6 percent as well, then farmers elsewhere. Besides, due to the long queue associate with commercial banks' loan and high level protocol related to governments' loans, these type of farmers seem to supplement their extra credit demand with microfinance borrowing.

Notably, this result is not different with other previous studies that the odds of borrowing preferences from formal lenders tends to be low for rural households in comparison to urban households. Since rural households lacks so many requirement criteria (Giné, 2011; Mpuga, 2010; Nguyen & Luu, 2013; Sebu, 2013). Consistent with Doan *et al.* (2010), the finding implies that informal source are very important source of finance for the rural households where interpersonal relationship plays a major role in deciding who to get loan. While, urban residence relies more on formal and subsidized-government loans. Although the result contrast with other field studies (Hartarska, 2012; Rand, 2007).

5.5.2 Diagnostics Tests for Credit Choice Model

This section deals with the post estimation tests associated with the MNL choice model. Several tests such as outcome pooling, model specification and fits have been conducted. Estimates from Table 5.13 tests against the null hypothesis that $H_0 : \beta_{1,m|n} = \cdot \cdot \cdot \beta_{K,m|n} = 0,$ using Wald test (Cramer & Ridder, 1991) and LR test of (Caudill, 2000). A statistical significant tests as in Table 5.13 recommend that combining outcomes is not valid. Therefore, the null hypothesis has been rejected at conventional level, suggesting that outcomes *m* versus *n* are distinguishable, hence should not be merged together.

Table 5.13
Tests for Combining Outcome Categories

	Wald Test		**LR Test**	
	χ^2	***p*-value**	χ^2	***p*-value**
Self-finance and Relative	3565.48	0.000	71.366	0.000
Self-finance and Microfinance	58.01	0.000	67.89	0.000
Self-finance and Banks	3200.40	0.000	35.15	0.000
Self-finance and Government	2508.30	0.000	37.859	0.000

Relative and Microfinance	1746.48	0.000	77.071	0.000
Relative and Banks	1322.79	0.000	40.944	0.000
Relative and Banks	2489.15	0.000	44.825	0.000
Microfinance and Banks	828.39	0.000	20.998	0.050
Microfinance and Government	1377.48	0.000	22.021	0.037
Banks and Government	1032.25	0.000	21.811	0.040

The Independence of Irrelevant Alternative (IIA) test is often used to test specification and justification of using MNLM. The null hypothesis tested here states that the odds between a pair of alternatives are independent of the remaining alternatives (Hausman & Mcfadden, 1984; Long & Freese, 2014; Long, 1997; Train, 1986). Thus, based on the statistics in Table 5.14, all evidence found for the five cases are for H_0, and therefore fail to reject the null hypothesis. Such that the five alternatives of the dependent variables are distinct to one another and therefore fit for MNLM.

Table 5.14
Hausman Test for Independence of Irrelevant Alternatives (IIA)

Tests	χ^2	***p*-value**
Self-finance	3.239	1.000
Relatives	0.036	1.000
Microfinance	0.000	1.000
Banks	0.001	1.000
Government	0.051	1.000

Apart from outcome pooling and IIA tests, other tests have also conducted. For instance, the statistics of Hosmer-Lemeshow test for model fits and misspecification (Fagerland, Hosmer, & Bofin, 2008; Fagerland & Hosmer, 2012; Hosmer & Lemesbow, 2000; Hosmer *et al.*, 2013), is insignificant as evident from Table 5.15. Based on this, an insignificant χ^2 (*p*-value=0.733) indicates adequate fit of the model, and therefore, fail to reject the hypothesis that no difference exists between the observed and the model predicted values.

Similarly, estimates from the maximum likelihood (ML) of MNLM could be tested either with a Wald test or an LR test. Both the Wald test and LR test (1) are provided in the second and third row of Table 5.15. In particular, the statistical significance of Wald χ^2 (p-value=0.000) and likelihood ratio χ^2 tests (1) at one percent (p-value=0.000) reject the null hypothesis $H_0 : \beta_1 = \cdots \beta_n = 0.$ Suggesting that at least one of the coefficients in the model has an impact on the dependent variables.

For model building, specification and comparison, the LR test (2) has been conducted using KLIC (Kullback-Leibler Information Criterion) (Long & Freese, 2014; Vuong, 1989). Therefore, the significance of LR χ^2 (p-value=0.000) as indicated in the fourth row of Table 5.15 predicts that the constraint model nested in full model. This statistical evidence provides strong support that the estimated multinomial Logit credit-choice model as in Table 5.12 is correctly specified and well fitted.

Moreover, information criteria for model selection and comparison such as AIC and BIC were also used in this research. Interestingly, result in Table 5.15 indicates that both the AIC and BIC have provide strong support for the unconstraint model. The significance of AIC χ^2 (p-value=0.054); and the differences of 39.15 for AIC and 20.83 of BIC provide very strong support for the full model over the nested one. The use of these criteria as a good measure of model comparison and specification has been grounded in the literature (Cameron & Trivedi, 2009; Long & Freese, 2014; Raftery, 1996). Furthermore, percentage of correct predictions (PCP) as appeared in Table 5.15 is 86.8. This is closer

to what was obtained in the Logit model in Table 5.10 for credit participation, and considered very high.

Table 5.15
Tests for Goodness of Fit for Credit Choice Model

Tests	***p*-value**	***Difference***	***Percentage***
Hosmer-Lemeshow	0.733		-
Wald Test	0.000	-	-
LR Test (1)	0.000	-	-
LR Test (2)	0.000	-	-
AIC	0.054	39.15	-
BIC	-	20.83	-
PCP	-	-	86.8

5.5.3 Robustness Checks for Multinomial Logit Model of Credit Choice

Of notable relevance in terms of robustness checks for model with unordered categorical dependent variables are the LR (Caudill, 2000) and Wald (Cramer & Ridder, 1991) tests for outcome pooling. However, results in Table 5.13 have out rightly reject the null hypothesis that the dependent variables are indistinguishable with respect to regressors in the model. This suggests that all the five different outcomes (dependent variables) are appropriate for the analysis. Moreover, as presented in Table 5.14, Hausman test for IIA is applied to check for the probable violation of the assumption which is part of the critical properties for MNLM. Interestingly, statistical evidence from the test suggests that the model estimates are in conformity with IIA. Besides this two prominent specification diagnostics, the LR test was conducted between the nested and non-nested models and the statistical inferences of this test has favoured the estimations in Table 5.12. Even with the omission of some variables, estimates from the nested model does not significantly differ from the non-nested model (Table 5.12).

Moreover, Wald and LR tests for joint significance of the explanatory variables across the different outcomes alternatives have been conducted as presented in Table 5.16. Iinterestingly, both the two tests results are similar and suggest that all the regressors included in the model are very important. Going by that, one may have confidence and concludes that estimates from the MNLM reasonably fit the data very well and the inferences drawn from the analysis will be good for policy formulation.

Table 5.16
Wald and LR Tests for the Joint Significance of the Independent Variables

	Wald Test		**LR Tests**	
Variables	χ^2	***p*-value**	χ^2	***p*-value**
AGE	8.573	0.073	8.6	0.072
MAS	533.065	0.000	1.8	0.767
QLF	22.081	0.000	15.7	0.003
FAM	315.486	0.000	7.0	0.137
TRD	2516.014	0.000	20.6	0.000
CSV	759.092	0.000	17.4	0.002
SYS	8.836	0.065	11.0	0.027
EXP	5.258	0.262	3.0	0.563
FSZ	11.619	0.02	25.3	0.000
POL	6.979	0.137	6.4	0.169
PRF	1893.543	0.000	9.2	0.055
RE2	1838.855	0.000	47.2	0.000
Set_1	40.352	0.001	590.765	0.000

Note: Wald and LR tests are for the joint significance tests of the independent variables in the multinomial logit model. Set_1 contains *MAS*, *FAM*, *EXP* and *POL*.

5.6 Results of Credit Rationing Model

Like previous section, this section presents the results of MNLM for credit rationing in an attempt to satisfy the objective three of this research. Moreover, numerous diagnostics checks were presented in the section.

5.6.1 Estimation and Discussion for Credit Rationing Model

Marginal effects that relate the impact of each explanatory variable on the predicted outcome probabilities are presented on Table 5.17. For categorical variables with more than two discrete choices, the marginal effect reveals the difference in predicted probabilities for each comparison category relative to the base category. Average marginal effects (AME) was used for the purpose of this study. The average marginal effect is preferred compared with marginal effect at mean (MEM) as some authors have argued that the latter may not indicate a good reflection of the marginal effect at values other than the mean (Cameron & Trivedi, 2009). Table 5.17 presents the marginal effects on the different type of credit rationing in the MNLM.

The coefficient of *AGE* appears to be negatively related to non-applicant of credit (self-finance), and positively related to being satisfied and loan-size rationed borrower as well, at conventional level of significance. All things being equal, the significance of this variable implies that an increase in age of a farmer decreases his probability to resort to self-finance by 0.019 percentage points; and therefore more likely to borrow for agricultural purpose. Besides, it turned out that as farmer grow older his chances of being granted all the credit amount requested increases by 0.004 percentage points. This suggests that old farmers are in the control of more assets that increases their creditworthiness and decreases their likelihood of being credit constraints at all. But, if they reach certain years, it appears that an increase in age is likely to increase the probability of someone to become loan-size rationed borrower by 0.013 percentage points. This is plausible because of the assessment of the project and its viability from the

lenders side, forcing them to approve lower than requested. On the other hand, formal lenders may likely grant lower amount of credit than the requested amount by the clients; because of too much demand of formal credit couple with limited liquid cash associated with developing economies like Nigeria.

Besides, this finding corroborates with the general farm life-cycle theory and many empirical studies (Freel, Carter, Tagg, & Mason, 2012; Kimutai & Ambrose, 2013; Okurut *et al.*, 2005; Treichel & Scott, 2006). However, the findings do not support the positions of other previous studies that the chances of being credit constrained increases with an increase in age (Dong *et al.,* 2012; Omonona *et al.,* 2010). But finding of this nature is important as it shows that old farmers are more manageable to risk and possessed more assets making them more likely to have more access to credit than their counterparts.

Of notable importance in Table 5.17 is the significance of *QLF* on the probability of credit rationing with the highest effects being found for non-applicant outcome. With positive marginal impact on being non-applicant and negative marginal impact reported on being satisfied and loan-size rationed, results indicate that farmers with more years of schooling are more likely to use owned capital for farming production by 0.018 percentage points higher than less educated farmers. Had it been the educated farmer would apply for a loan, the chances that he would not be satisfied with the amount of loan approved to him is 0.011 points; though he would not be considered as loan-size rationed by 0.007 points by the lenders than uneducated farmer. This is because educated farmer

may demand higher amount of loan beyond his credit limit as stipulated by the policy, making lenders to grant him a maximum credit limit, albeit lower than his request. This may be the reason why the preference to use owned money for farming ventures increases with the level of education. Besides, this finding is consistent with those of Baydas *et al.* (1994) in their study of micro-entrepreneur in Ecuador that micro-entrepreneurs with more formal education have more chances of being loan-size rationed or less satisfied-borrower. Similarly, micro-entrepreneurs with more formal education were found to be non-applicants than being satisfied borrowers. It also concurs with the previous studies such as found in Malawi and Madagascar (Sebu, 2013; Zeller, 1994).

The finding implies that educated farmers are more attributed with financial knowledge which provide them greater opportunity for engagement in other productive off-farm business and self-confidence. This make educated farmers more economically stable by providing them with more earnings that reduces their credit demand.

The coefficients of *FAM* and *TRD* which are significant at one percent and five percent have their marginal impact with respect to being satisfied with credit. Thus, the two variables are negatively related with respect to the probability of being satisfied-borrower. Results in Table 5.17 indicate that an increase in agricultural commitment decreases the probability of being fully receiving loan by 0.055 percentage points. Albeit this type of households will be included in the credit market, but they will be granted lower than their requests, *ceteris paribus*. Due to the fear that they lack extra business that will guarantee repayment in case of crop failure and other uncertainties associated

with farming. Hence, they were given lower credit amount making them to become unsatisfied-borrowers.

Although results in Table 5.17 indicate that farmers who engaged in other activities like trade (*TRD*) aside from farming are included in the credit market, but they are 0.072 percentage points less likely to become satisfied-borrowers, other things being constant. This suggests that those engaged in trading among farmers will be included in the credit market, but they are less likely to be given full amount of their requests. For the reason that they may demand too much amount beyond the accommodative-risk capability of the lenders. Consequently, they were given lower than their requests which make them less likely to become satisfied-borrowers. It is plausible since this types of farmers naturally will demand higher amount of credit to finance both on-farm and off-farm investments. Beside, this corresponds to the findings in Baydas *et al.* (1994) that micro-entrepreneurs with extra commitment in agriculture have more chances of being part of quantity-rationed borrowers than being non-applicants entrepreneurs.

Though the coefficient of *CVS* is significant with respect to non-applicants and being constraints, results however indicate a mixed marginal impact across the two alternatives at one percent level of significance. Hence, it exerts more influence on the probability of being non-applicants and being constraints-borrower relative to other occupation. For instance, the preference for civil servant to become non-credit applicant decreases by 0.186 percentage points than otherwise. However, civil servant is more likely to become constraint-borrower by 0.171 percentages relative to those in other sectors, *ceteris*

paribus. These findings are expected, because in the previous MNLM of credit choice in Section 5.5, civil servants are more likely to borrow from government and microfinance due to the reason stated there, but insignificant with respect to the informal sector borrowing such as relatives and friends. Therefore, the negative significant of *CVS* with respect to being non-applicant suggests that civil servants are less likely to become non-applicant, because they have access to government and microfinance bank loan, on one hand. The positive significant of *CVS* with respect to being constraint-borrower on the other hand envisages that the probability of farmers being denied-credit or discourage from informal borrowing increases with an increase in being in the administrative cadre. Aside that, it may also be possible that applicant with administrative commitment might likely demand higher loan amounts than those primarily in agriculture. Since the informal lenders might not value his position; or because of the general perception that higher default-risk is associated with higher loan amount, this type of loan demand is frequently being rationed.

