EFFECT OF CREDIT RATIONING ON THE PERFORMANCE OF SMALL-SCALE FARMERS IN NASARAWA STATE, NIGERIA

BY

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A DISSERTATION SUBMITTED TO THE POSTGRADUATE SCHOOL, AHMADU BELLO UNIVERSITY, ZARIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD OF PHD DEGREE IN ECONOMICS

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DECLARATION

I, **AKU, Emmanuel Maganie,** do hereby declare that the work contained in this dissertation is a record of my own research. All other scholars' works referred to have been duly referenced and acknowledged. I also declare that this dissertation has not been presented in any previous application for an award of a higher degree.

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Signature Date

DEDICATION

To God. To God be the glory, great thing He hath done! Mrs. Elizabeth Titilayo Adebiyi and Prophet Julius Kayode Fasuyi. This study is also dedicated to my late Parents: Mr. Allahnana Aku Jamu and Mrs. Lantana Yangaase Aku.

CERTIFICATION

This project thesis, "**Effect of Credit Rationing on the Performance of Small Scale Farmers in Nasarawa State, Nigeria**", by AKU, Emmanuel Maganie meets the regulations governing the award of the degree of Doctor of Philosophy (PhD) Degree in Economics of Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentation.

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ABSTRACT

Access to credit has been identified as one of the key factors required to accelerate agricultural growth and improve welfare of rural dwellers in developing countries.The credit market serving agriculture in Nigeria is encumbered by operational and administrative inadequacies and the discriminatory tendencies of financial institutions. The government has implemented policies to redress the situation, but small-scale farmers have not benefitted from these incentives to any reasonable degree. This makes it imperative to examine the factors circumscribing loan demand and the various rationing mechanisms. This study examines the factors militating actual credit access and the various rationing mechanisms and the effect of credit rationing on farm household's productivity and investment. It seeks to (1) examine the nature of risks facing small-scale farmer-borrowers in Nasarawa State, (2) analyze the factors that affect access to credit of agricultural credit by farmers and highlight the key determinants of this access, (3) ascertain the extent to which farmers are credit rationed and the factors influencing the rationing and how the rationing affects both productivity and investment of the small scale farmers. The study employs primary data obtained from 592 small-scale farmers through a survey conducted in 2018 across the three senatorial regions of the state. Methodologically, the study extends the analysis of credit rationing beyond quantity rationing and presents explicit econometric models for analyzing the determinants of three types of credit rationing: quantity rationing, risk rationing, and price rationing. The logit and probit regression models are employed to ascertain the determinants of credit access and credit rationing respectively. The effect of credit rationing on farm household productivity and investments were also examined by identifying credit-rationed

households based on direct elicitation of their credit-rationed status from survey questions about restrictions on credit and an endogenous regression model was used to analyse the effect of credit constraints on farm household performance.

The results show that credit market access was significantly influenced, among other variables, by gender, monthly income, assets value, savings, repayment capacity and social capital, indicating that security and guarantee is the main criterion lenders use in granting credit. In other words, clients' credit risk profile plays a determining role in household credit accessibility. We used logit model for the access to credit equation and the probit regression model to estimate the determinants of households' credit rationed conditions. The results show that there is a higher probability that farmers will be rejected than that they will be given a loan amount lower than what was requested. It also shows that gender, age, land and asset ownership, strength of previous relationship and social capital are significant in determining whether a household is credit rationed. The effect of credit rationings on farm household productivity and investment were estimated and we found that gender, geographical location, and marital status have no statistically significant effect on the probability that farmers will be quantity rationed. The effect of credit rationing on household productivity and investment which was estimated show that credit rationed households have lower productivity and even investment compared to the unrationed households. The results presented in this study therefore support the claims that credits have an important role to play in rural farm production and additional rural finance can enhance productivity and farm household investment, thus contributing to agricultural sector development. To address the credit rationing challenges and improve demand for loans by small-scale farmers, it is recommended that government and banks should mobilize resources and

establish loan-monitoring committees at the grassroots level to serve as insurance against the risk of loan default.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Access to credit has been identified as one of the key factors required to accelerate growth and improve welfare of rural dwellers in developing countries. Rural development programmes in these countries have shifted their emphases to rural credit as the Governments recognized that small farmers are potentially productive agricultural producers, that cheap and accessible credit is essential for rural development. In the developed countries, governmental intervention on credit markets is a major instrument to support national farming sectors. State-administered loan programmesin the developed countries for agriculturaldevelopment include the 'cooperative Farm Credit System' (created in 1916) and the 'Farm Services Agency' (formerly the 'Farmers Home Administration', created in the 1940s) in the United States of America, (Barry and Robison 2001, p. 557). The support measures in these programmes usually encompass interest subsidies, public grants or public loan guarantees or a mixture of these elements.

In developing countries, credit programmes sponsored by governments or international donor organisations to boost agricultural production assumed major importance after World War II, (Adams 1995).Sustained agricultural growth is crucial for reducing hunger and poverty. Agricultural growth has powerful leverage effects on the rest of the economy especially in the early stages of development and economic transformation, when agriculture accounts for large shares of national income, employment, and foreign trade. In addition, smallholder farmers occupy the majority of the countries land and produce most of its crop and livestock products. Yet most of the population engaged in smallholder agriculture continues to be poor (Salami et

al., 2010). According to Udry (2015),the root cause of this poverty is low agricultural productivity. Agricultural productivity is still lagging behind in many African countries, and most of the continent's lands remain uncultivated.Africa's value added per worker also still lags behind compared to other regions, and therefore there is need to raise agricultural productivity to achieve distributed economic gains.

After decades of policy inattention, disproportionate taxation, and a lack of investment, the importance of the agricultural sector is starting to be recognized by most African countries. The Maputo Declaration (AU, 2003) pledged the investment of 10 percent of countries' national budgets into agriculture and a proposed6 percent annual growth rate of the agricultural sector. The Malabo Declaration (AU, 2014) builds on the previous declaration to include a doubling of productivity gains (Dryden, 2015). If agriculture is to catalyze Africa's development, however, smallholder farmers will need to be the drivers of sustainable agricultural growth. To achieve this goal, the Bill and Melinda Gates Foundations, among other donors, have aimed to address factors that can result in doubling productivity and sustainability for African smallholders through partnerships that leverage an annual investment in agriculture of US$400 million. These factors including policies aimed at increasing yields per hectare through the use of modern seeds and sufficient fertilizer are important, other policy interventions need to be implemented, such as expanding credit in rural areas (Zedillo, 2015).

However, many credit programmeshave been introduced in these countries and they are characterised by strict interest controls or ceilings on loan interest rates, additional subsidisation, and extensive loan targeting. The latter is pursued by making credit access conditional on the use

of certain input or technology packages, supervision, or the affiliation with specific borrower groups. More recently, under the heading of 'rural microfinance', there is a shift towards public support of financial institutions serving various types of rural clientele, including women or small-scale enterprises and farmers in general.

In Nigeria, government has provided cheap funds to the market in an attempt to improve access to credit by small scale farmers. As the provision of credit to small farmers has been widely perceived as an effective strategy for increase production and the development of the agricultural sector, several credit policies have been put in place in Nigeria to improve the performance of small farmers. These include the establishment of schemes, programmes and institutions to address and deliver government's intentions in the sector. The institutions and schemes for financing agriculture have the first objective of encouraging banks to lend to the sector despite the relatively higher inherent risk and uncertainty associated with agricultural business. The second objective is promoting farmers' access to credit by provision of concessionary lending terms. It is believed that by providing small producers with cheap credits, they could be induced to use modern technologies, increase the number of hectares cultivated, agricultural production and rural employment would increase while rural income distribution would improve which in turn, would accelerate agricultural growths and development.With all these efforts to increase agricultural investment in Nigeria, the Nasarawa state agricultural sector remains grossly undercapitalized. Farmers and other stakeholders in the value chain need credit in order to address the issues of poor capitalization, the low level of use of modern inputs, and low productivity.

Despite the advances in technology and policy incentives provided by the government, the financial sector in Nasarawa state has not been able to deliver the services required to transform the agricultural sector. Inadequate information in the market system remains a critical problem in the agricultural finance value chain. The agricultural credit market is beset by numerous imperfections, including covariate risk, scarcity of collateral, information deficiencies, and mass illiteracy of clients. The widespread information asymmetry often leads to problems of adverse selection and moral hazard, which underpin the reluctance of banks to lend to small-scale farmers (Olomola 1996, 1999a).