The systematic positive marginal impact of *SUB* in relation to being satisfied-borrower at 10 percent; and negative impact with respect to loan-size rationed-borrower at five percent suggest that subsistence farming is very informative in the credit rationing model. Results however indicate that conditional with other regressors, the probability of subsistence farmer to become satisfied-borrower increases by 0.059 percentage points than commercial farmer. Similarly, the probability of being loan-size rationed-borrower decreases by 0.079 percentage points for a subsistence farmer. The finding that subsistence farmers are less likely to become loan-size rationed-borrower, however, more

likely to become satisfied-borrower highlight the importance of informal borrowing and government credit to these types of farmers. So that, they could be partly accommodated in the credit market. Noting that, subsistence farmers may lack productive investments that will force them to demand higher credit amount. Instead, they tend to demand lower credit amount that can easily be approved by the informal lenders, making them to become satisfied-borrower and less likely being loan-size rationed-borrower.

Though in the previous MNLM in Section 5.5, subsistence farmers are less likely to be given microfinance bank loan, but they are likely to be given informal loan, albeit insignificant in the model. It could further be explained from different perspectives that subsistence farmers may be part of the government targeted group that are in need of consumption-smooth loans. However, the recipients of this type of loans have no influence on the stipulated amount, because it has been dictated by the government policy. As such, subsistence farmers tend to be more favourable, making them to be satisfied with so whatever meagre amount given to them, and therefore become satisfied-borrower. The findings with respect to *SUB* is outstanding in the agricultural credit modelling; and the inclusion of this variable across different models has yields a consistent results which hardly being found in the literature.

The effects of *EXP* on the MNLM of credit-rationing was mixed, however, together was found to be statistically relevance at one percent and five percent, respectively. As expected, available statistical evidence from Table 5.17 predicts that a year increase in farming business decreases the probability of a farmer being credit-constrained or loan-

size rationed by 0.003 and 0.011 percentage points, then unexperienced farmer. But the probability of using owned capital or being non-credit applicant increases by 0.018 percentage points with an increase in farming years. That is why experience farmers are 0.004 less likely to be satisfied with amount of loan offered to them. This might be due to high cost of transaction; or the loan is too small for them. This finding is accordance with those of Baydas *et al.* (1994) that experience micro-entrepreneurs have more chances of being non-credit applicants or loan-size rationed than being credit-rationed. Even though findings of this research was found to be more informative as it provides the statistical significance of *EXP* with respect to being satisfied-borrower or being credit-constrained. Such relationship is rarely being examined in the literature.

Besides, findings of this nature is outstanding, because it highlight the importance of practical experience, knowledge, longevity and managerial capability associated with farming business. Those with more years in agriculture have acquired more skills and manoeuvres that could able to solve their financial problems internally, making them to shun away from credit. The result is also in line with Rand's (2007) intuition that those with higher skills are less likely to demand credit and finance their investment internally.

The coefficient of *FSZ* turned out significantly different from zero at five percent with respect to the probability of being credit-constrained or being satisfied-borrower, albeit with mixed effect. Results however indicate that an increase in one hectare decreases the probability of a farmer to become satisfied-borrower by 0.017 percentage points, thereby increasing his chances to shun away borrowing by 0.011 percentage points than

otherwise. This implies that farmers with large holdings are already in the possession of agricultural inputs which make them less likely to demand loan. Hence, they are more likely to become credit constraints non-borrower.

Table 5.17
Average Marginal Effects for Multinomial Logit Model for Credit Rationing

	(1)	(2)	(3)	(4)
Variables	**Non-Applicant**	**Satisfied**	**Size-Rationed**	**Constrained**
AGE	-0.019***	0.004**	0.013***	0.002
	(0.004)	(0.002)	(0.003)	(0.002)
MAS	0.082	0.002	-0.051	-0.033
	(0.076)	(0.041)	(0.067)	(0.046)
QLF	0.018***	-0.011***	-0.007*	-0.001
	(0.005)	(0.003)	(0.004)	(0.003)
FAM	0.061	-0.055**	-0.045	0.039
	(0.065)	(0.024)	(0.044)	(0.057)
TRD	-0.045	-0.072***	0.038	0.079
	(0.066)	(0.023)	(0.048)	(0.062)
CVS	-0.186***	0.007	0.008	0.171***
	(0.064)	(0.031)	(0.043)	(0.061)
SUB	-0.012	0.059*	-0.079**	0.032
	(0.052)	(0.031)	(0.037)	(0.034)
EXP	0.018***	-0.004**	-0.011***	-0.00310**
	(0.003)	(0.002)	(0.002)	(0.001)
FSZ	-0.004	-0.017**	0.010	0.011**
	(0.012)	(0.007)	(0.009)	(0.005)
POL	-0.055	-0.0481**	0.050	0.053***
	(0.040)	(0.0232)	(0.032)	(0.020)
PRF	-0.169***	0.0782***	0.098**	-0.007
	(0.064)	(0.0243)	(0.048)	(0.038)
RE2	0.064	-0.0431*	0.015	-0.036*
	(0.042)	(0.0238)	(0.032)	(0.019)

Note: Robust standard errors in parentheses. ***, **, and * donate statistical significance at 1%, 5%, and 10%, respectively. Outcome (1) is non-applicant; outcome (2) is satisfied-borrowers; outcome (3) is size-rationed borrowers; while outcome (4) is the constrained-borrowers. Estimates under outcome (1) through outcome (4) are the coefficients of the marginal estimates of the multinomial logit mode *AGE* is the age of the farmers, *MAS* is the marital status (1=married), *QLF* is education in years, *FAM* is the primary occupation (1=farmer), *TRD* is the entrepreneurial ability (1=if engage in trading), *CVS* is the dummy of administrative involvement (1=if civil servant), *SUB* is the farming system (1=if subsistence farmer), *EXP* is the years of farming business, *FSZ* is the farm size, POL is the dummy for political affiliation (1=if member of ruling party), *PRF* is the profit from farming (1=if farming is profitable), *RE2* is the regional dummy (1=if located in urban areas).

Notably, this finding did not differ with the position of Jia *et al.* (2010) that farmers with large hectares are less inclined to apply for loan, but are regarded formally as credit-rationed borrowers. However, the finding contrast with previous studies such as Petrick (2004b) who found that lands are less important in the credit rationing model.

Turning to the farmer's political affiliation in connection with credit rationing, some interesting effects have been noticed. At five percent level of significance, the coefficients of *POL* were found to be relevance with respect to being credit-constrained and being satisfied-borrower, albeit with mixed effects. Results indicate that the likelihood to become satisfied-borrower by a politically affiliated farmer falls by 0.048, and thereby, increasing his probability of running away from the credit market by 0.053 percentage points. It is worth noting that in the credit choice model of Table 5.12 in Section 5.5, those with political commitment are less likely to demand informal credit, however, the results of credit rationing model infers that they are less willing to accept the current loan-size making them to become credit-constrained farmers.

The findings that credit access depends so much on political networks of the firms such as found by Galindo and Schiantarelli (2002) in Latin America, Zhang (2008) and Jia *et al.* (2010) in China have been contradicted in this research. Nonetheless, most of these were conducted outside agricultural sector. But the finding with respect to farmer's political affiliation is imperative, as it infers on the heterogeneous nature with response to credit rationing among varying credit outcomes, and the relevance of farmer's political status in the agricultural credit rationing model has been justified.

As hypothesized and expected, the coefficient of *PRF* was found to be statistically significant throughout in the model with an exception of credit-constrained outcome, with the highest effects being recorded for non-applicant. Conditional with other regressors, results in Table 5.17 indicate that a unit increase in farming profit decreases the probability of a farmer being non-applicant by 0.169 percentage points, thereby boosting his chances to borrow from credit market. Similarly, those making profit among farmers are more likely to become size-loan rationed and satisfied-borrowers as well, than credit-constrained borrowers. Though being loan-size rationed or satisfied-borrower depends on the project assessment by the lenders and availability of credit. But the good story for the profit making farms is the fact that this type of farmers are less likely to be among constrained-borrowers. This finding has important implication in the literature and concurs with risk-balancing theory and consistent with other studies outside agricultural sector (Bratkowski, Grosfeld, & Rostowski, 2000; Galindo & Schiantarelli, 2002; Hashi & Toci, 2010).

This finding is very important in the eyes of policy makers, as it will encourage more competition that will pave way for new innovation in the agricultural sector. It also highlights that future prospects or creditworthiness which proxy by profitability is an observable characteristic to the lenders, which has greater influence that increases farmers' access to external fund. Moreover, the findings agree with the bank screening hypothesis that prospective farmers have less chances of being credit-constrained, because the lenders can easily identify good farmers from bad farmers. While lack of access to institutional credit remain the key factor that hinders the growth of private

sector (Hansen & Rand, 2011). Yet being included in the financial market encourage scale production and consequently increase operational size of the firms that permit them to pastures investment opportunities and exploit growth (Beck *et al.*, 2006; Demirguc-Kunt, 2008).

At 10 percent level of significance, results in Table 5.17 indicate that farmers' dwelling location (*RE2*) is important with respect to credit-constrained status, with the greatest impacts being found for satisfied-borrower. The systematic negative statistics implies that farmers living in urban areas (Dambatta Zone 2) are less likely to be denied loan by 0.036 percentage points than their rural counterpart. Even though they are less likely to be among satisfied-borrowers by 0.043 percentage points. This is not surprising, because there is heavy concentration of banks in the urban areas reaffirming that urban businesses are specifically being protected and favoured by the political class. This is a very common practice specifically in developing world which suggests a more oriented policy bias towards helping urban markets. Consequently, urban residents tend to take competitive advantage and dodge some credit requirement that are inherent in the credit market. While the likelihood of being given credit rises with being urban residents, yet urban households are less satisfied with the credit-limit imposed by the lenders. As such they are less likely to be satisfied with the amount of loan approved to them. This signifies that demand for farm credit is reasonably higher in the urban centres than elsewhere. However, transaction cost may probably be low for the urban clients, compared to rural counterpart, and the consequential effects will be more advantages to urban dwellers. Similar effect has been noticed in the finding of Van de Walle and Cratty

(2004) that government credit policies in Vietnam seems to be more favourable to urban areas by having greater credit access than rural counterpart. It is also corroborate with those of Doan *et al.* (2010), whereas it contradict Rand (2007) and Nguyen and Luu (2013) who found that firms in urban areas are more credit-constrained, and subsequently, they rely more of owned capital for productive activities.

5.6.2 Diagnostic Checks for Credit Rationing Model

The details of outcome pooling have been provided in this section. But interestingly, it appears from Table 5.18 that all the four different outcomes are statistically significant at one percent suggesting that none of them would be pooled together.

Table 5.18
Wald χ^2 Tests for Combining Outcome Categories

Outcomes	χ^2	***p*-value**
Non-Applicant and Satisfied	55.396	0.000
Non-Applicant and Size-rationed	72.864	0.000
Non-Applicant and Constraints	58.838	0.000
Satisfied and Size-rationed	39.476	0.000
Satisfied and Constraints	42.805	0.000
Size-Rationed & Constraints	29.319	0.004

Similarly, Table 5.19 reveals an interesting story, because all the three different tests of IIA available in the literature namely Hausman base, Suest-based Hausman and Small-Hsiao tests have been obtained (Amemiya, 1981; Hausman & Mcfadden, 1984; Long, 1997; Daniel McFadden, Train, & Tye, 1977; McFadden, 1973, 1987; Small & Hsiao, 1985; Train, 1986). But interestingly, none of these tests was against the null hypothesis, indicating that the IIA has not been violated.

Table 5.19
Hausman, Suest-based, Hausman and Small-Hsiao Tests of IIA

	Hausman		Suest-based Hausman		Small-Hsiao	
Variables	χ^2	***p*-value**	χ^2	***p*-value**	χ^2	***p*-value**
Non-Applicant	-35.622	-	29.403	0.293	32.769	0.169
Satisfy	3.175	1.000	19.867	0.798	28.376	0.340
Size-Ration	-21.468	-	24.403	0.536	28.627	0.328
Constraints	-8.696	-	21.73	0.703	24.161	0.567

Similarly, numerous tests for model fitness was conducted. The most prominent are the Wald and LR tests for joint significance of the explanatory variables across the different outcome alternatives as presented in Table 5.20. But with an exception of *MAS* and *FAM*, all the independent variables are statistically significant in the credit rationing model.

Table 5.20
Wald and Likelihood Ratio Tests

	Wald Test		LR Test	
Variables	χ^2	***p*-value**	χ^2	***p*-value**
AGE	32.278	0.000	29.337	0.000
MAS	1.495	0.683	1.485	0.686
QLF	18.08	0.000	16.546	0.001
FAM	4.423	0.193	4.474	0.189
TRD	8.799	0.032	8.584	0.035
CSV	19.455	0.000	12.421	0.006
SYS	7.563	0.056	8.304	0.040
EXP	43.279	0.000	40.724	0.000
FSZ	7.681	0.053	9.732	0.021
POL	11.931	0.008	12.022	0.007
PRF	9.059	0.029	7.15	0.067
REG	6.723	0.081	6.947	0.074

Note: Wald and LR tests are for the joint significance of the independent variables in the multinomial logit model.