Nonetheless, the dire need for financial credits by the various subsectors of agriculture (crop, livestock, fisheries, and forestry) cannot be ignored. The credits required vary by type and location of enterprise as well as scale of operation. In general, the need for finance will be in the form of accumulation of funds (savings), working and investment capital, money transfer, and risk mitigation (insurance). According to Making Finance Work for Africa (MFW4A) (2011), secure savings-deposit facilities are needed to meet contingency expenditures and smooth cash flows.

Due to a number of factors, including high incidence of poverty, low savings, and harsh economic conditions, it has been difficult for farmers to rely on equity capital to meet their needs. They have therefore continued to seek debt capital which is creditfrom various sources, both informal and formal. Although sustainable access to financial credits to grow the economy and reduce poverty such access is highly restricted. Access to credits is most limited in Nasarawa state.

The agricultural sector has been poorly served by the financial system partly on account of the unfavorable policy environment, which includes weak regulatory regimes, poor physical and financial infrastructure, and policies that repress the formation of effective linkages between the financial and real sectors of the economy. The credit market serving agriculture is encumbered by the operational and administrative inadequacies and exploitative tendencies of financial institutions. These include

(i) the stringent loan terms and conditions set by financial institutions,

(ii) the negative attitude of financial institutions,

(iii) high interest rates,

(iv) inadequate capacity to offer services, and

(v) inappropriate financial products and services.

The government has implemented policies to redress the situation, including a capital injection in 2009 to boost the financing of commercial agriculture and the introduction of the Nigeria Incentive-based Risk Sharing System for Agricultural Lending (NIRSAL) in 2010. The small-scale farmers who constitute the backbone of Nigeria's agriculture and its substantial contribution to the country's gross domestic product (GDP) have not benefitted from these incentives to any reasonable degree. This is an indication that the intervention strategies aimed at enhancing the performance of agricultural finance often address the supply-side constraints without paying due attention to the demand side. Thus, over the years farmers' access to formal credit has remained restricted and their capacity for inclusion in the credit market continues to be undermined. This discriminatory approach must be redressed. Doing so requires a full

understanding of the nature of the credit rationing that borrowers are facing and the type of remedial measures that will engender a win-win solution that is also in the interest of investors in the agricultural sector. The major form of state intervention on rural credit markets in Nigeria is the extension of preferential loans to agricultural producers.

The Preferential loans under the government programme are extended through the existing network of banks. There are two types of lending organizations specialised on agriculture, namely the Bank of Agriculture (BOA), and the system of commercial banks. The BOAwas the primary channel for financing state-managed agriculture before 1986 when the structural adjustment program was introduced.

The existence of financial constraints and credit rationing in the small farmers activities and finance literature has long been recognized. Small scale farmers have encountered many difficulties in accessing credit from lending institutions in support of their working and fixed capital investments (Meyer 1989; Cruickshank, 2000). The credit market serving agriculture is encumbered by operational and administrative inadequacies and the discriminatory tendencies of financial institutions. When a farmer lacks access to credit or cannot borrow as much as he wants, he is said to be credit rationed or credit constrained. Credit rationing is commonly used to describe a situation where banks limit the supply of loans, even though it has enough funds to loan out, (Jaffee and Modigliani 1969).

The performance of small farmers requires adoption of new technology which is largely depended on availability of capital and agricultural credit is considered as one of the major

sources of this capital. Availability and accessibility to this credit can stimulate the transfer of technology into agriculture, alleviate the constraints inherent in farming and lead to increased crop yield.

Despite the positive effect of agricultural credit on output, investment and sectoral growth in agriculture, credit institutions find it difficult to lend to small-holder farmers. The tentative analysis suggests that positive impacts of governmental credit market intervention on the structural problems of the small-scale farmer in Nigeria and Nasarawa State in particular are in no way evident. It seems even unclear whether access to credit and credit rationing are in fact the bottleneck which is constraining farming operations to a significant extent. Two questions therefore emerge from the preceding discussion which provides the major motivation for this study. First, is there a problem of credit access and credit rationing existing in Nasarawa State farm sector, and second, if yes, can the government intervention programme contribute to solve this problem?

1.2 Statement of the Problem

Although an increasing number of Banks, governmental and non-governmental organizations (NGOs) are involved in raising the efficiency of financial intermediaries targeting rural farmers, their effectiveness in improving the small-scale farmers' access to credit and credit rationing is below expectations (Olomola,and Gyimah-Brempong 2014). Quantitative analyses of the factors influencing credit access and credit rationing in the rural sector have focused more attention on consumption loans than on production loans, or, in many instances, they have made no effort to identify the factors influencing the credit access and rationing for production loans (Kirchler,

Hoelzl, and Kamleitner 2008; Nguyen 2007; Del-Rio and Young 2005; Magri 2002). In effect, a wide variety of variables are often included in the analysis, including household income, savings, cultivated land area, skill of household head, level of education, and official status (Cheng 2006), as well as age of household head, household size, number of working members per household, and number of children under six years (Pastrapa 2011).

Access and rationing of formal credit are important for the development of the firm. Several factors are responsible for this but some are not publicly available. Factors such as the probability that a loan requested by a good applicant be granted, probability that a loan requested by a bad applicant be rejected, and the probability of collecting from loan defaulters are without publicly available data. Other factors prevailing in the credit market that make the provision of credit difficult and/or impossible to obtain include borrower's creditworthiness, terms of credits, asymmetric information for both lenders and borrowers and transaction costs among others. Since lenders behave with the profit motive in mind, they will lend to borrowers who are creditworthy. More often than not, these borrowers can offer collateral or collateral substitutes that are deemed acceptable by the lenders to become creditworthy. However, the choice of this collateral is not easy. Borrowers incur transaction costs in their search for credit. If such costs become too prohibitive for them, they are more likely not to borrow at all.

In Nigeria, agricultural lending funds come from a number of sources which impose different levels of restrictions on the bank's lending operations, especially on its credit evaluation or screening activities. Traditionally, the Government and international financial institutions provide Banks with funds to finance predetermined group(s) of borrowers and/or agricultural

activities, thereby preventing arbitrary selection of borrower. The direct effect is the changing parameters used in decision making such as the banker's screening technology that can allow for a good borrower being accepted rather than for a bad borrower.

Cheap and abundant credit is often regarded as essential for rural development. In Nigeria, the government has strengthened regulation and provides cheap funds to the market in an attempt to improve access and rationing of credit by small scale farmers. However, the performance of rural financial markets remains problematic. Credit programs tend to be self-destructing and policymakers are largely blaming institutional design for the poor financial results from rural credit programs.

The rural financial markets literature (e.g., relationship lending, information asymmetries between lenders and borrowers and transaction cost of information search and monitoring) has identified cheap-credit policies and high operational costs per unit of money loaned as some of the most important factors causing the disappointing results observed in formal agricultural or rural credit programs. Claudio Gonzalez-Vega (1984) and Aguilera, and Graham, (1990) argued that cheap-credit policies tend to create excess demand, thereby forcing formal agricultural lenders to ration credit through non-price mechanisms. Since operational lending costs and associated risks in serving large producers are lower than those associated with small producers, the formal agricultural lender is motivated to favor the largest producers in order to reduce per unit lending costs. The main argument here is that interest rate deregulation would serve to alleviate discriminatory credit rationing and would improve the financial viability of rural credit institutions. Despite the recognized importance of these arguments and the number of studies

engaged in understanding the disappointing results of rural credit programs, few attempts have been made to consider how the imperfect nature of information in credit markets and a role for a non-neutral financial intermediary would help to explain these results. Formal credit market in Nigeria is highly regulated and the amount of research on this issue is limited. Most of the credit market regulations implemented in Nigeria have been established with little if any understanding of how much regulation would affect their main economic aspects, for example, credit access, and credit rationing, loan default and small farmers' performance.

Available empirical evidence suggests that most agricultural credit programs implemented in the country have failed to reach their intended expectation with credit being often diverted to the largest producers and influential producers, thus worsening rural income distribution, (Gonzalez-Vega 1984b and Aku, 2011). The Nigerian Bank of Agriculture Limited that has participated in these programs has fallen into increasing financial difficulties due to a large percentage of nonperforming assets. In some cases, credit expansion has coincided with a decline in agricultural output and an increase in agricultural imports and in rural unemployment.

Carter (1988), Aguilera, and Gonzalez-Vega. (1993)and later (Jeffers 2013) argued that interest rate deregulation would be insufficient to guarantee better results in credit markets if there are asymmetric information problems. Their conclusions however are based on the model of Stiglitz and Weiss, (1981) which does not account for a non-neutral financial intermediary using risk-reducing technologies. Furthermore, the markets considered by them are perfectly competitive without regulations. It is important to recognize that information in credit market is incomplete. The formal agricultural lender cannot know with certainty the riskiness, ability, honesty, or effort

of borrowers, nor can he control all the actions taken by borrowers with borrowed money. Due to adverse selections (information asymmetry) and moral hazard (hidden action) problems, the lender cannot know with certainty the borrower's ability or willingness to repay loans and how it affects the performance of the farmer. The formal lender always faces the possibility of loan default and farmers face the problem of poor performance in production/investment. In view of the credit market information asymmetry, the risk of loan default from poor harvest faced by the agricultural borrower may increase with more stringent terms of the loan contract for two reasons. First, tightened terms of the loan contract may induce applicants with relatively safer projects (Stiglitz and Weiss, 1981, 1983, Wette, 1983), more responsible behavior (honest) (Jaffee and Russell, 1976), and/or higher ability as producers to drop out of the applicants' pool or these terms may force a larger share of borrowers to default on their loan obligations. This is the adverse selection problem. Second, tighter terms of the loan contract may induce some borrowers to invest in riskier activities (Stiglitz and Weiss, 1981, 1983), and/or to devote less effort to their productive activities, thereby increasing the overall risk faced by the agricultural lender. This is the incentive or moral hazard problem.

The incomplete nature of information and the existence of asymmetric information problems in credit markets prompt some problems in measuring agricultural loans in monetary units. Interest rate changes modify the probability of loan default, that is, the quality of the loan. Similarly, an increase in loan size may change the risk to the lender and this cannot be compensated by an increase in the interest rate charged. Thus, for the lender, it is of crucial importance to whom it grants a loan and what actions the borrower takes with it. So, loans cannot be treated as

homogeneous goods measured in monetary units. Neither the interest rate nor costs per loan can be considered to be the price nor the cost of money lent.

It is important to recognize that the aim of the agricultural lender is not only to find borrowers, but borrowers with low probability of default; either because the borrower has a safe project, is honest, a high-ability producer, or has a valuable collateral. Since information in credit markets is incomplete and perfect identification of different classes of borrowers is not possible without additional information, the lender uses different risk-reducing technologies to separate borrowers into different classes, through information or screening technologies, or to induce borrowers to reveal their own class, through incentive and signaling. The lender formulates goals and policy guidelines for loan recovery strategies to collect from unrecognized loan defaulters as well. All these risk-reducing strategies however are costly activities. Thus, it is important that the lender is aware of the marginal impact of these strategies on both revenues and costs and even the productive capabilities of the borrowers.

In the literature, there exist a controversies and limitations in current wisdom of neoclassical economic theory regarding credit rationing. The theoretical controversies are found in the traditional assumption that markets clear and there is no rationing. Any excess demand or supply is eliminated by the 'invisible hand' of the price mechanism. This stands opposite to real world observations of, for example, persisting credit rationing. Although explanations of these phenomena have been sought and proposed for a long time, only recently did economists seriously call into question the general applicability of the standard textbook model of neoclassical theories to certain types of markets. Drawing on pioneers such as Akerlof (1970), a

branch called the ‘economics of information’ developed models in which persistent excess demand could be established due to an asymmetric distribution of information between market participants and Stiglitz and Weiss (1981) on credit rationing.

The major contribution of this branch of literature is the demonstration that contractual arrangements, and in this sense ‘institutions’, can be analyzed through the use of the basic behavioural hypothesis of neoclassical economics of self-interest as expressed by homo economicus. The result is a genuine extension of the neoclassical standard model. Although this can be regarded as an important theoretical progress, the implications are less comforting. As soon as information asymmetries are introduced, most of traditional welfare analysis breaks down. As shown by Greenwald and Stiglitz (1986), in economies with imperfect information, market equilibria are rarely efficient. This implies that much of received economic reasoning such as government intervention on competitive markets is welfare decreasing loses its basic foundation.

The question is whether the neoclassical standard model of clearing markets is a permissible simplification. Are credit markets really distinct from other markets such as markets for chairs, tables, or pencils? The decision has particularly serious consequences due to the fact that, once information asymmetries are allowed, the models do not provide clear-cut policy advice anymore. A case in point is the interrelatedness of credit rationing and underinvestment. From a standard neoclassical perspective, one would assume that, by its very name, credit rationing necessarily implies too little investment. De Meza and Webb (1987; 2000) show that this is in no way the case, since credit rationing may both imply too much or too little funding. Whether one

or the other applies in a given real-world situation is therefore an a priori open question. Compared with the standard welfare arguments usually put forward by trade theorists when it comes to an assessment of border protection or customs regulation, the economics of information provides much less straightforward guidance. There are, therefore, theoretical controversies on two levels: whether information asymmetries are a relevant phenomenon at all and, if yes, what their implications are.

Nasarawa state in Nigeria has high agricultural potentials. The agro climatic condition of the State favors both crops and livestock production. Although about 90 percent of the population in the state is involved in one form of agricultural activity or the other, available statistics show that agricultural profitability and investment are low according to national and international benchmark. For instance, while recommended average yield of grain products per hectare is 0.35 tones, Nasarawa state average yield per hectare is 0.20 tones. This low yield crop performance has kept the farming population in Nasarawa state poor, (Etonihu, Rahman and Usman 2013). Even the technology in use and the development of the sector remain at a subsistence level.

Individual farms in the definition of the National Bureau of Statistical inNasarawa State comprises of privately owned farms cultivating not more than three hectares of land (NBS 2011). This is currently the dominant farm type in Nasarawa Stateas they are the practice in all the local government areas. A general impression is the overwhelming importance of small-scale farms in the state. Over the entire period,more than 75 percent of all holdings are individual farms cultivating

less than 5 ha, and more than 90 percent cultivate less than 10 ha. Overall, to the extent that it

manifested in changes of land resources per farm,there is no structuralchange in the Nasarawa State farming sector since the return todemocracy in 1999. Inaddition, the minimal changes visible in the statistics show no uniform shift towards larger farm sizes.

Though many factors seem to be contributing to this low performance, lack of access to credit and credit rationing seems to be the most important problem. Most of the farmers are peasant farmers and they find itdifficult to meet up with conditionalities in accessing credit from banks. Stringent regulatoryguidelines governing credit institutions have inhibited credit access. Even those that areprivileged to be given loans may be given just fractions of what is requested among others.

1.3 Research Questions

Taking the notion of credit access and credit rationing as a potential problem in rural credit markets in Nasarawa State, the central research questions of this study can be grouped as follows:

(i) What are the socio-economic and loan characteristics of small-scale famers in Nasarawa state?

(ii) What factors influence small scale farmer's access to credit in the Nasarawa State rural credit market?

(iii) What factors influence banks credit rationing to small scale farmers in the Nasarawa State rural credit market?

(iv) How does credit rationing affect productivityof small-scale farmers in Nasarawa State?

(v) How does credit rationing affect investment of small-scale farmers and does it provide an explanation for the structural problems ofthe Nasarawa State farms?

1.4 Objectives of the Study

The main aim of this study is to examine the effect of credit rationing on the performance of small-scale farmers in Nasarawa state and the specific objectives are:

(i) To investigate the profile of the borrowers and examine the loan characteristics of small-scale farmers in Nasarawa state;

(ii) Identify and evaluate the factors determining small scale farmer's access to credit in Nasarawa State;

(iii) Identify and evaluate the factors influencing credit rationing of small-scale farmers in Nasarawa State;

(iv) Analyse the effectof credit rationing on the productivityand loan repayment of small-scalefarmers in Nasarawa State.

(v) Analyse the effectof credit rationing on investment of small farmers use of credit and to determine whether it is responsible for the structural problems of the Nasarawa state farming sector.

1.5 Hypotheses

The hypotheses put forward for this study are:

(i) Access to credit is not influenced by the small-scale farmer socio-economic characteristics in Nasarawa state;

(ii) Small scale farmer credit rationing is not affected by socio-economic characteristics and government intervention in the rural credit market in Nasarawa state;

(iii) Credit rationing does not influence the small-scale farmer performance measured as productivity and investment in Nasarawa state agricultural sector.