In addition, the Hosmer-Lemeshow which tests for model fitness and misspecification (Fagerland & Hosmer, 2012; Hosmer & Lemesbow, 2000) are presented in Table 5.21. But, the Hosmer-Lemeshow χ^2 (*p*-value= 0.185) is insignificant, thus, fail to reject the

hypothesis that no difference exists between the observed and the model predicted values, as such, the estimates of the model fits the data very well. Similarly, the Wald χ^2 and LR χ^2 statistics as provided in the second and third rows of Table 5.21 are significant at one percent (*p*-value=0.000), rejecting the null hypothesis $(H_0 : \beta_1 = \cdots \beta_n = 0)$ that all the parameters are simultaneously equal to zero in the model. Instead, it predicts that the model as a whole is statistically significant.

Apart from that, the LR (2) test for model building, specification and comparison is presented in the fourth row of Table 5.21. The statistical significance of LR χ^2 at one percent (*p*-value=0.000) has provides strong support for the estimated credit rationing model in Table 5.17. Suggesting that the model is correctly specified and well fitted. Similar support was provided by both information criteria in Table 5.21. The significance of AIC χ^2 (0.041) and difference of 29.77 and 2.30 for AIC and BIC test statistics have favoured the estimates in Table 5.17. Moreover, the PCP as presented in the last row of Table 5.21 has correctly predicted 59.7 percent. Even though, this percentage is not very high compared to what was obtained in credit participation and credit choice models. However, it considered modest as it falls within 50 percent and 100 percent suggested in the literature for predictive accuracy (Pampel, 2000).

Table 5.21
Tests for Goodness of Fit for Credit Rationing Model

Tests	***p*-value**	**Difference**	**Percentage**
Hosmer-Lemeshow	0.185		-
Wald Test	0.000	-	-
Likelihood Ratio Test (1)	0.000	-	-
Likelihood Ratio Test (2)	0.000	-	-
AIC	0.041	29.77	-
BIC	-	2.30	-
PCP	-	-	59.7

5.6.3 Robustness Checks for Multinomial Logit Credit Rationing Model

Apart from conventional diagnostic checks that have been satisfied in this section, other important tests associated with MNLM such as IIA, outcome pooling test and the LR tests have also been conducted. More specifically, statistical tests of all the three types of IIA appear favourable and validate the estimates in Table 5.17. Besides, the difference of 29.77 for AIC and 2.30 of BIC, as well as the significance of AIC χ^2 provide strong support for the estimated model. Similarly, the LR test (Vuong, 1989) for model building and selection indicates that the estimated rationing model in Table 5.17 is well fitted and correctly specified, signifying confidence in the estimated output. Besides, the model has been subjected to different changes in specification with respect to some key variables, but the results remain largely the same, suggesting confidence in the key findings. More interestingly, systematic consistencies have been noticed in the analysis. It appears that both estimates from Table 5.12 and those of Table 5.17 did not contradicts one another and remain largely with their theoretical expectations. Overall, one may have confidence and concludes that the estimates from MNLM of credit rationing reasonably fits the data very well and the inferences drawn from the analysis will be good for policy formulation.

5.7 Results of the Amount of Credit Received by Farmers

In Section 5.4, a dichotomous analysis of participation in agricultural credit market has been demonstrated, with respect to the probability of being part of the credit participants or otherwise. While a more rigorous and expanded analysis on the probability of the quantity of credit received by farmers has been shifted to this section. Following the analysis, this model appears to satisfied objective four in this research.

5.7.1 Estimations for Ordered Logit and Probit Models

Results of Logit (ologit) and Probit (oprobit) ordered models for the analysis of the amount of credit received by farmers have been provided in this sub-section. Noting that the notion of latent variable assumption are ignored, hence, estimates from the ordered regression equations are regarded as a non-linear probability models (Long & Freese, 2014). Table 5.22 has yields are very wonderful and expected results. Model 1 and Model 2 are the ologit estimates and its corresponding average marginal effects while Model 3 is the oprobit estimates. The overall results indicate that the probability of obtaining higher amount of credit increases with age *(AGE)* and having irrigational facilities *(IRR)*, ownership vehicle *(VEH)*, proper accounting record *(REC)*, having financial literacy *(LIT)* and presence of lenders *(LEN)* together with living either in Dambatta Zone (*RE2*) or Gaya Zone (*RE3*).

While the probability of obtaining zero amount of credit increases with educational qualification *(QLF)* couple with subsistence farming *(SUB)* and relying on non-hired or purchased farm *(TNR)*. These results have been confirmed by the average marginal effects estimated at the predicted probability of obtaining zero credit amount. Results in Model (2) suggest that educated farmers and those with land tenure from pledge, gift or inheritance together with subsistence farmers are more likely to receive lower or zero amount of credit than otherwise. Although the validity of these results is questionable as statistical tests indicate that the parallel regression assumption (Brant, 1990; Long & Freese, 2014), or sometimes called proportional odds assumption (Wolfe & Gould, 1998)

has been violated as shown in Table 5.23. With the significance of LR χ^2 and Wolfe-Gould statistics, estimates from Table 5.22 would not reliably fit for policy formulation.

Table 5.22
Ordered Logit and Ordered Probit Models

	(1)	(2)	(3)
Variables	**OLogit**	**Margins**	**Oprobit**
AGE	0.015	-0.002	0.002
	(0.012)	(0.003)	(0.008)
QLF	-0.045**	0.006**	-0.0352**
	(0.022)	(0.003)	(0.014)
IRR	0.949***	-0.137***	0.595***
	(0.178)	(0.025)	(0.116)
VEH	0.673***	-0.097***	0.0531
	(0.251)	(0.036)	(0.169)
TNR	-0.161	0.0233	-0.183
	(0.204)	(0.030)	(0.126)
SUB	-0.365	0.053	-0.118
	(0.224)	(0.032)	(0.136)
REC	1.426***	-0.206***	0.615***
	(0.194)	(0.026)	(0.125)
LEN	1.835***	-0.265***	1.089***
	(0.222)	(0.027)	(0.133)
LIT	0.467**	-0.068**	0.286**
	(0.220)	(0.032)	(0.136)
RE2	2.081***	-0.271***	1.046***
	(0.372)	(0.041)	(0.202)
RE3	2.817***	-0.394***	1.747***
	(0.353)	(0.036)	(0.191)
CUT_1	4.892***	-	2.767***
	(0.744)	-	(0.403)
CUT_2	5.841***	-	3.315***
	(0.754)	-	(0.407)
CUT_3	8.135***	-	4.629***
	(0.786)	-	(0.423)

Note: Dependent variables are the extent of credit participation with 0 for those who did not participate; 1 for those who obtained lower amount ($50 - $350 =1); 2 for those who obtained medium amount ($351 - $1000 =2); and 3 for those who received higher amount ($1001 and above =3). While Models 1 and 2 are the ordered Logit regression and corresponding average marginal effects given the predicted probability of having zero amount of credit (outcome), model (3) is the ordered Probit estimates. *AGE* is the age of the farmers in years, *QLF* is the years of education, *IRR* is the irrigation dummy (1=if access to irrigation), *VEH* is the ownership of car or bus (1=if possession of car or bus), *TNR* is the dummy representing ownership type of landholding (1=if inherited, pledge or gift), *SUB* is the dummy representing the type of farming system (1=if subsistence), *PRF* is the profit dummy (1=if making profit), *REC* is the dummy of bookkeeping (1=for farm with bookkeeping), *LEN* is the lenders dummy (1=if presence of lenders in the area), *LIT* is the credit awareness and financial literacy (1=financial literate) while *RE2* is the regional dummy representing urban areas (1=if residence of Dambatta Zone or Zone 2) and *RE3* is the regional dummy representing rural areas (1=if residence of Gaya Zone or Zone 3) (1=if Zone 2 residence), *CUT_1, CUT_2* and *CUT_3* are the departure cut point order from having zero credit amount to higher amount. Robust standard errors in parentheses while

***, **, and * are the statistical significance at 1%, 5% and 10% respectively as indicated by their corresponding *p*-values.

Table 5.23
Tests for Parallel Line Assumption

	Ordered Logit		Ordered Probit	
	χ^2	***p*-value**	χ^2	***p*-value**
Likelihood Ratio Test	154.41	0.000	-	-
Wolfe-Golf Test	271.81	0.000	271.96	0.000

5.7.2 Estimation and Discussion for Partial Proportional Odds Model

As an alternative, Long and Freese (2014) suggest the use of other ordered model such as Fu's (1998) Generalized Ordered Logit model (GOLOGIT) which totally relaxes the proportional odds assumptions. But instead of the Fu's model to fit the partial proportional odds model, it however, fit only the less constrained model. But interestingly, an improved version of this model was developed by Williams (2006) which is called partial proportional odds model (GOLOGIT2). Even though this model has been enthused by Fu's model, however, it overwhelms the Fu's model drawbacks and offer numerous features that could not only make the estimation of this model very simple, but also more appealing.

Partial proportional odds model provides an ordinal alternative that does not violate the parallel regression assumptions, and produce output similar to that of Fu's (1998) model; and is more parsimonious than multinomial models. Specifically, the output produce by this model is more informative than the ordered logit model, and has the capability to free all explanatory variables from constraint to parallel lines assumption. Perhaps, if this

model were to be estimated using either ordered Logit or Probit regressions, the estimates would be incomplete, incorrect and misleading.

Although GOLOGIT has been rarely used elsewhere (Lall, Walters, & Morgan, 2002), but the use of partial proportional odds model in this study is another contribution in the literature. As yet to the best of researcher's knowledge there is no empirical researches on credit market in particular and agriculture in general using this model.

Table 5.24 presents the odds ratios of the partial proportional odds model, while these estimates were converted in to percentages in Table 5.25; but most of the variables are consistent with their hypothesized values. Specifically, the coefficient of *AGE* is statistically different from zero at five percent and one percent, however, it associates positively with borrowing medium and higher amount of credit. This implies that as age of a farmer increases the odds of borrowing moderate amount of credit will increase by 3.6 percent and larger amount by 8.5 percent, respectively, in comparison to young farmers.

Though an increase in age will increase someone to participate in credit market, but his borrowing preferences is higher if he can able to get larger amount of credit. Freel *et al.* (2012) noted that young farmers may be much in need for loan but their application are very unlikely to succeed, due to their inexperience. Therefore, age is frequently regarded as a proxy for asset and experience. Farmers with more age may be more connected with financial institutions as well as farmers' cooperatives that can help them to secure larger amount of credit. This finding concurs with the results of Akoten *et al.* (2006) and Yuan and Gao (2012) that formal lenders prefer to grant credit to elder households since these type of households usually are stable and have more income that may cushion the default

risk. But, it contrasts the finding of Rand (2007) that debt holding is inversely related to age. Rand argues that older firms generally are more stable and therefore very unlikely to involve in activities that may demand more capital, and this make them to become less innovative.

This finding is very important because it indicates that young and inexperienced farmers might have less social capital owing to their little social connections with other agents in the economy. Consequently, these young farmers are less likely to secure larger amount of credit, which demand high levels of trust that may be developed through social connections and interactions, as a precondition for lending, compared to old farmers. It is also possible that young farmers might not approach formal lenders, for the reason that the likelihood of defaulting might be high due to the farmers' inexperience. As such they are prone to apply for loans.

Of notable importance in Table 5.25 is the positive and statistical significance of *IRR* at one percent throughout the model. This suggests that the probability of obtaining both moderate and larger loan-size increases with having irrigational facilities, with the strongest result being found for large credit. Relatively to those who lack access to irrigation, the probability of securing moderate loan-size increases by 85.5 percent and larger credit amount by 398.1 percent for those with irrigational system. In fact, farmers with more irrigated land are likely to get formal loan in large amount because of their increase demand for farming inputs and their commercial orientation. These findings may be attributed to both productive capacity and yearly farming opportunity for those who

have access to irrigational facilities. For this reason, Briones (2007) noted that having irrigated land could highlight the level of land productivity and output risk. Perhaps, farmers who lacks irrigational facility seem to battle with production cost, feature uncertainty and short growing season. The finding might also be grounded in the seminal work of Iqbal (1983) and Yadav, Otsuka, and David (1992), and also improves on the work of Kochar (1997) who found that ownership of irrigated farm increases the demand for credit, whereas its effect on bank loan is positive albeit insignificant. This finding is appealing due to the fact irrigated farm is a good proxy for land endowment and creditworthiness, therefore, lenders may have good information of variations in farm quality, and it may be possible to turn down applicant who has irrigational problem or soil salinization. The fact that access to irrigation has not being tested with respect to quantity of credit model highlight the importance of this finding.

Evidence from the econometric inferences of Table 5.25 shows that the coefficient of *VEH* is statistically different from zero with respect to receiving moderate loans with the greatest impact being found for borrowing large sum of credit. Even though the variable is statistically not significant in terms of small borrowing, however, it appears with correct sign. This indicates that the odds of receiving moderate amount of credit increases by 140.8 percent with the ownership of physical endowments such as car and bus relative to non-automobile farmers. Although the odds have almost doubles (252.6 percent) for bigger loans relative to moderate loans. Because ownership of vehicle is a good proxy for farmers' creditworthiness; and the repayment ability is largely being influenced by physical and durable assets. In fact, if variations in economic wellbeing could easily be

detected through ownership of physical assets such as furniture and television as forward by Kapoor and Le Blanc (2008), then possession of vehicle is likely to attract bigger loan-size. This finding may be comparable to those of Doan *et al.* (2010) who report that telephone ownership that represents individual wealth via the ability to accommodate telephone and connection bills reduces credit constraints. The reason that asset is related to demand for credit may be explained by the role of assets as an indication of high economic wellbeing, and hence for credit information. Similarly, the finding corresponds with the literature that microfinance lenders fails to extend credit access to the very poor strata in rural Bangladesh and Ghana (Bendig *et al.*, 2009; Datta, 2004). Though the fact that those with physical endowment which not only represents social network, but also indicates socio-economic status are likely to receive huge sum of loans, yields a very good story to wealthier farmers.

Besides, the finding highlights the importance of the inclusion of this variable in the partial proportional odds model for a quantity of credit receive by farmers within the framework of agricultural credit market in the literature.

An interesting result emerges with respect to land-tenure *(TNR)*, which appears negatively connected with zero-low credit probability at conventional significance level, but insignificantly linked with the remaining two outcomes. This suggests that the odds of borrowing huge amount of credit decreases by 36.1 percent for farmers with land-tenure from gift, inheritance or pledge-system, relative to those who hired or purchased farm for agricultural purpose. The fact that this type of tenureship work negatively with

respect to agricultural borrowing may be due to failure of this type of land to guarantee loans in many cases. Because most of this type of lands are vulnerable to land fragmentation, since generally it is either be possessed through interpersonal and marital relationships or inheritance. At this point, Komicha and Ohlmer (2007) noted that, one of the major obstacle to agricultural productivity in agrarian economies is land fragmentation. They however found that the higher the smaller plot under cultivation due to land fragmentation, the less likely that a farmer will adopt a new farming technology. This however exclude small scale farmers from participation in agricultural credit market on one hand. On the other hand, this type of land holdings indicates lower socioeconomic status, and hence lack of commitment and availability of resources which make it very unlikely to attract formal lenders. Whereas, the degree of risk and readiness for farming husbandry will be reflected in the proportions of land holdings, with the expectations being that those who hired or purchased land are more likely to receive huge amount of credit.

Although previous studies have provide some empirical justification which linked between credit market and tenancy as an institutional arrangement for lending and share-cropping (Aryeetey, Hettige, Nissanke, & Steel, 1997; Basu, 1997; Bell *et al.*, 1997; Besley, 1995a; Fafchamps, 2013; Kochar, 1997). But generally the implications of land-tenancy such as pledge-tenancy where a farmer will be granted temporary ownership without share-cropping; and the proportion of farm from gift and inheritance has been bypass in the literature. Therefore, this finding is important for policy making, because the traditional share-cropping tenancy is at lowest practice in African villages and or has

been substituted with land holdings through purchased, rent, inheritance, gift and pledge-tenancy. While neglecting such characteristics will amount to loose of information regarding farm characteristics in relations to amount of credit borrowed.

As expected, the coefficient of *SUB* appears with correct sign at conventional level, with the greatest impact being found in relations to borrowing larger credit. In comparison with commercial farmers, the probability of borrowing moderate and higher amount of credit decreases between 52.7 percent and 73.9 percent for subsistence farmers, all other things being constant. This is plausible, because subsistence farmers are characterized by small-scale farms where members of these households are expected to supply labour, whose returns are kept completely for the survival needs of their families. Consequently, these type of farmers could only produce sub-optimally that may not be enough to generate surplus for market.

Besides, this type of farming produces largely subsistence crops, couple with the application of traditional farming tools, together with insufficient organic and chemical inputs. Whereas, these process might likely result only in low agricultural output. Subsequently, their credit demand is low with small loan-size if at all. While from the lenders perspectives' shorter loans are likely to attract higher operational cost; hence they will be discouraged from the credit contract on one hand. Commercial farmers on the other hand are anticipated to receive higher returns from their farming; making them more likely to settle debts quickly than their counterpart who owns small farms which can hardly yields commercial benefit. Moreover, subsistence households seem to produce at survival level, because they are recognized through the use of traditional farm tools

couple with low capital intensity, which leads to low agricultural output (Muhongayire, Hitayezu, Lee, & Mukoya-wangia, 2013; Ugwumba & Omojola, 2013). This development may be due to their limited credit access owing to their attributes. It might be possible that most subsistence farmers had no credit access due to tedious loan process and lack of assets; hence they lack productive capacity to undertake large scale farming on the other hand. In general, the consistent appearance of this variable in different models of this study has justified its contribution in the analysis of agricultural credit market.

Results in Table 5.25 show that farm record plays a key role in influencing the amount of credit received by farmers. More specifically, farmers with proper accounting record or bookkeeping per se relates to an increase in the probability of lower and moderate credit amount by 103.6 percent and 873.6 percent, respectively. But interestingly, it turned out from the results that the most prominent impact of bookkeeping is on the larger loan-size. Whereas in comparison with farms running without proper record, farms with proper accounting record have a higher probability of securing larger loans by 925 percent. These findings may be attributed to farmers' skills, literacy, professionalism and commercial orientation associated for those with adequate bookkeeping. Besides, the findings are consistent with empirical studies in different fields (Allee & Yohn, 2009; Hashi & Toci, 2010; Muguchu, 2013; Nguyen & Luu, 2013).

Along the same vein, the results emanate from the decrease in information asymmetric couple with cost appraisal from the lenders which reflected from the transparency

associated with bookkeeping. In particular, proper bookkeeping in farming sector is a reliable tool that lenders have capitalized more often to evaluate farmers' credit worthiness in terms of productivity, risks assessment and profitability. As Muguchu (2013) noted that, lenders consider small firms without proper transaction history as the riskiest applicants, since their repayment capacity is unknown.

Similarly, these unaccounted small firms are assumed to lack the necessary skills that manage their ventures. For the simple reasons being that having inappropriate proper accounting method including information on income statements and inventory systems, makes it harder for external lenders to appraise their projects. The introduction of this variable in quantity-credit model is important, because transparency in farming ventures which proxy by proper farm record has important effect on the percentage of projects that a farmer will undertake through external borrowing. This indicates that farms with clearer financial statement are more likely to secure higher loans, whereas farms with inadequate farming record are more likely to be denied loan. Moreover, the reputation and reliability of a farmer as represented by his managerial ability to keep business record properly, is at least if not at all a significant way for obtaining loans. Along the line, Diamond (1989) added that, the placement of collateral or equity to guarantee repayment ability has been replaced with acquisition of reputation in the credit market. This however, might be reflected in the transaction history for a particular farming season.

It turned out from Table 5.25 that of notable significance for a quantity of money borrowed is the presence of lenders in a given community at five percent. Conditional

with other regressors, an additional one more lender increases the borrowing amount probability by 500.9 percent. It follows that availability of the financial institutions could be an important determinant of credit amount borrowed.

Table 5.24
Partial Proportional Odds Model- The Odds Ratios

	(1)	(2)	(3)
Variables	**Zero-Low**	**Moderate**	**High**
AGE	1.006	1.036**	1.085***
	(0.014)	(0.016)	(0.034)
QLF	0.966	0.966	0.966
	(0.021)	(0.021)	(0.0211)
IRR	3.235***	1.855***	4.981***
	(0.655)	(0.382)	(2.159)
VEH	0.891	2.408***	3.526***
	(0.275)	(0.746)	(1.331)
TNR	0.639**	1.201	1.584
	(0.141)	(0.313)	(0.783)
SUB	0.827	0.473**	0.261**
	(0.195)	(0.141)	(0.178)
REC	2.036***	9.736***	10.25***
	(0.444)	(2.452)	(5.394)
LEN	6.009***	6.009***	6.009***
	(1.389)	(1.389)	(1.389)
LIT	1.798**	1.798**	1.798**
	(0.414)	(0.414)	(0.414)
RE2	6.778***	6.778***	6.778***
	(2.579)	(2.579)	(2.579)
RE3	23.07***	11.61***	5.259***
	(8.358)	(4.281)	(2.759)
CON	0.011***	0.001***	7.41e***
	(0.008)	(0.001)	(1.17e)

Note: Robust standard errors in parenthesis. ***, **, and * donates the statistical significance at 1%, 5% and 10% respectively as indicated by their corresponding *p*-values. Dependent variables are the extent of credit participation with 0 for those who did not participate; 1 for those who obtained lower amount ($50 - $350 =1); 2 for those who obtained medium amount ($351 - $1000 =2); and 3 for those who received higher amount ($1001 and above =3). *AGE* is the age of the farmers in years, *QLF* is the years of education, *IRR* is the irrigation dummy (1=if access to irrigation), *VEH* is the ownership of car or bus (1=if possession of car or bus), *TNR* is the dummy representing ownership type of landholding (1=if inherited, pledge or gift), *SUB* is the dummy representing the type of farming system (1=if subsistence), *REC* is the dummy of bookkeeping (1=for farm with bookkeeping), *LEN* is the lenders dummy (1=if presence of lenders in the area), *LIT* is the credit awareness and financial literacy (1=financial literate), *RE2* is the regional dummy representing urban areas (1=if residence of Dambatta Zone or Zone 2) and *RE3* is the regional dummy representing rural areas (1=if residence of Gaya Zone or Zone 3).

Table 5.25
Partial Proportional Odds Model- Odds Ratio in Percentages

	(1)	(2)	(3)
Variables	**Zero-Low**	**Moderate**	**High**
AGE	0.6	3.6**	8.5***
QLF	-3.4	-3.4	-3.4
IRR	223.5***	85.5***	398.1***
VEH	-10.9	140.8***	252.6***
TNR	-36.1**	20.1	58.4
SUB	-17.3	-52.7**	-73.9**
REC	103.6***	873.6***	925***
LEN	500.9***	500.9***	500.9***
LIT	79.8**	79.8**	79.8**
RE2	577.8***	577.8***	577.8***
RE3	2207***	577.8***	425.9***

Note: Refer to Table 5.24 for definition of the variables and asterisks.

This finding could be grounded in the famous Say's law of market that supply generates its own demand. It could also be explained from the supply leading approach of banking services that the presence of lender in a given community is likely to increase the supply of financial services, including deposit and credit, and of course the quantity amount borrowed. Nonetheless, this result is different from the one reported in Mpuga (2010) that the presence of lenders in a given community may not be enough to augment demand for financial services, but something that he called for further research.

Notwithstanding, other transaction costs such as transportation, distance and time that have been consistently found to discourage farmers' credit participation may be intercepted by the presence of lenders. As a matter of fact, if the availability of lender is to be considered as a proxy for distance and transaction costs imbedded in the loan process, the finding may be comparable with other field studies. More specifically, the findings imply that those living closer to financial institutions are likely to receive larger loan size than their counterparts who resides differently with the lenders on one hand. On

the other hand, as the presence of banks increases farmers tend to get more information about the financial services that may be beneficial to them; hence they are more likely to secure larger loans. Therefore, availability of lenders is a significant impediment for credit participation and the amount borrowed as tested in this study.

The importance of financial literacy in the agricultural credit market is straight forward and very neat as has been found in Table 5.25. The systematic overall significance of financial literacy (*LIT*) at five percent suggests that acquiring higher financial literacy may increase farmers' chances of securing larger loan-size than otherwise. This indicates that farmers with financial literacy are more likely to receive higher credit amount by 79.8 percent than those with little or no financial knowledge. Literature advocates that financial literacy is one of the crucial features that increase financial inclusion, but more importantly on the specific amount borrowed as has been shown in this study. Even though the influence of financial literacy had rarely been tested in the agricultural credit market in general, and Nigeria in particular, but finding of this nature may be comparable with other field works.

Survey from Asia, Europe and Mediterranean shows that financial literacy has significant effects on household saving habits and operation of bank account for the specific vulnerable and poor consumers on one side (Cole, Sampson, & Zia, 2011; Le Blanc, Porpiglia, Teppa, Zhu, & Ziegelmeyer, 2015). On the other side, financial education raises the likelihood that someone may demand formal banking services, since all the intricacies associated with banking services is no longer an issue to them (Semenova & Rodina, 2013). Notably, the finding is not different from those of Klapper *et al.* (2011)

who establish a positive impact between financial literacy and participation in financial markets and low spending in Russia. Besides, an increase in financial calculation increases the awareness on different financial services that may yields higher utility in comparison to other financial products. More interestingly, estimates from average marginal effects in Appendix 9 shows that borrowing large credit amount are more attributed to farmers who are financially knowledgeable with 11.37 average years of schooling by three percent higher than non-financially literate farmers. However, education alone is not enough to influence large amount of loan as found in this study.

Regions specific dummies that takes care for the unobserved regional differences, and sampling variation that are unaccounted in the model, proved to be important variables at five percent (*RE2*). With respect to resident of Rano Zone (semi-urban region: Zone 1), results in Table 5.25 indicate that *ceteris paribus*, the probability of receiving larger loan-size increases by 577.8 percent for being urban resident (Dambatta Zone) than otherwise. Consistent with some empirical studies in China, India and Vietnam, the probability of having greater access to formal credit increases with households living in urban areas (Ho, 2004; Kochar, 1997; Li, Gan, & Hu, 2011). This finding highpoints that urban residents have good road-network in addition to non-farm employment that generate more earnings and improve their credit access. While frustration associated with credit application and borrowing cost that may likely discourage farmers' credit participation owing to their geographical location are no longer an obstacle for the urban applicants.

Apart from this, the systematic association between residents of rural areas *(RE3)* and amount of credit received remains largely significance at one percent. Although the coefficients appear positive throughout the model, but it keeps decreasing across the cut-points. This suggests that residents of Gaya Zone (rural region: Zone 3) are more likely to obtain larger loan-size than residents of Rano Zone (semi-urban region: Zone 1), with the greatest variations being found in the first category. It follows that the probability that a farmer in this region will receive moderate loans is higher (577.8 percent) than for larger loans (425.9 percent). However, farmers in this region were less likely to get moderate or larger loans compared to lower amount of credit (2207 percent).

Support for this result was found in empirical studies conducted in U.S. and Vietnam (Bird & Sapp, 2004; Briggeman & Akers, 2010; Rand, 2007). Rand found that the odds of obtaining credit were less in urban areas than in rural Vietnam. Because most of government sponsored credit initiative were directed towards rural areas in order to provide support for rural firms that were aims to promote the local markets. Hence, rural firms were given more opportunity to boycott some of the credit barriers that may otherwise be difficult for them. Similarly, Briggeman and Akers in U.S report that rural households with small business are more likely to receive loans than the urban counterpart, suggesting that rural firms and farms have an additional advantage in access to loan. Because, rural areas in the U.S. are generally served by more diverse and strong rural lenders, such as rural community banks and other credit agencies.