1.6 Justification of the Study

Increasing global attention is being given to the study of small farmers access to credit and its effect on various aspects of human life especially farmers performance and alleviating their poverty. Although access to credit has been shown to be of crucial importance in increasing performance and the reduction of poverty of the small farmer, policy for commercial banks in Nigeria and Nasarawa State in particular appears to be underdeveloped and lacking in coherence, (EFInA, 2012). In a report by EFInA on Access to financial Services in Nigeria Surveys (FinScope, 2012) it was revealed that out of the total adult population of 87.9 million, 71.1% reside in rural areas where farming is their occupation and are excluded from formal financial credits and do not have bank accounts. Thus, 34.90 million people are marginalized or formally excluded from credit. Placing these statistics in context, the unbanked populace in Nigeria are the marginalized poor rural small farmers that form part of the Nigerian's population that are poor. Therefore, the results from this thesis will assist in exposing the reasons for these poor performances.

It is obvious that a well-functioning financial sector is a necessary and sufficient condition for rural development and building a prosperous economy. Studies that deal with rural finance and its link with the agricultural sector will have a much greater role. Therefore, this study will provide information that will enable financial institutions to understand how credit affects agricultural production and thereby formulate appropriate lending policies that will improve their lending technology.

The Asian Development Bank (2000) has identified the lack of access to a broader set of financial options as an indication of a potential constraint to entrepreneurship and the ability to undertake socially and privately profitable investment ventures. The reasons for any early failure on the part of financial institutions must be well understood if they are going to play any meaningful role in the delivery of micro financial services. Therefore, the outcomes of this thesis will be useful in determining the modalities for restructuring the rural financial systems in order to convert them into viable rural financial markets that will be well functioning, healthy and expanding with financial innovation that could cause a fall in the costs of financial services.

In practice, small farmers apply for credit and lenders determine how much credit is allocated to them based on their perception of the farmer's creditworthiness. This often results in farmer's being negatively credit rationed and it reflects the lender's perception of the farmer risk profile. Therefore, understanding the factors that influence small farmers to be credit rationed will highlight specific interventions that may raise the creditworthiness of farmers, both to the advantage of lenders and small farmers.

The failure of farmers to gain access to credit is frequently used as an explanation of many important economic phenomena. Accordingly, many studies have been conducted to investigate the determinants of small farmer access to credit and its effects on a different range of issues in Nigeria. Despite the large number of studies on credit accessibility, (Rahji and Fakayode, 2009; Sanusi and Adedeji, 2010; OloladeandOlagunju, 2013; and Eneji, Umejiakwu, Sylvannus, and Gwacham-Anisiobi, 2013) using the probit method, finds that the probability of household applying for credit increases with household total income and decreases with a high level of dependency ration and dissaving circumstances, there has been relatively little empirical work devoted to understanding why farmers are not able to access credit in the credit markets in Nigeria, particularly in Nasarawa State. There is need for empirical research on access to credit and effects of credit rationing on farmer performance in order to generate sustainable information that would serve as a tool or guide for policy makers in their quest to improve agricultural sector credit and performance as well as to achieve the objective of government towards better rural livelihoods. Results from this qualitative study, would be of use in forming a link between concepts and reality. It will also facilitate the proposition of relevant policy interventions and reforms that would lead to improved performance and development of the agricultural sector in Nasarawa State and other States in the country.

In the asymmetric information, Adverse selection, Moral hazard and agency theory literature, micro level efficiency of credit access and credit rationing has been discussed widely under two separate bodies. However, only a limited number of empirical researches, for example, Ali, Deininger, and Duponchel, (2014); Olomola,and Gyimah-Brempong 2014); Kiplimo, 2013; Eneji, Umejiakwu, Sylvannus, and Gwacham-Anisiobi, 2013; Akudugu 2016; Ferede

2012;Pastrapa 2011; Sanusi and Adedeji 2010; Doan, Gibson, and Holmes 2010; Kirchler, Hoelzl, and Kamleitner 2008; Nguyen 2007; Del-Rio and Young 2005; Magri 2002 and Atieno 1997) attempted to analyze the microeconomic efficiency of credit rationing. Most empirical studies, for example, (Rahji and Fakayode, 2009; Sanusi and Adedeji, 2010; OloladeandOlagunju, 2013; and Eneji, Umejiakwu, Sylvannus, and Gwacham-Anisiobi, 2013) concentrate on the demand side, i.e. borrowers' investment behavior and performance; whereas insufficient information is provided with respect to the supply side, i.e. banks behavior and lending policy. Therefore, the potential role of financial institutions to improve efficiency of credit allocation is largely neglected. It is well known that, in less developed countries; the financial sector has a substantial influence on the overall efficiency of domestic resource mobilization. This study aims to bridge this gap by providing valuable information on bank lending behavior and the efficiency of credit allocation under different regulatory conditions.

While researchers, (Ali, Deininger, and Duponchel, (2014); Olomolaand Gyimah-Brempong 2014), among others have relied on various econometric tools to address equity issues in discriminative lending, their approaches have little influence by the literature on microeconomics of lending decisions, especially to small scale farmers. This latter literature focuses on how lenders cope with the opaque information related to small farm borrowers to fashion loan contracts that overcome asymmetric information, moral hazard, agency problems, and other capital market imperfections and frictions. Therefore, the insights from this work will shed more light on the investigation of discriminatory lending practices as it is expected that new evidence on preferential lending will be uncovered through this thesis.

The importance of the study, therefore, is its potential in filling some gaps in literature on access to credit and the effect of lack of credit on small farmers' performance in Nasarawa State. It attempts to identify reasons for the limited access to formal financial credits by rural farmers, by looking at demand and supply behavior. This study is also expected to contribute to both the growing knowledge on credit as a tool in production and rural development in the academic world. It is an information input relevant to government, policy makers and banks towards an improved performance status for rural dwellers and bank profitability. As stated by Stone and Brown (1962), it is better to know the working of the economic system before pushing blames here and there on the failure of government policies and programmes.

1.7 Limitation of the Study

This study is limited to rural financial markets and it concentrates more on the micro aspects of rural finance. In terms of financial services, only credit components are analyzed while other services such as savings are not considered. The focus in this dissertation is small farmers' access to the credit market through the provision of investment and production credit.

One major limitation of the study is that the accuracy of the data depends on the information given by respondents. Most small farmers do not keep records of their operations and finances, hence the dependence of the research on verbal information from respondents. However, all the appropriate scientific approaches to ensure that the confidence levels are high enough are implemented. It is also worth noting that one of the limitations of empirical analysis is that the behavior of only 592 farmers in a random sample is under consideration and generalized to the rest of small farmers in Nasarawa State. Due to the different contexts of the states, the findings of this study cannot be generalized to the rest of Nigeria. Therefore, there is need to complement

the result of this study with similar studies in other states in order to broaden the scope of application of the result of this study.

1.8 Organization of the Study

This study is divided into five chapters. It began with Chapter one as introduction into the basic characteristics of the Nigerian agricultural sector and the government efforts to improve the agricultural sector performance and how the credit programmes had generated the banking related access and rationing that had to be contended. The study notes however, that the establishment of various schemes and programmes has not help matters. The rest include Statement of the problem, objectives of the research, Justification of the study and the organization of the thesis.

In chapter two: we present the concept of credit and some literatures and theories on the small-scale farmers and Bank behaviors. The review covers the classical, Keynesian and the neo-classical analyses of the information, Market failure and the role of government in rural credit market and bank credit concepts. Specifically, it composes of the conceptual, theoretical and empirical literatures on bank lending and borrowing.

The third chapter engages the methodology of the research along with the models and estimation techniques used in this research. It comprises of the methodology of study, study area, theoretical framework, our modeling approach, nature, sources and size of the data along with the sample and the sampling technique. While chapter four covers the analysis of the results and the study ends with summary, conclusion and recommendations in chapter five.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this section, we review some Concepts, theories and empirical works on credit access, credit rationing and small farmers' performance. The review seeks to establish their relevance in explaining the relationships between the relevant variables that influence policies in Nigeria. In examining these relationships, the theories chosen are those that examine the behavior of lenders and borrowers and the transmission from credit to the activities of the small farmers. The choice is significant because the study is focused on the nature of the relationship between lender and borrower through the mechanism of loan and small farmers' performance.