Another potential reasons may be associated with the issue that credit access is more prevalence in rural areas compared to urban counterpart. Because new business in rural communities were more fruitful than otherwise (Rowe, Haynes, & Stafford, 1999). Besides, households living in semi-urban areas such as Rano province (Zone 1) were largely secured employment in industries that yields more return, making them to pay less attention to agriculture in comparison to rural areas. Hence, their preference to farm credit is very low.

5.7.3 Diagnostic Checks and Model Specification Test

Results in Table 5.25 have been validated with model fitness such as the one presented in Table 5.26. The global Wald test (1) for the parallel line assumptions was presented in the first row of Table 5.26. A significant global Wald test statistics specify that the final model violate the parallel regression assumptions. Therefore, the global Wald test (1) is insignificant suggesting that the final model does not violate the parallel lines assumptions, and therefore fit for ordinal regression. The Wald test (2) as indicated in the second row of Table 5.26 test the H_O: $\beta_1 = \beta_2 \ldots = \beta_n = 0$, but the significant of the Wald χ^2 (p-value=0.000) statistics at one percent reject the null hypothesis, and infers that at least one of the explanatory variables has effect on the dependent variables. Similar result was also reported by the corresponding LR test (1) test (p-value=0.000) in the third row. These together, have provide sufficient statistical evidence that the model as a whole reasonably fit the data very well. Moreover, the LR test (2) for model building and selection has also conducted. The null hypothesis that the GOLOGIT2 of Williams (2006) nested in that of Fu's (1998) GOLOGIT has been rejected at five percent.

Similarly, the differences in AIC (2.19) and that of BIC (39.35) provide very strong support for GOLOGIT2 model over the GOLOGIT model based on the Raftery (1996) guidelines. This suggests that partial proportional odds model have higher chances of generating the observed data.

Table 5.26
Tests for Parallel Line Assumption, Model Specification, Selection and Fitness

Tests	χ^2	***p*-value**	**Difference**
Wald Test (1)	8.40	0.396	-
Wald Test (2)	308.42	0.000	-
Likelihood Ratio Test (1)	530.70	0.000	-
Likelihood Ratio Test (2)	13.81	0.087	-
AIC	-	-	2.19
BIC	-	-	39.35

Note: These tests are between the GOLOGIT and GOLOGIT2. Statistics of parallel line assumption, and model fitness was also presented.

Besides, since the LR χ^2 test statistics on Table 5.27 is significant at one percent, there is no statistical evidence to reject the null hypothesis that OLOGIT model nested in the GOLOGIT. This was also confirmed by differences of AIC (110.71) and BIC (8.513) measures, which provides strong support for the generalized logit model. Therefore, these results reveal substantial evidence in favour of the estimates in Table 5.25.

Table 5.27
Tests for Model Specification and Selection

Tests	χ^2	***p*-value**	**Difference**
Likelihood Ratio Test	154.41	0.000	-
AIC	-	-	110.71
BIC	-	-	8.513

Note: These tests are between the ordered logit model and the generalized logit model version of Fu (1998).

5.7.4 Robustness Checks for Partial proportional odds Model

Robustness checks are presented in this section. These tests are important since the estimates of an inappropriate model specification is misleading and contradicting.

Following the link-test in Table 5.28, the *hat* variables are significant while the hat^2 are found to be insignificant for each *J-I* equations throughout the model, as evident by their statistical *p*-values. This suggests that the model is well specified and has appropriate functional fittings. Similarly, the alphas on the second part of Table 5.28 are the cut-points along the continuum of the amount of credit borrowed. Indeed, the significance of cut-points as indicated by their *p*-values shows that all the four observed outcome groups are undoubtedly ordinal in nature, and are placed along the continuous scale of the probability of the amount of credit borrowed. This implies that the four outcome groups should not be merged together in to two or three categories. In general, statistical evidence from Table 5.28 predicts that the data fits the partial proportional odds model very well.

Therefore, the model selection process and the statistical tests presented in this section and preceding section testified that estimates from the partial proportional odds model of Table 5.25 adequately and reasonably fits the data very well. The fact that omission and addition of some regressors in the process of model specification in order to produce the nested model do not alter with the signs and significance of non-nested model validate the outcomes of the estimated model.

Table 5.28
General Model Specification and Threshold Parameter Tests

General model specification test	**Coefficients**	***p*-values**
Zero/low Amount:		
hat	0.982	0.000***
hat^2	-0.005	0.933
Medium Amount:		
hat	1.083	0.000***

hat^2	0.005	0.940
High Amount:		
hat	1.289	0.000***
hat^2	-0.091	0.546
Threshold parameter test	**Coefficients**	***p*-values**
Alpha_1	-4.550	0.000***
Alpha_2	-6.947	0.000***
Alpha_3	-11.812	0.000***

5.8 Results of Credit Supply Model

As previously explained, Tobit model was used to analyse the determinants of microcredit supplied to farmers in the study area. Thus, the estimated results as reported in Table 5.29 have addressed the objective five of this study. Moreover, the section also contains some diagnostics checks and robustness of the credit supplied model.

5.8.1 Estimation and Discussion for Credit Supply Model

Available evidence from the Tobit model of Table 5.29 shows that most of the variables are consistent with their hypothesized relationships, and their influence on the probability of credit supply has been confirmed by their individual tests of significance at different levels. Of notable importance is the positive statistical significant coefficients of *MKS* at conventional level. This implies that all other things being equal, an increase of one marketing staff employed by microfinance bank increases the predicted rate of credit supply by a factor of 10.8. Basically, this category of staff mobilizes funds and disburse credit especially in the rural areas where there is poor infrastructure. Therefore, without this type of staff, farmers might find it difficult to operate an account with microfinance bank, due to the transaction cost, infrastructural barriers and other regional problems.

For this reason, marketing staff in a bank are regarded as a proxy for bank's branch, due their ability to extend financial services closer to people. Meyer (2011) argues that if the supply-leading approach should be targeted, financial regulators must provide incentives that would encourage banks to open more branches in the rural areas. Moreover, Ibrahim (2012) maintains that one of the obstacles that hindered rural banking scheme in Nigeria to succeed is the inability of the banks to penetrate rural areas, as a result of inadequate banking personnel in the industry.

Besides, this result might be comparable with those of Bell *et al.* (1997) and Demirgüç-Kunt and Klapper (2012) who report that access to financial services is significantly and positively associated with the presence of bank branches in the area. Notably, this concurs with the position of Lapenu and Zeller (2002) that considered number of staff as a source of outreach and in-depth operation of microfinance bank in Africa. The reason may be that having more staffs are likely to increase deposit and extend credit to rural dwellers. In fact, this would allow for more effective supervision and monitoring; and the introduction of this variable in this model was found to be informative in the analysis of the quantity of credit supplied.

Result in Table 5.29 shows that the coefficient of *PRF* is statistically different from zero at one percent. With positive impact reported, result indicates that an increase in profit by the microfinance bank is accompanied with the expected increase in credit supply by 13.95. This suggests that an additional profit gained by the microfinance banks at the end of each financial year, will rise the predicted credit supply to the farmers by 13.95 in the

new financial year. Interestingly, this is not different from the findings in Bigsten, Collier, and Dercon (2003) that lenders allocates credit based on the profits expectation. Lenders may use sector or firm specific regulations to recognise less risky applicants, so that it maximises its own profits while taking into cognisance of risk aversion strategies. However, in the presence of imperfect information, credit markets will be disturb, since may be the price of loan is within which the defaulting rate increases in the sense that the profitability of bank will goes down (Meza & Webb, 2000). So, in this case, banks can only lend to risk-neutral applicants that guarantee repayment with motive of profit-maximisation on one hand. On the other hand, Ho (2004) maintains that a profit-making lender may probably raise the interest rate on risky contracts. However, assuming that all applicants have favourable credit history, lenders may be more willing to approve big loans to a single applicant rather than numerous small credit to several applicants. This is because transaction costs will be high when it involves several small loans to many borrowers.

In support of this, Dell'Ariccia and Marquez (2004) explain that lenders could make more profits if the captured borrowers were targeted than borrowers with other financial substitutes. However, in a condition where the borrower's information is unavailable, which also affects the price of credit, loans to borrowers with good reputation in the credit markets will yield more returns. Whereas, in many rural areas, Hoff and Stiglitz (1997) posit that informal money lenders are regarded as usurious monopolists that charged high interest rate for the purpose of profit-maximisation. The fact that credit expansion is associated with an increase in profits-making may not be surprised

(Banerjee & Duflo, 2014). Besides, this finding will be grounded in the motives of reinvestment and bank's expansion and has successfully add impetus into the literature of agricultural credit supply.

Turning to the deposit account, some interesting effect has been noticed with the significance of *ACC* at 10 percent. Result indicates that the predicted chances of being supply with credit by the banks increases by 11.2 for bank account holders than otherwise. All other things being constant, having a bank account increases the expected credit supply to the account owner relative to non-account holder. This is accordance with the banks screening mechanism where banks are more agile to those with credit reputation which may increase the probability of repayment, and promise more returns. In many cases, borrowers are required to open an account before credit advancement. This mechanism has been used by the microfinance banks in order to increase the chances of repayment. Similarly, having more deposits account by a bank will increase the total deposits of this bank. The consequential effect of this will motivate microfinance bank to supply more credit in order to generate more revenue. This finding coincides with the report of Donkor and Duah (2013) that there is strong connection between total bank deposits and the amount of loan given. While Papias and Ganesan (2010) argue that lack of account by the applicant may likely result in loan being denied by the banks; result of Li *et al.* (2011) indicate that non-borrowers are more associated with deposit accounts than borrowers in China.

The finding also agree with the assertion of Disney, Fichera, and Owens (2010) in Malawi that microfinance banks offers two different accounts to its clients: contract and ordinary savings accounts. With a former, borrowers can decide on the timing and amount of deposits. Though by honouring credit contracts, borrowers would either benefit from the rebate of interest or their credit limit would be increase irrespective of collateral possession. Besides, Adams, Graham, and Von Pischke (1984) argue that deposit facilities should be utilised by the banks to mitigate the difficulties that are inherent in the agricultural credit markets. Because having deposits account will overcome the problems that may arise due to the information asymmetric. In this way, deposit accounts will help in monitoring borrowers' progress and would give a continuous insight into borrowers' financial conditions. It follows that deposit accounts could be seen from the policy makers as a good mechanism that banks may capitalize upon to supply credit. In fact, this finding is in line with prediction, because banks in rural areas generally demands their applicants to have deposit accounts with them as one of the condition of loan contract.

Table 5.29
Tobit and OLS Regression Coefficients

Variables	Coefficients	S. Errors	*t*-value	*p*-value	Restricted	OLS
LIQ	0.142	0.158	0.900	0.375	0.151	0.113
MAK	**10.752**	5.085	2.110	0.041**	**9.995***	**9.368***
PRF	**13.953**	5.224	2.670	0.011***	9.829	**14.30***
DIS	**-0.193**	0.069	-2.800	0.008***		**-0.19****
EXP	1.990	3.486	0.570	0.572	-0.075	1.870
ACC	**10.130**	5.693	1.780	0.084*	8.171	9.554
TRD	**11.207**	5.553	2.020	0.051*	**15.37****	**9.576***
Constant	2.493	10.784	0.230	0.819	-8.789	7.313

Note: Dependent variable is *CRS* which is the observable and unobservable amount of credit supplied by the microfinance banks, *LIQ* is the liquidity of the banks measured by current asset over current liability, *MKS* is the number of marketing staff in the microfinance bank, *PRF* is bank's profit dummy with 1 if the bank is making profit and 0 otherwise, *DIS* is the distance between farmers and microfinance bank in kilometres, *EXP* is the years of business

experience by the microfinance bank, *ACC* is dummy assigning 1 if the bank considered farmers' with bank account before advancing credit and *TRD* represent the entrepreneurial ability of the microfinance bank's customers assigning 1 for farmers with other activities apart from agriculture. Second to the last model is the restricted tobit while OLS estimates are presented at the last column. ***, **, and * donate statistical significance at 1%, 5%, and 10% respectively.

At 10 percent level of significance, estimates from Table 5.29 justified the importance of *TRD* in the analysis of credit supply. In comparison with full-time farmers, the probability of being supply with credit increases with off-farm commitment. Conditional with other regressors, the expected credit supply is 10.1 higher for the farmers that engaged in extra income activities than otherwise. Logically, the result shows that lenders might prefer to supply credit to borrowers with other commitment in non-agricultural sector in order to ensure repayment. Because farmers with additional income from non-farming have more repayment capacity in the event of crop failure. Besides, this corroborates with the finding that banks might prefer to offer credit to the farmers who engaged in other off-farming businesses than otherwise. Though previous studies that utilized this variable in credit-supply equation to compare or contrast are rarely available. However, this result may be comparable to other studies using demand-side data (Kuri & Laha, 2011a; Mpuga, 2004).

Moreover, the finding highlights that lenders are more incline to supply credit to farmers with higher off-farming commitment as indicated in the credit-supply equation. Perhaps, their diverse source of earnings influence their creditworthiness. Whereas, borrowers' creditworthiness may lead to quick reimbursement of the current loan, which may eventually resulted in more credit being granted. The finding that banks are more willing to supply credit to households with greater activities in commerce, trade or wholesale is

important for policy makers. More interestingly, credit applications by this type of households are more probably to succeed, with larger loan-size being granted in comparison to those in agriculture.

But in contrast, the systematic negative connection between credit supply and distance (*DIS*) at one percent is appealing. Result in Table 5.29 indicates that an increase in one kilometre away from the microfinance banks reduces the expected supply of credit by a factor of 0.2 to the farmers. It follows that that the probability of supplying credit decreases with farmers being living far away from the microfinance banks, compared to those living closer to lending agencies. More specifically, this suggests that transaction cost is likely to increase if a borrower is leaving far away from a lender. Although previous studies have used demand-side approach to arrive at their conclusions, however, the result corresponds to the finding that an increase in distance from financial institutions increases the likelihood that a household may not be supply with credit (Akudugu, 2012, 2013; Chi & City, 2014; Gbadebo *et al.*, 2013; Ho, 2004; Kiplimo, 2015; Okten & Osili, 2004; Rosana & Muturi, 2014; Ugwumba & Omojola, 2013). However, their findings did not deviant from the demand theory that increase in cost which is proxy by distance may leads to decline in the amount of credit demanded. The finding that distance is associated with decrease in credit supply is important. Because distance to the lending agencies will rise the communication and travelling costs for rural farmers, and subsequently lenders may find it very difficult to supervise, monitor or to manage transaction. While being closer to microfinance banks may decline the anticipated costs.

Besides, both monetary and non-monetary costs such as travelling expenses and opportunity cost associated with time factor, increases with borrower-lender distance. This may possibly increase the borrowing cost that may otherwise relatively low. It is also plausible from the lenders perspectives that because farming is one of the risky business, being far away from the banks makes assessment process more problematic. Hence resulted in the credit supply being rationed by the formal financial lenders to the rural farmers. Perhaps, farmers who distant away from the credit suppliers may rely more on neighbourhood borrowing such as friends and relatives, due to the price and non-price cost associated with long distance borrowing.

It appears from the estimated results that the coefficients of *LIQ* and *EXP* turned out positive albeit not significant, but together does not deviate from the theoretical and logical expectations. It follows that to every reasonable additional cash by the microfinance banks, the expected supply of credit will increase by 0.14. While an additional one-year experience by the microfinance bank, will approximately induce credit supply by 1.99. Therefore, these two explanatory variables have intuitively and theoretically explained the determinants of credit supply in Nigeria. However, the fact that *LIQ* and *EXP* turned out with less statistical power suggests that these two variables may not be good for policy formulation; and this is something that call for further investigation.

5.8.2 Diagnostics Checks for Credit Supply Model

Some statistical tests have been conducted in order to strengthen the internal validity and to checks for certain assumptions violation in the model as indicated in Table 5.30. Estimates from Table 5.29 have been subjected to the specification test using Cameron and Trivedi's decomposition information matrix (IM) (Cameron & Trivedi, 1990; Long & Trivedi, 1992). However, it appears statistically insignificant suggesting homoscedastic normal residual and therefore fit for analysis. Similarly, different types of normality tests have been conducted which include Shapiro–Wilk test (Shapiro & Wilk, 1965) and Shapiro–Francia (Shapiro & Francia, 1973) as suggested (Gould, 1992; Gould & Rogers, 1991). But, evidence from these tests have fail to reject the hypothesis that the data is normally distributed. Same result was obtained using Skewness and kurtosis normality tests. In addition, the result of Ramsey (1969) test is presented in the last raw of Table 5.30 However, evidence from the Ramsey's test has found no evidence for omitted variables.

Table 5.30
Goodness of Fit Tests

Tests	***p*-value**
IM-test	0.907
Skewness and Kurtosis Test	0.984
Shapiro-Wilk W Test	0.734
Shapiro-Francia W' Test	0.734
Ramsey Test	0.134

Notwithstanding, Table 5.31 presents some statistical tests for internal validity, specification and model selection. The Wald χ^2 and LR χ^2 tests statistics are significant at one percent, rejecting the hypothesis that all parameters are simultaneously not different from zero. This indicates that the estimated Tobit model as a whole is statistically significant and well fitted for the analysis. Moreover, the formal link-test for dependent

variable specification is presented (Pregibon, 1980). But it follows that statistical evidence available for this test does not warrant for model-rebuilding, as evidence by the insignificance of hat^2.

Table 5.31
Internal Validity, Model Selection and Specification Tests

Tests	χ^2	***p*-value**
Wald Test	4.09	0.002
Likelihood Ratio Test	17.89	0.013
Hat^2	-	0.806

5.8.3 Robustness Checks for Credit Supply Model

For proper model assessment, three different models have been estimated as evidence from Table 5.29; the Tobit model (full model); the restricted Tobit model (Restricted); and the ordinary least square (OLS) regression coefficients. Statistical evidence from Table 5.29 indicates that the estimated coefficients using OLS method yields inefficient results compared to the full Tobit model due to the censoring effects. Similarly, the coefficient of *ACC* is not significant even at 10 percent with OLS while the coefficients of *MKS* is under estimated using OLS. However, the coefficient of *MKS* found to be more efficient with unrestricted Tobit regression model. In general, the overall model fitness as suggested by the model's log likelihood is significant at five percent implying that the model as whole is very relevance in the analysis of credit supply. However, a more interesting and important statistics is found with respect to model prediction squared. The insignificant hat^2 shows that the estimated parameters from the unrestricted Tobit model are correctly and well specified, as such inferences from this estimates would be good for policy formulation.

5.9 Conclusion

This research intends to add value to the literature of agricultural credit market in developing countries. More specifically, the research considers most of the fundamental components of credit market namely credit participation, choice of finance, credit rationing, the analysis of quantity of credit received by farmers and the amount of quantity supplied by microfinance banks. Though not just the usual way as treated in the literature. However, in addition to new findings, the results obtained confirm several earlier findings.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 Introduction

This chapter presents the summary of the research findings and evaluates the contributions of the study where policy implication has been derived. Moreover, the chapter highlights some limitations of the study and finally offer some recommendations for future research.

6.2 Summary and Conclusions

This study is derived from five objectives using 835 cross section of farmers and 45 microfinance banks from three agricultural Zones in Kano State; namely, Rano, Dambatta and Gaya Zones, respectively. Whereas, Kano State is chosen due to it is historical background in the development of agriculture in Nigeria since from the colonial period. This coincide with highest population and local government areas associated with study area.

The first objective of the study analyses the determinants of agricultural credit market participations among farmers using Logit regression model. Overall, the result indicates that participation in credit market increases with farmers having deposit-account, traditional-title, whose neighbours are credit participant with the greatest impacts being found for information, possession of radio-television and being urban residents as well as households being engaged in commercial farming. However, it turned out that credit

participation decreases with application of traditional farming tools compared to mechanized farmers. An insight from this finding suggests that lenders may be more interested to release credit to whom they have confidence in order to guarantee repayment. The finding also re-affirms the relevance of social network and relations in agricultural credit market of Nigeria. Besides, the findings agree with social capital theory that predicts decline in the transaction costs due to informational advantage. It also reflects the capability of farmers in large province to obtain credit within their complex networks, to benefit from the availability of bank branches.

The second objective of the study examines the choice of agricultural credit market among farmers using multinomial Logistic regression. With reference to this model, some interesting findings have emerged. More specifically, the systematic significance of profit variable with respect to borrowing from the informal and formal lenders, validates the importance of profit in farming business. Relative to non-profit making farmers, an increase in farming revenue increases the odds of borrowing from relatives and commercial banks by 59.5 percent and 62.4 percent, respectively, in comparison to self-funding. This indicates that households who make profit from farming activities seem to solve their financial obstacles through the combination of both informal and formal loans. Moreover, it appears from the credit choice model that being urban resident is positively and significantly associated with all different alternatives of agricultural finance except borrowing from relatives and friends, with the strongest impact being found for banks borrowings. In comparison to residents elsewhere, result indicates that urban farmers had a greater opportunity to borrow from different source such as microfinance banks,

commercial banks and government as well, relative to self-finance. Besides, farmers' living in urban areas tend to be closer to microfinance banks and other formal financial lenders which may facilitate loan application on time. While farmers living far away from the centre are less likely to have greater access to variety of financial lenders.

On the other hand, the probability of having credit from microfinance banks decreases for subsistence farmers relative to commercial farmers. It appears that the likelihood of being crowded out in the credit market increases with subsistence farming. The finding that commercial farmers may be included in the credit market is important for the development of agriculture in Nigeria with differential treatment being given to large scale farmers. This finding has been confirmed by the statistical significance of a farmer being engaged in trade at conventional level. Whereas the probability of borrowing from governments, microfinance banks, friends and relatives increases for more diversified farmers as reported from the choice model. The fact that entrepreneurs among farmers are encourage for more diversification, lenders tend to release more credit to them. Whereas, their high non-farming commercial activities pave way for them to generate more assets that could enable them to have access to financial services.

Similar to objective two, the third objective of the study investigates credit rationing in the agricultural credit market of Nigeria. Result indicates that *ceteris paribus*, a unit increase in farming profit decreases the probability of farmers being in non-applicant category, thereby increasing their chances to borrow from the lending agencies. Moreover, farmers who make regular profit from farming ventures seem to be associated

with loan-size rationed and satisfied-borrowers, rather than credit-constrained borrowers. Besides, consistence with risk-balancing theory, the good story for farmers is that profit making farmers are less likely to be among the constrained-borrowers. It turned out from the credit rationing model that urban farmers' had a greater chance of being successful applicants in the Nigerian agricultural credit market. In comparison to farmers at periphery, urban residents are less likely to be associated with being constrained-borrowers. One of the important implication of this finding highpoints the extent of regional inequality in the development process in Nigeria. With regards to subsistence farming, some striking result emerged. Relative to commercial farmers, result indicates that the probability of being connected with loan-size rationed-borrower declines for subsistence farmers. The finding in the credit rationing model with respect to farmer being engaged in trade is appealing, suggesting that although those engaged in trade among farmers will be included in the credit market, but they are less likely to be given full amount than their requests. One possible explanation relates to their too much demand for credit beyond the accommodative-risk capability of the lenders. Subsequently, they were given below their requests which make them less likely to be associated with satisfied-borrowers.

For the accomplishment of objective four, partial proportional odds model has been used, whereas some interesting results emerged from the estimated model. Notably, the irrigation variable is found to be positive and statistically significant throughout the model. Conditional with other regressors, the probability of obtaining moderate loan-size and larger credit amount increases for those with irrigational system, relative to lower

credit amount. Besides, these findings may be associated with yearly farming circle and productive capacity for these type of farmers. Moreover, results indicate that the odds of receiving moderate amount of credit increases by 85.5 percent with the ownership of vehicle compared to non-automobile farmers. More specifically, the probability for these farmers have double four times for bigger loans in comparison to moderate loans. This suggests that ownership of vehicle is a good proxy for farmers' creditworthiness, and the repayment ability is largely being influenced by physical and durable assets.

However, the negative appearance of land-tenure with respect to borrowing probability remains outstanding, implying that the probability of borrowing huge amount of credit decreases for farmers with land-tenure ship from gift, inheritance or pledge-system, relative to farmers with hired or purchased farm. The fact that this type of tenureship works adversely at different direction with large borrowing is as a result of failure of this farms to guarantee credit in many cases. Similarly, an interesting result emerges with respect to subsistence farming, with the highest impact being found in connection with borrowing large amount. Relatively to commercial farmers, the probability of borrowing moderate and higher amount of credit decreases for subsistence farmers. In addition, it appears from the microeconometric model that the ability to utilize adequate farm record increases the likelihood of being associated with moderate loan-size. But more specifically, it relates well to an increase in the probability of having larger loans. With regard to presence of lenders, evidence from the econometric inferences reveal that an additional lender increases the borrowing amount probability to farmers, holding other things constant. This indicates that availability of financial institutions in rural areas

increases the amount of credit borrowed by the farmers. Perhaps, it is clear that the presence of banks in a given community is likely to augment the supply of financial services such as credit and deposit. Moreover, of notable relevance in relations to borrowing is the statistical appearance of financial literacy. The systematic positive significance of this variable indicates that borrowing higher amount of credit is related to acquisition of financial literacy. Noting that financial literacy increases the likelihood that farmers may prefer to borrow more from banks; because most of the barriers connected with credit are no longer an obstacle to them. In addition, it turned out that urban residents are more likely to receive higher amount of credit. Consistence with other studies, bottleneck associated with credit application that are found to discourage credit participation are no longer an issue for the urban applicants.

Finally, the fifth objective deals with the expected probability of access to agricultural credit. More importantly, an additional employment of marketing staff by bank is accompanied with an increase in the predicted credit access to the farmers. In conformity with literature, the coefficient of profit is statistically relevance at five percent, suggesting that an increase in profit is associated with an additional supply of credit by microfinance bank to the farmers. This finding may not be surprise since credit supply is more related with profit-maximisation motive. Moreover, having deposit account is one of the important factor of credit access. With positive significance, it appears from the Tobit regression model that having deposit account will increase the expected amount of credit supply by banks to farmers. This finding justified the banks' screening mechanism; where banks are more willing to lend credit to those with reputation and whom they

know; for the fact that banks may lessen the probability of defaulting by the farmers. Turning to the effects of distance to lending agencies, some interesting finding emerged. Result indicates that cost of borrowing is likely to skyrocket if a farmer is leaving far away from a lender. Thus, makes a lender to ration credit supply to the farmers.

In summary, greater elements of consistencies have been observed throughout the estimations, re-affirming the validity and robustness of estimates from the agricultural credit models. For instance, the significance of farm profit in both credit choice and credit rationing models indicate that while farm profit is related with borrowing from different source, profit making farmers are more likely to become satisfied-borrowers. Similar effects have also been observed with respect to location variable. It follows that the probability of securing loans from difference source are more inclined with urban residents, while a good story from other models have emerged in relations to farmers living in urban areas. Besides, the systematic appearance of commercial farming, subsistence farming, deposit account, distance and farmers' occupational characteristics relative to agricultural borrowing remain the same throughout the models.