2.2 Concept and Definition of Credit, credit access and credit rationing

2.2.1 Credit

The concept of credit is not so easy to define in view of the fact that no universally acceptable definition is available. Disagreements over the definition of credit run deep and are closely associated with disagreements over the quality of credit. In practice, all these issues of definition, quality, determinants and credit terms are bound up together and understanding of credit requires an appreciation of the interrelationship between them all.

While credit quality and policies are often inseparable, it is important to know that in credit research, the quality of credit determines the access and rationing. Therefore, it is clear to argue that the definitions and quality of credit ought to inform programs and policies aimed at access to credit and/or rationing. The difference between the concept, definition, quality, determinants and terms of credit has been critically highlighted by Moore Geoffrey H and Philip A. Klein(1967), Berger and Udell(1990), and Gopalan Radhakrishnan, Fenghua Song and Vijay Yerramilli(2011). Definitions are what are used to determine the credit and quality that operationalizecredits concept. This clarity of approach is very useful in unpacking how credit can be addressed.

Credit can be seen as the trust which allows one party to provide money or resource to another party where that second party does not reimburse the first party immediately thereby generating a debt and arranges either to repay or return those resources or other materials of equal value at a later date. The resource provided may be financial for example loan or they may consist of goods or services like consumer credit. Credit encompasses any form of deferred payment. It is extended by a creditor also known as a lender, to a debtor also known as a borrower. Credit does not necessarily require money. According to Ingham, (2004), the credit concept can be applied in

barter economies as well and is the direct exchange of goods and services. However, in modern societies, credit is usually denominated by a unit of account. Unlike money, credit itself cannot act as a unit of account.

In most discussions of credit, the quality of the credit is important. According to Moore Geoffrey H. and Philip A. Klein (1967); Berger et al 1990 and later Byaruhanga (2013), the first consideration is given to the terms on which credit is granted. Allan Sproul (1955) and Gopalan et al (2011), observe that the problem of granting credit is not in the amount of credit but on the relaxation of the terms of the credit and the process should not go on indefinitely. There is a strong suggestion here that quantitative changes in credit is brought about by changes in quality and that the process might have undesirable consequences. Analysis of this process is aided by defining and measuring credit quality as precisely as possible so that the effect of changes in it can be identified.

In the literature, recognition has been given to the need for maintaining sound credit terms as quality but there has never been any agreement on how to define these terms. Some early attempts were made to use specific characteristics of the loan contract for this purpose, but these broke down because the guidelines were never very clear, (Moore Geoffrey H. and Philip A. Klein (1967) and it appears no solution have been found till date. There have been efforts to define credit terms as sound if the loan is granted on a collateral basis, (Rogers, 1955; Nwankwo, 1991; Massimiliano Affinito and EdoardoTagliaferri, 2010). The collateralized definition suggests that terms may safely be liberalized as long as the value of the money outstanding will at no time during the life of the credit contract exceed the market value of the commodity used as

collateral to cover the loan. Others emphasize the character and capacity of the borrower, rather than the terms on which the loan is borrowed as the essential ingredient of credit quality, (Lorenz, 1957; Nwankwo, 1991; Kimutai et al 2013). Nwankwo (1991) considers borrower's Capacity, Capital, Conditions and Character as terms to determine credit quality. Capacity according to him is the borrower's ability to repay a loan obligation and bear the subsequent financial risk. Lenders generally analyze a borrower's repayment capacity by conducting an analysis of both historical and projected profitability and cash flow of the business. Capital refers to the borrower's funds available to operate a business. To assess capital, lenders review balance sheets or financial reports of borrowers from both current and at least three previous years, and calculate assets and liability ratios including financial measures of liquidity and solvency. This allows the lender to gauge the amount of equity a borrower has invested in the business and how effectively that investment generates cash flows. Collateral represents a security arrangement that serves as a final source of repayment to the lender should the borrower defaults on the terms of the loan agreement. Since lenders seek to maximize profits, they carefully consider the risk/return relationship of the loan request. As risk increases, lenders will seek larger amounts and/or higher quality collateral, Emerole, Nwachukwu, Anyiro, Osondu, Ibezim and Jonah (2014). Condition refers to the intended purpose of the loan. Lenders consider factors such as the loan amount, the use of the loans, collaterals and repayment terms as conditions for accessing the loans. The lender also considers conditions of the overall economy, which include interest rate levels, inflation rate and demand for money along with fiscal policy of Government that affect the business to be financed. Character encompasses personal factors such as honesty, integrity and reliability. The borrower's risk attitude is an important element of this human factor

considered in the loan decision-making process. If a borrower has a negative evaluation on this factor, the loan may be rejected even if the other factors are accepted.

Credit terms and borrower characteristics, however, constitute only one aspect of the concept of credit quality, albeit an important one. The importance of these terms of credit notwithstanding, Pitcher (1979) criticizes over reliance and emphases on them by the lender and argued that character of the borrower must be primed in any consideration for accessing credits. With the borrower's integrity undoubted and security inadequate to cover the maximum amount to be borrowed, can honesty be simply enough to ensure the success of an enterprise in a difficult and demanding condition of an economy? All the integrity and honesty in the world will be of little help to the managers of a firm that is rapidly sinking to oblivion. To repay loans, the firm must make enough profits and to make profit, the firm has to adopt their product to meet the needs of a changing market or take appropriate corrective action to counter a disproportionate risk in overhead costs and fall in trade. In view of this, we agree with Pitcher when he advocates that the lender when considering the capital and capability of the borrower should also enlist the aid of management accounting and other newer techniques of credit analysis to improve the credit terms. These new techniques according to Nwankwo (1991) include the technical skill of the borrower as well as the capacity for hard work and experience in the particular thing for which the credit will be used and the possibility of the proposed investment generating sufficient cashflow and profits to ensure repayment of the credit including the environment in which the lender operates. Understanding the economic and political conditions and environment whose key issues are the development plan, fiscal and monetary policies and bank regulations among others are a necessary condition to ration credit.

2.2.2 Credit Access, credit rationing and Small-ScaleFarmers

According to Adam Smith in the wealth of nations, Money makes money, and when you have a little, it is often easy to get more but the great difficulty is to get that little. So, accessing credit can be tasking. It refers to the ease or difficulty of acquiring credit by borrowers for purposes such as to smooth consumption or enhance business performance. According to Diagne and Zeller (2001), a farmer has access to credit from a particular source if it is able to borrow from that source, although it may choose not to borrow for a variety of reasons. The maximum amount a farmer can borrow is a measure of the extent of access to credit it has and this is its credit limit. So, a farmer is said to have access if this amount is positive and it participates in the credit market if it actually borrows from that source of credit. This implies that access to credit can be a constraint externally imposed on the farmers and participation in a credit market is a choice made by a farmer. Thus, a farmer can have access but may choose not to participate in the credit market for such reasons as expected rate of return of the loan and/or risk consideration.

Zeller, M., G. Schrieder, J. von Braun and F. Heidhues, (1997) distinguish four groups of farm households in relation to credit access. The first, referred to as voluntary non-borrowers who are those that decline to borrow at will either because they have strong risk aversion or fear of getting into debt or because they are prudent and only would like to consume up to what they earn. The second are those who want to borrow less than their combined available credit lines from all lenders referred to as non-rationed borrowers. Rationed borrowers are those who want to borrow more than their available credit limit at a particular point in time. The last type of farm households are involuntary non-borrowers and are borrowers with no access to credit, or those

who perceive that they are highly unlikely to get credit, so that the perceived borrowing costs outweigh the expected benefits of the loan. They are the rejected borrowers.

When a farmer lacks access to credit or cannot borrow as much as it wants, he is said to be credit rationed or constrained. A farmer is credit rationed only when he would like to borrow more than lenders allow or if its preferred demand for credit exceeds the amount lenders are willing to supply. A careful examination of the interaction between borrowers and lenders would facilitate the analysis of characteristics of credit-rationed farm households.

In the first stage of a loan application, the determination of demand probability is carried out by examining two scenarios, notional and effective demand. Notional demand for credit is the household demand for credit when the applicant is certain of being offered a loan and the transaction cost for loan application is zero. Effective demand for credit is the household's demand for credit when there is a probability of being rejected and there is a transaction cost.The loan that an applicant obtains depends on the household's characteristics and the terms of the loan.

In the second stage, the lender makes a financing decision on the loan application. This constitutes the supply side of the bargain. The lender undertakes the screening of the potential borrower based on observable characteristics in order to minimize default risk. The results of this screening influence the lender's response to the borrower's credit demand. Three outcomes are possible. Firstly, the loan amount demanded by the borrower may be fully granted by the lender. Secondly, the loan amount demanded by the borrower may be partially granted by the lender and

thirdly, the loan application may be completely rejected by the lender. The last two scenarios represent credit constraint which is the state in which the borrower is constrained in his/her access to credit markets or is credit rationed by the lender. Lenders determine how much credit is allocated based on the probability of loan default often resulting in credit rationing.

2.3 Conditions under which Small farmers access credit and Credit is rationed

In spite of the increasing number of private and public agencies involved in raising the efficiency of financial intermediaries targeting the small farmers clientele, their effectiveness in improving the farmer's access to financial services, especially credit, is below expectations Schrieder and Theesfeld, (2000), Zeller, (2000). As a result, the majority of small-scale farmers are left out of the rural financial system. According to Lariviere and Martin (1999), rural financial intermediation is expensive because participants are geographically scattered, small financial transactions are involved and rural incomes tend to be unstable. Most often, there is no clearly defined collateral and rural people are usually not educated. Furthermore, the cost of gathering information about rural borrowers is high, which naturally impedes financial markets from making contact with rural people, especially the farmer Lariviere and Martin, (1999),Schrieder and Theesfeld, (2000).

Lipton (1976) was of the opinion that these problems result from urban bias. According to her, urban interests conspire against the rural people to deny them access to significant amounts of credit, while Gonzalez-Vega (1989) based his argument on the supply allocation problems within financial institutions. He identified widely used concessional interest rate policies coupled with a relatively high transaction costs for servicing small loans and new borrowers as the factors that

discourage financial institutions from lending to the rural people. Another plausible explanation is that because most rural households lack profitable investment opportunities, they do not seek formal credit, nor are they aware of the availability of formal credit, or are too timid to request formal loans. Another significant factor playing a role in household credit accessibility is the differences in borrowing costs among various types of lenders. These discrepancies in costs strongly affect the willingness of the rural farmers to seek loans from formal lenders. Other factors, which influence the accessibility of credit to small rural households, are discussed as follows:

2.3.1 Risk

Spio (2006) describes risk as a blessing as well as a curse of rural finance. It is risk that motivates lenders' efforts to remain liquid so that payments are honoured on demand and to remain solvent by using profits to build capital. Risk is the essential element of finance (Von Pischke, 1994). This is illogical because it is risk that unseats systems, institutions and projects that issue excessive credit, risk translates otherwise rational behaviour into forces that depreciate credit contracts and destroys credit institutions. Debtors are unable to pay, creditors are unable to collect or both (Spio, 2006).

From Herath (1996) and Barry and Lee (1983), six sources of risk for an intermediary can be identified as:

(i) credit risk from potential delinquency or default by borrowers,

(ii) investment risk from capital gains or losses on securities sold before maturity,

(iii) liquidity risk from possible losses of funding resources,

(iv) cost of funds risk from unanticipated changes in the cost of funds,

(v) financial risk from intermediaries' high financial leverage, and

(vi) regulatory risk from unanticipated changes in the regulatory environment.

One source of credit risk that is more prominent in rural credit markets is information asymmetry. Imperfect information about the likelihood of default has several fundamental implications for the nature of credit markets (Blinder and Stiglitz, 1983; Herath, 1996). It gives rise to institutions that specialize in acquiring information about default risk, hence influencing the behaviour of the lender towards its clients. It is easy for a lender with superior information to distinguish between good and bad risks. With such superior information, a lender's ability to identify the borrowers with the best investment opportunities improves greatly. Lenders can discriminate between borrowers only in very broad terms, and will indiscriminately adopt rational and/or irrational methods to reduce risk when information is poor.

Lenders may raise interest rates charged on loans to cover risk; this approach may lead to adverse selection. To illustrate how the adverse selection problem arises in financial markets and how interest rate can be used as a direct screening mechanism to differentiate the risky projects from the safe ones. It is assumed that both borrowers and lenders are risk-neutral, and there are two groups of borrowers, safe and risky ones, and the value of output if successful, while the bank is assumed ignorant of the probability of success of the individual borrower projects. Even though it is assumed that the bank is ignorant about the characteristics of each individual project, it does know the value of the common expected gross returns of the two projects.

In the model developed by Stiglitz and Weiss (1981), it is indicated that lender does not use the interest rate as a screening device because changes in interest rate may affect the riskiness of the pool of borrowers. The implicit assumption is that riskier borrowers have access to risky projects with lower probability of success but higher return if they succeed, while safe borrowers have projects with higher probability of success but a lower return. For any class of projects with the same mean gross return but differing risk, the interest rate can be used to determine the riskiness of a project. At a certain low interest rate, even low return and low risk projects will survive. As the interest rate increases, low return projects will start to yield negative expected returns. Thus, the higher the interest rate, the higher the expected return must be before a borrower finds it worth borrowing for his project. All remaining projects that give the borrower a higher expected net return entail a lower probability of success. Borrowers with low return and low risk project will drop out of the credit market, because they are unable or unwilling to pay higher interest rates. Therefore, the bank cannot use the interest rate as a signaling mechanism.

However, this analysis of credit market is contrary to the classical teachings of the market mechanism. At a given interest rate, if there were excess demand for loan, the classical economic analysis would suggest that the price (interest rate) would rise to offset excess demand. However, in the presence of asymmetric information, the lender will choose to keep the interest rate low enough to obtain a favourable risk composition of projects and to ration the available loanable funds through other means. Therefore, quantity demanded may exceed quantity supplied, while the interest rate does not rise as a result.

Another form of information asymmetry problem is moral hazard. This occurs in credit markets if an increase in the interest rate induces borrowers, who have a choice of projects, to invest in a project that yields the bank lower return than another project in which the borrowers could have invested. It is assumed that both the lender and borrower are risk-neutral and that a borrower has an investment choice between a risky and safe project. The riskier project has a lower probability of success but a higher pay off if it succeeds, while the safe project has a higher probability of success but with lower return. However, the bank does not know which project has been chosen. In this case, the interest rate acts not as selection mechanism, as in the previous case, but as an incentive mechanism, since it affects the actions taken by the borrower once he obtains the loan. At lower interest rate, it is worthwhile for the borrower to invest in safer project that brings positive returns. However, as the interest rate continues to rise, the borrower is induced to switch from the safer project to the risky one, because with the increase interest rate the safer project starts to yield negative net returns. In other words, the higher the interest rate, the higher the net expected returns has to be, and only the risky project will fetch higher expected returns, which induces borrowers to opt for it.

This switch affects the expected returns of the lender because of the limited liability characteristics of the loan contract. If the project is successful, the lender will receive at most the loan amount with the accrued interest, while if the project fails, the lender will receive nothing (or any residual value). The expected returns to the bank are lower for the riskier project than for the safe project. Expectedly, due to the moral hazard problem, banks tend to keep the interest rate low and instead ration credit in order to curb excess demand (See: Herath, 1996; Yazdani and Gunjai, 1998).

Different financial markets try to come up with mechanisms to reduce information asymmetry. The formal financial institutions tend to tackle the adverse selection and moral incentive problems by imposing stringent collateral requirements or restrictive agreement, or by requiring borrowers to provide carefully documented evidence, showing their intention and ability to repay (Floro and Yotopoulos, 1991).

Lenders in some cases may also devise contracts that will provide a strong incentive for their clients not to default, such as contracts in which both the rate charged and the availability of credit at a time in future will depend on the borrower's previous performance, that is,based on the strength of previous relationship. This will create a "customer market", linking particular borrowers to particular lenders.

Barry and Lee (1983) have identified other ways the lenders may choose to counter risks, which are:

(i) diversifying assets and liabilities in order to spread risks over various types of loans, investments, and funding resources;

(ii) diversifying geographically to spread credit risks over a wider area;

(iii) developing loan participation and loss-sharing agreements with other institutions; and

(iv) utilising loan insurance, government guarantees, security requirements, customer counselling, documentation, supervision and avoiding loan risk and other activities.