6.3 Policy Recommendations

Several policy recommendations have been derived from this study based on the reflections of the findings. With the significance of farm record in relations to credit market, extension workers should organise additional training to farmers on how to keep farming record and encourage for the adoption of bookkeeping in farming system. These would bestow and restore confidence on financial lenders to increase credit access to the

farmers. Given that, a number of indicators in this study highlight that credit rationing in financial market is spillover effects emanated from asymmetries of information. Therefore, the forward-looking policies by the interest groups and government should target on the mechanism that not only improves farm record but encourage transparency in agriculture. Part of these efforts is to relax the bottleneck associated with bank account opening. This will help on the flow of financial information and business condition of the client. The end result of this policy will make the screening of credit applicants easier and quicker, whereas the reverse is the case when the formal credit providers relied more on hard information to screen borrowers.

With the significance of financial literacy, articulated policies that could improve financial awareness and literacy are needed. For instance, specific and constructive financial literacy programs through national orientation agencies at local levels to support financial reforms are call for. The consequential effects of this policy would lead to general equilibrium in many sense. For example, it will decrease the economic volatility, improves financial intermediation, amplify the demand for financial products, improve risk-sharing ability and to speed the process of financial development in general. Besides, this would ignite competition among financial institutions, and hence effective resource allocation within the economy. On the other hand, removing credit barriers and handle the risks associated with loans, may permits lenders to intensify their efficiency in resource allocation towards farmers with more investment returns.

From the policy implication assessment with respect to subsistence farming and tenureship, pro-poor credit policies are required for the establishment of new agencies and financial institutions devoted to agricultural sector. Similarly, an integrated system of forward-looking policies based on tax and subsidy-regimes to augment desired incentives for private financial sector and NGOs to lend money to the farmers are needed. These may not only rise the productive capacity of the rural households through better and efficient utilisation of farm resource, but it will discourage labor-mobility, hence an increase in rural productivity that may lead to rural welfare. Noting that, even in the laissez-fair financial settings, the idea of getting the right institutions is required as a compliment that could address the microeconomic intricacies facing small and poor farmers in the rural areas. Besides, some subsidized formal credit agencies should be implemented and devoted to these type of farmers so that it will cushion the inequality and financial gaps.

However, since ownership of asset plays an important role in the credit market, improving property protection rights and strengthen the enforcement laws would bestow and restore trusts and confidence among economic agents, hence better access to credit in large quantity. Similarly, the establishment of registry for fixed and non-fixed assets is something worth noting. These policies would be complemented by relaxing the obstacles associated with long queue and tedious bureaucratic bottleneck in the property titles formalisation. But the process of registration should be decentralised to registries at the local government levels at relative affordable cost.

Moreover, the significance of off-farm commitment is clear. As a result, uplifting and investing in human capital in Nigeria may produce some benefits in the financial arena. Specifically, polices should focus on rural development through the activities that could generate off-seasonal employment. Similarly, the provision of rural infrastructure and local markets would be useful in pro-famers transformation process in the financial reform.

However, with the increasing influence of neighborhood participation and traditional title highpoint some imperfections in the working of credit market in Nigeria. While in the presence of well-functioning credit market, social network may not properly work. Therefore, government policies should be targeted towards reducing the effects of social relations and be forward-looking to more well-functioning credit market. This can be achieved through measures that can quickly spread information on the credit availability, application procedure and the source of that particular credit. Apart from increasing credit information through electronics and non-electronics medium, incorporating local heads through community re-orientation programs will be worth noting.

With reference to the findings at hand, the overall priority component of policy formulation should be targeted toward regions where access to credit is low, or there is pervasive credit constraint due to high demand – such as the one observed in Rano Zone and to some extent in Dambatta Zone. The designated policy as alerted from the regions specific could overcome regional difference and inequality in the development process in general and financial reforms in particular. Overall, these policies would upsurge the

receptiveness of the households along the demand for credit and pave way for more credit access to farmers.

6.4 Limitations and Future Research

Similar to most of preceding researches, this study has acknowledged the existence of some constraints. Even though the scope of the present study is limited to only Kano State, Nigeria, but one of the major limitations of this study is lack of data availability. Field studies with a larger number of respondents across Nigeria are needed to address issues such as modeling dynamic productivity and investment in relation to credit participation. Thus, future researches should employ longitudinal data or time-series data covering several years to confirm the findings of this study. This might have given more flexibility in determining credit participation among farmers in Nigeria. It will also allow for comparison and could pave way for the inclusion of more variables in the analysis such as: households risk attitudes; household resettlement (migration); experience in credit use and the effect on time variation in the analysis; perhaps, this is left for future studies.

Another limitation of this study relate to the fact that four out of five objectives in this research was devoted to credit demand, whereas only one objective addresses issues related to credit supply. Therefore, future studies should dwell more on the credit supply, and investigate formal and informal credit market contracts with special reference to lenders' attributes, revenue versus cost and repayment rate in relation to credit supply.

Additionally, there is a growing body of literature about measurement issues involved using survey data to make inferences about borrowing condition (Petrick, 2005). A notable drawback of directly asking farmers about borrowing experience is the issue that

it relies upon individual's subjective assessment of his or her condition in the credit market. Though Direct Elicitation Method (DEM) as adopted in this research is admittedly better than any other survey method (Diagne, 1999, Diagne *et al.*, 2000). Yet, more research are needed to eliminate possible measurement errors in future field studies.

Fourthly, formal credit interacts with informal credit sector (Bose, 1998; Zhang, 2008); nevertheless, this interaction was unaccounted in this study. Therefore, future studies can expand the scope of this research to account for this interaction. In fact, investigating heterogeneity among credit providers will be an important topic in the future. Fifth, due to the institutional specific differences and shocks associated with financial demand in diverse economies, the empirical results presented in this study could not be straightly extrapolated to other economies for effective policy making. Though the rigorous microeconometric approach used in this study is generally worth. But similar studies of credit market participation and credit rationing that may involve some variables used in this study together with institutional variables where data is available could simply be conceived in different countries. This highlights the need for further cross section study. Moreover, an impact assessment that account for the effect of length of credit participation and past credit history could be a very important future research. Because the effect of credit programme on household is more or less associated with duration of credit participation and previous loan. This will justify whether the impact of credit programme goes beyond the credit participation period.

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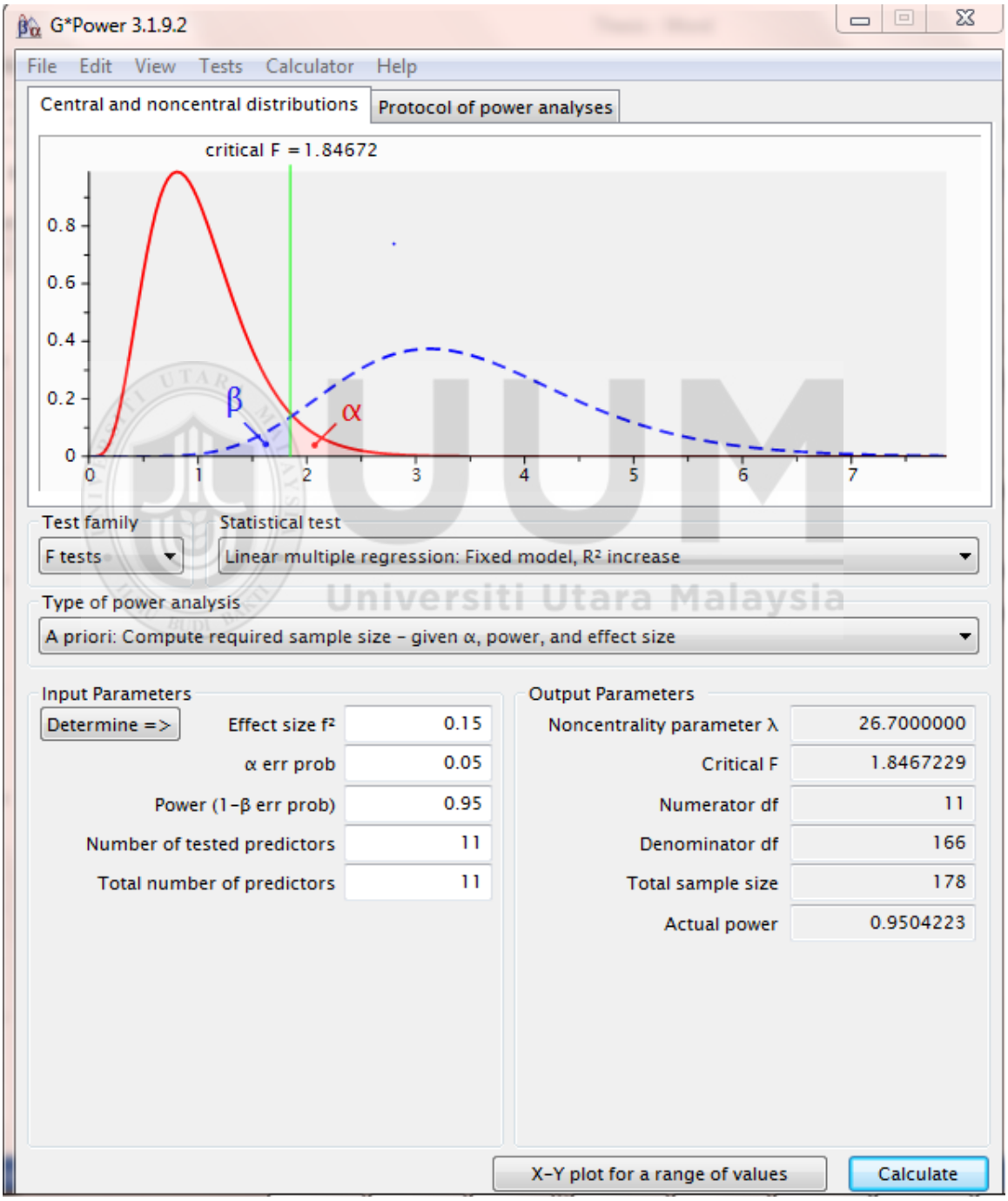
APPENDICES

Appendix 1

G*POWER



*Sample Size Calculated Using G*Power with 11 Regressors.*

Appendix 2

Farmer's Questionnaire

SURVEY QUESTIONNAIRE

Research Title: An economic analysis of participation in credit market and credit rationing among farmers in Kano State, Nigeria.

Objective: To analyse the rural agricultural credit market in Nigeria with respect to credit participation, rationing and access to loans among farmers.

Target: Farmers

Dear Respondent

I am a Ph.D. Economics research student in the University Utara, Malaysia (UUM), currently conducting a survey on the aforementioned titled research. The following are the self-explanatory questions that will not take much of your time to answer. Your kind and objective response would be appreciated as it will significantly contribute towards achieving the objectives of the study. Please note that your response will be treated strictly confidential, and purely for academic purpose.

Please do not hesitate to contact the researcher for any enquiry about this research.

Thank you.

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FARMER'S QUESTIONNAIRE

Targets: Credit Participation and Rationing in Nigeria

Local Government Area: ***Date:*** ***Time:***

Instructions: To be completed by research assistance

Please mark □in the box that corresponds to your choice and/or fill in the answer in spaces provided. Your answers will be treated confidentially and purely for academic purpose.

SECTION A: ATTRIBUTES OF THE RESPONDENT

1. Gender
   - □ Male
   - □ Female

2. Respondent's age:
   - □ 20 and Below
   - □ 21 – 29
   - □ 30 – 39
   - □ 40 – 49
   - □ 50 and above

3. Marital status:
   - □ Single
   - □ Married
   - □ Divorced
   - □ Widowed

4. Respondent's highest educational qualification:
   - □ No education
   - □ Non-formal education
   - □ Primary school
   - □ Junior secondary
   - □ Senior secondary
   - □ Diploma/NCE
   - □ Degree/HND
   - □ Post graduate diploma
   - □ Masters
   - □ Vocational attendant

5. Household/family size: □□

6. Number of children in the following category:

	Category	**Number**	**Number of Employed**
a.	Male children		
b.	Male adult		
c.	Female children		
d.	Female adult		

7. Years of farming experience: □□

8. What is your main occupation?
   - □ Farming
   - □ Non-farming

9. What is your another occupation?
   - □ Farmer
   - □ Civil servant
   - □ Unskilled labourer
   - □ Student
   - □ Trader
   - □ Others (specify) ----------

10. What is your average annual off-farm income (N)?
   - □ < 50,000
   - □ 51,000 – 100,000
   - □ 101,000 – 150,000
   - □151,000 – 200,000
   - □201,000 – 250,000
   - □251,000 – 300,000
   - □301,000 – 350,000
   - □351,000 – 400,000
   - □ > 400,000
   - □Others (specify) ……

11. Specify the assets that you have (multiple response possible):
   - □ Car/bus/haulage vehicle
   - □ Television
   - □ Motorcycle
   - □ DVD player
   - □ Computer
   - □ Air conditioner
   - □ Refrigerator
   - □ Others (specify)……

12. Do you have an account with any bank?
   - □ Yes
   - □ No

13. If yes, specify the type of the account
   - □ Savings account
   - □ Current account

14. Are you a member of any political party or affiliated with any politician?
   - □ Yes
   - □ No

15. Do you have any social or traditional title in your family, or were you among the decision circle in your community?
   - □ Yes
   - □ No

SECTION B: CREDIT ACTIVITIES OF THE FARMERS

16. How much is your working capital (₦)? ……..

17. Where did you source your capital? (Multiple responses possible)

□ Sales of property
□ Personal savings from the profit of other business
□ Inheritance/gift
□ Loan from friends/family/relatives
□ Private Money lenders
□ Loan from the microfinance bank
□ Commercial banks /Insurance
□ Loan from the government initiative financing programme

18. Is there any credit providers available in your area?
□ Yes
□ No

19. If yes, how many of them including bank branches? □□

20. Do you have access to any source of credit?
□ Yes
□ No

21. If yes, which source of credit do you have access?
□ Friends/family/relatives
□ Private Money lenders
□ Microfinance bank
□ Commercial banks
□ Government loan

22. If you borrow money between 2011 and 2013, fill the following information

Year	Amount Request (₦)	Amount Obtained (₦)	Source of Loan	Repayment Period	Borrowing Purpose
2011					
2012					
2013					

23. At what interest rate did you collect the loan?
□ Interest free loan □ 11% - 15%
□ 1% - 5% □ 16% - 20
□ 6% - 10% □ >20%

24. Was collateral required before getting the loan?
□ Yes
□ No

25. If collateral was not required, then was a guarantor required?
□ Yes
□ No

26. How many times did you applied for the loan? …….....……

27. How many times did you go to the lender before getting the loan? …..……..……

28. How long did it take to process your loan from the credit provider? .....……

29. How long was your travel time each time you went to the lender? ……

30. What is the total cost of transportation for the loan? (₦) ….……..……

31. Specify the amount of other costs, such as gift for the lender, if any (₦) ……

32. Where did you source the credit information?
- □Public channel (newspapers, radio, TV)
- □ Local authority at commune level
- □ Village head
- □ Friends/relatives/neighbours
- □ Others (specify) ……

33. With the current interest rate, are you willing to borrow from banks?
- □ Yes
- □ No

34. Did you repay the previous loan, if any?
- □ Yes
- □ No

35. If not, what was the reason for not repaying on time?
- □ Failure of the project
- □ Unforeseen shocks
- □ Lack of funds to repay
- □Interest rate is too high
- □ Unexpected expenses
- □ Others (specify) ……

36. Does any of your neighbours or one of your family member get agricultural credit?
- □ Yes
- □ No

37. Are you financially literate, or do you have awareness on the working of financial services?

38. Are you aware with any one source of agricultural credit, or have you benefits from one of these credit programmes?
    - □ Agricultural Credit Guarantee Scheme Fund (ACGSF)
    - □ NACRDB/BOA
    - □ Commercial Agricultural Credit Scheme (CACS)
    - □ Agricultural Credit Support Scheme (ACSS)
    - □ Others (specify) ----------

39. What do you think is the major obstacle against obtaining loan by farmers?
    - □ Religious perception
    - □ Lack of information
    - □ Lack of collateral
    - □ Lack of access to the credit
    - □ Fear of risk
    - □ Unfriendly credit officers
    - □ High interest rate
    - □ Being requested bribe
    - □ High transaction cost
    - □ The loan is not needed
    - □ No group membership
    - □ Others (specify) ……

40. Are you aware of any risk mitigation schemes such as insurance?
    - □ Yes
    - □ No

41. If yes, which insurance scheme do you patronise?
    - □ Crop insurance
    - □ Revenue/income insurance
    - □ Livestock insurance
    - □ Social insurance
    - □ Others (specify) …….....

42. Have you ever benefited from any extension services?
    - □ Yes
    - □ No

43. If yes, how often?
    - □ Weekly
    - □ Fortnightly
    - □ Monthly
    - □ Quarterly
    - □ Yearly

SECTION C: PRODUCTION ACTIVITIES OF THE FARMERS

44. How many plots of farm do you have? □□

45. Of what size (in hectare) is your farm?
    - □ < 1 hectare
    - □ 1 – 2 hectares
    - □ 3 – 4 hectares
    - □ 5 – 6 hectares
    - □ > 8 hectares

46. Specify the type of your land tenure (multiple responses possible):
    - □ Rented
    - □ Purchase
    - □ Inherited
    - □ Pledge
    - □ Gift

47. Which type of the agricultural system do you practice?
    - □ Subsistence
    - □ Commercial
    - □ Combined

48. What type of farming tools/implements are you using in the farming operation?
    - □ Modern tools (such as tractors, cultivating machine etc.)
    - □ Traditional tools (such as a hoe, cutlasses, rakes etc.)
    - □ Semi-modern tools (such as hosepipe, horses, ox-plough etc.)

49. Do you have access to irrigation facilities in your farm, or your farm is located in lowland area?

50. Variable Inputs for the previous farming season:

Description of Inputs	Quantity in kilogram/litre	Unit price (N)	Sources* (see below)
Seed			
Seed			
Fertilizer			
Manure			
Chemicals			
Others			
TOTAL			

*From: market (1), government agency (2), NGOs (3), loan (4), others (specify)…… (5).

51. Labour Inputs for the previous farming season:

Description of work	Number of labourers hired	Total Man-day hours	Cost of labour per man-day hour (₦)
Land preparation			
Planting			
1st weeding			
2nd weeding			
Fertilizing			
Harvesting			
Processing			
Others			
TOTAL			

52. Output produced during the previous farming season (rain):

Description: Grain Yield	Quantity produced (Kg)	Market's Unit price (₦)	Total amount(₦)
Others			
TOTAL			

53. What was your gross annual farm income from previous farming season (₦)?

- □ < 50,000
- □ 51,000 – 100,000
- □ 101,000 – 150,000
- □151,000 – 200,000
- □201,000 – 250,000
- □251,000 – 300,000
- □301,000 – 350,000
- □351,000 – 400,000
- □ > 400,000
- □Others (specify) ……..……

54. Are you making profit from your farming business?

- □ Yes
- □ No

55. Do you keep a record for your farming activities?

- □ Yes
- □ No

56. Compared with your previous condition before the loan, has any one of these changed after the loan was collected in the last 12 month? Tick the applicable answer

	Increased	Decreased	No change
a. Income			
b. Land			
c. Appliances			
d. Savings			
e. Cropping			
f. Livestock			
g. Food expenditure			
h. Children education			
i. Health care			

57. Compared with your overall living standard without loan, has your living standard changed with loan in the last 12 months?

- □ Increased
- □ Remain the same
- □ Decreased

58. How do you cope with agricultural financial problems if any?

.....

.....

59. What are suggestions on how to improve farmers' access to credit ad their relationship with lending agencies?

.....

.....

This is the end of questionnaire. Thanks.

Appendix 3

Microfinance Bank's Questionnaire

SURVEY QUESTIONNAIRE

Research Title: An economic analysis of participation in credit market and credit rationing among farmers in Kano State, Nigeria.

Objective: To analyse the rural agricultural credit market in Nigeria with respect to credit participation, rationing and access to loans among farmers.

Target: Microfinance Banks

Dear Respondent

I am a Ph.D. Economic research student in the University Utara, Malaysia (UUM), currently conducting a survey on the aforementioned titled research. The following are the self-explanatory questions that will not take much of your time to answer. Your kind and objective response would be appreciated as it will significantly contribute towards achieving the objectives of the study. Please note that your response will be treated strictly confidential, and purely for academic purpose.

Please do not hesitate to contact the researchers for any enquiry about this research.

Thank you.

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MICROFINANCE BANK'S QUESTIONNAIRE

Targets: Credit Participation and Rationing in Nigeria

Local Government Area: ***Date:*** ***Time:***

Instructions: To be completed by research assistance

Please mark □in the box that corresponds to your choice and/or fill in the answer in spaces provided. Your answers will be treated confidentially and purely for academic purpose.

SECTION A: MICROFINANCE BANK'S ATTRIBUTES

1. Name of the microfinance bank: ……..…….

2. Year of establishment? ……..

3. Do you have any branch somewhere else?
   - □ Yes
   - □ No

4. If yes, specify the number of your branches: …….

5. Specify the number of your staff: ……

6. Specify the number of marketing staff out of your total staff ……...

7. Does your staff move to the various locations to mobilise customers?
   - □ Yes
   - □ No

8. Who are your clients? (Multiple response possible)
   - □ Farmers
   - □ Traders
   - □ Civil servant
   - □ Craftsmen
   - □ Others (specify) …….

SECTION B: CREDIT AND OTHER ACTIVITIES OF MICROFINANCE BANKS

9. How long does it take before you give loans to your clients?
   - □ 1 - 2 weeks
   - □ 3 - 4 weeks
   - □ 4 - 6 month
   - □ 6 - 12 month

□ 1 - 3 month □ > 1 year

10. Do you require collateral before advancing credit?
□ Yes
□ No

11. If yes, what type of collateral would you require? (Multiple response possible)
□ Landed property □ Automobile
□ Farm □ Others (specify) …….

12. Do you require a surety or a guarantor before credit advancement?
□ Yes
□ No

13. Do you require any minimum deposit before granting loans to your clients?

□ Yes
□ No

14. Do you impose credit limit on your clients?
□ Yes
□ No

15. What is the maximum amount of loan that you can give to clients? ₦……..…….

16. Fill in the available information in the box

Year	Number of Loans Applicants	Total Amount requested by your clients	Number of Satisfied Borrowers	Amount Lent to Them	Number of Quantity rationed Clients
2011					
2012					
2013					

17. On average, what is the percentage of interest rate that you charge on your clients?
□ 1% - 5% □ 26% - 30%
□ 6% - 10% □ 31% - 35%
□ 11% - 15% □ 36% - 40%
□ 16% - 20% □ 40% - 45%
□ 21% - 25% □ > 46%

18. How long does it take them to pay back the credit?
□ 1 – 4 weeks □ 5 – 6 months
□ 1 – 2 months □ 6 – 12 months
□ 3 – 4 months □ > 1 year

19. What is the share of borrowers that did not repay back their outstanding credit in the last financial year?

□ 1% - 5%
□ 6% - 10%
□ 11% - 15%
□ 16% - 20%
□ 21% - 25%
□ 26% - 30%
□ 31% - 35%
□ 36% - 40%
□ 40% - 45%
□ > 46%

20. Do you consider borrower even if he/she is far away from your location?

□ Yes
□ No

21. If yes, what is the distance from your location beyond which you will not consider a borrower?

□ 1 – 20km
□ 21 – 40km
□ 41 – 60km
□ 61 – 80km
□ 80 - 100km
□ > 100 km

22. Does high transaction cost in terms of monitoring and supervision prevent you from giving credit to your clients?

□ Yes
□ No

23. Do you have any outstanding loans in the last financial year?

□ Yes
□ No

24. What is the total liquidity of your bank (current asset/current liability)? ……

25. Specify the number of your deposit accounts: …….

26. Have you made profit in your last financial year?

□ Yes
□ No
□ Breakeven

27. If yes, have you encountered any lost in one of your last three financial years?

□ Yes
□ No

This is the end of questionnaire. Thanks.

Appendix 4
Multicollinearity Test Results for Credit Market Participation

Variables	**VIF**	**TV**	**R^2**
PCM	1.28	0.78	0.22
COM	1.14	0.88	0.12
TOL	1.14	0.88	0.12
INF	1.67	0.60	0.40
ACC	1.39	0.72	0.28
PAR	1.40	0.71	0.29
OFF	1.13	0.89	0.11
TTL	1.15	0.87	0.13
RTV	1.26	0.79	0.21
REG	1.30	0.77	0.23

Note: The mean VIF (variance inflator factor) is 1.29, TV is the tolerance value, while R^2 for the corresponding variables.

Appendix 5
Multicollinearity Test Results for Credit Choice

Variable	VIF	TV	R^2
CAF	1.13	0.88	0.12
AGE	1.98	0.50	0.50
MAS	1.46	0.69	0.31
QLF	1.29	0.77	0.23
FAM	1.57	0.64	0.36
TRD	1.56	0.64	0.36
CSV	2.09	0.48	0.52
SYS	1.22	0.82	0.18
EXP	1.62	0.62	0.38
FSZ	1.25	0.80	0.20
POL	1.10	0.91	0.09
PRF	1.06	0.95	0.05
REG	1.16	0.86	0.14

Note: VIF mean is 1.42, VIF is the variance inflator factor while TV is the tolerance value.

Appendix 6
Multicollinearity for Credit Choice

Variable	VIF	TV	R^2
ACR	1.15	0.87	0.13
AGE	2.04	0.49	0.51
MAS	1.46	0.69	0.31
QLF	1.29	0.77	0.23
FAM	1.57	0.64	0.36
TRD	1.55	0.65	0.36
CSV	2.11	0.47	0.53
SYS	1.22	0.82	0.18
EXP	1.69	0.59	0.41
FSZ	1.23	0.81	0.19
POL	1.10	0.91	0.09
PRF	1.06	0.95	0.05
REG	1.09	0.92	0.08

Note: VIF mean is 1.43, VIF is the variance inflator factor while TV is the tolerance value.

Appendix 7
Multicollinearity Test for the Amount of Credit Demanded Model

Variable	VIF	Tolerance	R^2
AMT	1.68	0.59	0.41
AGE	1.20	0.83	0.17
QLF	1.19	0.84	0.16
IRR	1.23	0.81	0.19
MOB	1.13	0.89	0.11
TNR	1.18	0.85	0.15
SYS	1.15	0.87	0.13
REC	1.40	0.71	0.29
BNK	1.43	0.70	0.30
LIT	1.28	0.78	0.22
RE2	2.42	0.41	0.59
RE3	2.46	0.41	0.59

Note: The mean VIF is 1.48. VIF is the variance inflator factor, while TV is the tolerance value.

Appendix 8

Multicollinearity Test for the Amount of Credit Supplied

Variables	VIF	TV	R^2
LIQ	1.25	0.80	0.20
MRK	1.02	0.98	0.02
PRF	1.26	0.80	0.20
DIS	1.15	0.87	0.13
EXP	1.17	0.85	0.15
ACC	1.27	0.79	0.21
TRD	1.25	0.80	0.20

Note: VIF is the variance inflator factor, while TV is the tolerance value. The mean VIF is 1.20.

Appendix 9

Marginal Effects at Mean of Education (11.37)

Variables	Coefficients	Standard Error	*z*-value	*P*-value
IRR	**0.072**	0.019	3.73	0.000***
REC	**0.104**	0.023	4.43	0.000***
LEN	**0.080**	0.013	6.1	0.000***
LIT	**0.026**	0.010	2.45	0.014***

Note: dy/dx with respect to irrigation, farm record, lenders and financial literacy at mean of years of schooling.