Some of these approaches have reduced the accessibility of credit to small rural households. Therefore, to be able to manage risk effectively and efficiently, information is not only a

necessary condition but must be sufficient and adequate. Accordingly, the greater the amount of relevant, valid and timely information that can be gathered about the affairs of a loan applicant and the markets in which the client operates, the more refined the rational credit or investment decision. In fact, according to Von Pischke (1994), this is often used to create confidence in the financial markets.

2.3.2 Credit Rationing

In economics and banking, the concept of credit rationing is commonly used to describe a situation when bank limits the supply of loans, even though it has enough funds to loan out, and the supply of loans has not yet equaled the demand of prospective borrowers. Jaffee and Modigliani (1969) defined credit rationing as a situation whereby demand for commercial loans exceeds the supply of these loans at rates quoted by the banks. Bester (1985) viewed credit rationing as when some borrowers receive a loan and others do not, although the latter would be willing to pay even higher interest or to offer an increase in collateral. However, according to Jaffee and Russell (1976), credit rationing occurs when lenders quote an interest rate on loans and then proceed to supply a smaller loan size than demanded by the borrowers.

There is a great debate about the rationale, mechanism and effects of credit rationing on both borrowers and lenders because of the interest of various governments and donor agencies to advancing credit to smallholder farmers, micro-enterprises and the rural poor and the asymmetric information characterising most rural credit markets.

The theory of asymmetric information comes from the discipline that is known as "economics of information". The basic teaching of this discipline is that many markets such as labour, finance and insurance, information is asymmetrically distributed and is costly to acquire (Akerlof, 1970). Information asymmetry models assume that at least one party to a transaction has more, better or relevant information than others Brown, Hillegeist, and Kin. (2004).This creates an imbalance of power in transactions, which can sometimes cause the transaction to go awry. According to Stiglitz (1989), financial contracts include elements that lead to the basic problems of adverse selection and moral hazard. In adverse selection, the ignorant party lacks information while negotiating an agreed understanding of contract to the transaction, whereas in moral hazard the ignorant party lacks information about the performance of the agreed-upon transaction or lacks the ability to retaliate for a breach of agreement (Aboody and Baruch, 2000; Brown, Hillegeist, and Kin (2004). These problems make lenders to ration credit through non-price mechanism. Therationale for financial institution rationing credit by non-price mechanism and the reasons for favouring larger clients over small clients in this process is explored.

(a) Rationale for Credit rationing by non-price mechanism

According to Spio (2006), if the basic tenets of economics are to be followed, then credit rationing will not exist because market equilibrium results when demand equates to supply. Stiglitz and Weiss (1981) posited that credit rationing is not necessary if prices perform their job well, but in reality, it does exist. They explained this phenomenon based on the idea of short or long-term disequilibrium. According to them, in the short term, credit rationing is viewed as a temporary disequilibrium phenomenon in which the economy is said to have incurred an exogenous shock, resulting in some stickiness in the cost of borrowing (interest rate), creating a

transitional period during which rationing of credit occurs. Governmental constraints such as usury laws are used to explain long term credit rationing.

Braverman and Guasch (1986) and Schrieder and Theesfeld (2000) have identified a variety of factors that seem to induce the allocation of credit under competition in the form of rationing that include:

(i) Finiteness of Borrower's Wealth: Borrowers' liabilities are postulated to be an amount not greater than their wealth. This makes lenders find it optimal to set credit limits (Spio, 2006), which according to Bradford, Boucher, and Carter. (1996), is normal for the Borrower's equity to offer the lender some protection against loss from default. However, it is the client's overall equity position on an unsecured loan that is relevant, usually measured by the ratio of down payment to value. In general, the supply of credit is a positive function of these ratios, given that the larger the borrower's own investment or equity relative to his/her borrowed funds, the less the risk to the lender that adverse circumstances will reduce the value of the collateral below the outstanding principal of the loan and thus lead to default. Thedemand for credit will tend to be a negative function of these ratios because of the existence of "marginal" borrowers for whom equity or down payment requirements represent an effective constraint on borrowing and spending.

(ii) Adverse Selection and Incentives Effects: Credit markets are characterised by imperfect information that disables interest rates from playing its classical market clearing role. If there were perfect information and no cost incurred in information gathering about borrowers, lenders would be able to stipulate precisely all the actions that the borrower would undertake which

might affect the returns on the loan given to him. However, due to information asymmetries, and the situation obtained in most rural financial markets in developing countries, where the credit histories of borrowers are not documented, the lender is not able to control directly all the actions of the borrower. Should lenders increase the lending rate to compensate for higher cost of information gathering and its reliability; this may result in adverse selection and moral hazard (See Stiglitz and Weiss, 1981; Herath, 1996; Bradford et al., 1996; Chaves and Gonzalez-Vega, 1996). Both forms of behaviour of borrowers could negatively affect the lenders' returns on loans.

Adverse selection occurs where borrowers with safe and low default risk projects choose not to borrow because of high and rising interest rate, while more risky projects with potential higher returns but higher probability of default are attracted into the market. An increase in the interest rate increases the probability of attracting projects with high probability of default, which reduces lenders' returns on loans.

A rise in the lending rate may also create an incentive or moral hazard problem that induces borrowers to undertake riskier projects that promise higher returns but with high probability of default. The lenders often use a variety of screening devices in the formulation of the loan contracts in order to protect its interest, enhanced the likelihood of repayment and attract low risk borrowers. They may therefore find it optimal to charge lower than equilibrium interest rates and use non-price mechanism to ration credit (Hoff and Stiglitz, 1990).

(iii) Small Borrowers versus Large Borrowers: Small farmers and poor households alike are often discriminated against in favour of the large farmers/households in the credit market especially for agricultural loans, mainly because of the high risks and costs associated with lending to them; and secondly when the lenders rely on farm size as an indicator of individual farm characteristics. According to Spio (2006), because farms are imputed to possess the average characteristics of the group, relatively productive and low risk small farms are offered discriminatory contracts which discourage credit use and further distorts equilibrium credit allocation away from small farms. This distortion is based on information asymmetry, which would be reduced if lenders faced lower information cost, by efficiently collecting better information about their prospective clients (Carter, 1989).

Lenders would only lend to the small farmers/poor households only if they can charge or transfer the proportionally large transaction costs of the small loans to the small borrowers, either as a fixed fee or an increased interest rate. However, when they cannot shift costs, the existence of markets from the supplier's side for small borrowers will cease.

Two contractual restrictions, such as, the imposition of a collateral ceiling and high interest rates, are used by lenders to ration the small farmers in the credit market (Carter, 1989). Most small farmers have vague legal title and this gives them only limited net collateral value, which restricts their feasible loan terms. If interest rate restrictions are imposed exogenously, the conventional result applies with more reason. With restricted interest rates and high collateral requirements, offering loans to small farms to yield the requisite expected profit level may not be attractive. With binding interest rate ceilings, lenders would shift their lending to better

collateralised and, on the average, safer and more productive large farmers at the expense of the small farmers.

Lenders would still prefer lending to large farmers than to small farmers and would ration credit accordingly, even under the same collateral ceiling. Carter (1989) has identify the key factor of credit rationing as the variability in production, which makes small farmer loans risky and unprofitable, while the systematic outcome of profit maximizing behaviour of competitive lenders is the reason why credits are made available to large farmers.

2.3.3 Transaction Costs

It has been argued that high transaction costs are the major factors discouraging many of the rural small farmers in developing countries from using formal loans. According to Gonzalez-Vega (1993) and Olomola (1999), transaction costs have clear influence on the structure of rural financial markets and the behaviour of participants. Gonzalez-Vega (1993:32) identified that improved access to credit is determined by "changes in the environment in which financial institutions operate, changes in the policies that regulate their behaviour, changes in their organisational design and operational procedures, and changes in financial technologies". Transaction costs constitute one of the major determinants in such policies.

According to Spio (2006), transaction costs are an appropriate measure of the higher degree of "friction" in the functioning of these markets. Transaction cost is inversely proportional to market efficiency. The higher the transaction costs of financial intermediation, the less efficient is the performance of the financial markets, and the more constrained is their contribution to

development. Higher transaction costs limit the services that the financial institutions are willing to provide to the rural farmer and their new borrowers. High transaction costs encountered by clients of financial institutions have been a major obstacle that discourage them from seeking loans and making deposits. According to Adams and Canavesi (1992), if rural financial intermediation is to be sustained and expanded, it will largely be dependent on a decrease in transaction costs for both the institutions and their clients.

Insights into how efficiently and equitably rural financial markets are functioning is provided by information on transaction costs. If the clients of rural credit markets are incurring high transaction costs, there is a likelihood that relatively few people are being served by these markets and that the qualities of services provided to clients are poor. It is also an indication that intermediaries are inflicting extensive transaction costs on non-preferred clients, which shows that interest rates are not doing an efficient job of rationing credit. According to Adams and Higurashi (1987), a decline in total transaction costs is a sign that intermediaries are successfully innovating, that more people have access to credit and that the quality of credit is increasing.

The costs of financial intermediation are not shared in fixed proportions between borrowers and lenders. Theintermediaries can transfer, absorb, or in some cases, increase transaction costs incurred by various classes of individuals through a rationing device, depending on whether they are preferred or non-preferred clients.

2.3.4 Delinquency and Default

Delinquency is the inability of borrowers to repay their debts on time, while default is the inability or failure to repay them at all. This is a serious problem and has been a widespread experience for the past few decades. In most developing countries credit repayment, especially smallholder agricultural credit has been a major problem (Chirwa, 1997). Loan delinquency and default has continued to threaten the existence of most formal lenders, for example, Bank of Agriculture (BOA) in Nigeria. According to Sharma and Zeller (2000) and Alex Addae-Korankye (2014), delinquency and default not only decapitalise the institutions and increase their reliance on donors and governments, but they also discourage lending to specific target groups. Credit institutions and programmes in many developing countries have become liquidity constrained largely because of poor loan repayment. These massive defaults and delinquencies have destroyed the long-run efforts to create viable rural lending institutions.

However, formal lenders have often innovatively succeeded in reducing the incidence of default and delinquencies. For instance, by lending to groups of borrowers, the joint liability and social collateral that is created ensures the strict screening of members, the incentive to honour commitments and members of the group monitoring each other's actions. Intensive loan collection either monthly or more frequently and loan supervision measures have been found not only to be effective in limiting default, but also to pass-cost analyses.

Another set of effective measures employed by formal lenders to limit loan default is the provision of repayment incentives, such as pardoning part of the final interest payment if all payments are received on time; speeding up subsequent loan approvals; and increasing

borrower's credit limit if repayment are made on time (Mosley and Hulme, 1998. Interest waiver in Nigerian commercial banks has help reduced bad debt in these banks.

Credit availability, and timeous access to it, is of importance to the small rural household farms. If repayment is not necessary, there will be no place for credit and therefore, any funds advanced cannot be defined as credit. According to Spio (2006), if credit is not return to the lender, revolving funds will not revolve, and to make things worse, new money will not come out from the original sources which are from savers. Fry (1988) and Hunte (1993) have identified excessive arrears and default rates as an indication of inefficiency of credits either because the financial institution has financed unproductive investments or it has failed to press for loan repayment.

2.3.5 Interest Rate

Interest rate is the cost associated with borrowing. In other words, it is the rent or level of compensation a borrower of funds must pay a supplier, or the compensation a lender gives a saver. The interest rate is used as a regulatory device to control the flow of funds between suppliers and demanders, and/or keepers and savers. Thus, the interest rate represents the cost of the money. It is a key variable influencing the actions of financial institutions, borrowers and savers.

The common feature of most credit programmes is the subsidization of interest rates. There are numerous arguments for subsidized credit in rural financial markets and deeply held convictions about its desirability. According to Von Pischke, (1991); Ellis (1994); and Lariviere and Martin

(1999); Mohane H, G. K. Coetzeen and W. Grant (2000), the artificial low interest rate policies have been justified on the following grounds:

(i) They serve as an income transfer device to the poor, who cannot afford expensive credit.

(ii) High rates contribute to inflation.

(iii) Low interest rates induce borrowers to adopt new technologies and increase production.

(iv) Such policies have been adopted in advanced economies, so why not in developing countries

(v) The concessions provided by development agencies should be passed on to farmers.

(vi) Religious and ethical values; and

(vii) They are the second-best alternative if the government cannot improve the economy.

Low interest rate policies have failed to achieve their primary objectives of promoting agricultural production and assisting the small farmer. It has beenargued that subsidized credit is not a cost-effective approach for promoting most of the activities of the small farmers, (Von Pischke 1983). According to him, unprofitable investment cannot be profitable just because credit is subsidized. Credit does not create the non-existent technologies, just as it does not make the required unavailable inputs accessible, nor build the missing infrastructures like roads and storage facilities among others that are required in the farming sector. In addition, credit does not create the absent markets, does not engender comparative advantages, and does not reduce yield uncertainty. In particular, credit does not modify relative social and private profitability, or create investment opportunities that do not exist in rural areas. Credit simply transfers generalized purchasing power to farmers who also faces the same investment options like others. According to Meyer and Nagarajan (1988), subsidized credit is a weak instrument for achieving most of the intended objectives of most credit programmesand evidence emanating from most developing countries points to the fact that subsidized credit cannot compensate for high input prices, low

product prices, unstable input supplies, poor information and transportation systems, and complicated rules and regulations that favour large enterprises.

According to Vogel (1984) and later Gonzalez-Vega (1993), there is an implicit subsidy, when interest rates do not reflect the social opportunity cost of the claims on resources transferred. Subsidized interest rates, contrary to their good intentions had regressive implications for the distribution of wealth in rural areas. The effects of low interest are widely documented in the literature,Mohane, Coetzeen and Grant (2000), the Strauss Commission (1996) and Spio, Groenewald, and Coetzee. (1995).

Subsidized interest rates have been shown to restrict rural households' access to formal credit and it follows therefore that low interest rates cannot remove the monopoly of moneylenders in rural areas as it has been recognized that low interest rates cannot create the missing physical inputs, markets or the technologies that keep the productivity of farmers low in many developing countries. Once the factors are in place (i.e. inputs, markets and technologies) subsidized credit will not stimulate the adoption of new technologies unless large loans are granted to many small farm households. Subsidized interest rates can also lead to credit rationing and exclusion in the credit markets.

The general subsidization of lending interest rates in the rural economy has no strong economic justification, even for the rural farmer. Scarce credits will be required to finance the start-up activities and institutional strengthening of emerging rural finance institutions. Grants are preferable to interest rate subsidies especially when income redistribution is pursued. According to Spio (2006), subsidies create a bias towards accepting investment projects with low returns. It

allows borrowers' own funds or the funds of other lenders to be substituted for credit. Itencourages excessive indebtedness and distorts incentives in favour of capital-intensive techniques of production which promotes corruption and the rationing of credit, and weakens borrowers' incentives for debt recovery. According to the Strauss Commission (1996), subsidised interest rates, unless the subsidy is fully paid through fiscal operations instead of the banks, will result in lower returns to savers and higher costs for non-subsidized borrowers and will increase significantly the countries' inflation and fiscal deficits.

2.3.6 Collateral

Many lenders have come up with various mechanisms to reduce delinquency and to minimize the losses in the case of default by the client. One of the non-price mechanisms universally designed to increase the lender's expected profitability from a loan transaction, apart from screening potential borrowers according to creditworthiness criteria and credit rationing is the use of collateral and guarantees,(Feder G, L. J. Lan; J. Y. Lin; and X. Luo1989). Collateral, at a given interest rate, has three effects, namely:

(i) It has the ability to increases the expected return of the lender and reduce the expected return for the borrower.

(ii) It can partly or fully shift the risk of losing the principal from the lender to the borrower (Bradford, Boucher, and Carter (1996) and;

(iii) It provides those borrowers who have low ability to repay loans with additional incentives to repay a loan (Binswanger and Sillers, 1983). According to Von Pischke (1983), an additional risk-bearing element, implicit in collateral is the fact that it reduces the borrower's ability to incur additional debt.

Larr (1994) had defined collateral as an asset that upon liquidation is adequate to cover most or all of the lender's risk exposure, including principal, accrued interest and collection costs. Most of the definitions of collateral in formal finance fail to include collateral substitutes, which are used more often in the informal financial markets. To extend these definitions of collateral to include these substitutes, FAO (1996) defined collateral as an asset that a borrower agrees to forfeit in the event of loan default, or an asset that has the qualities to enforce loan repayment. To fulfil the requirement, collateral should have certain features which include:

(i) Appropriability which is the ease of liquidation in the event that a borrowerdefault.

(ii) It should have low risk or be properly insured.

(iii) Accrual of the returns to the borrower during the loan period.

(iv) It should be valuable to both borrower and lender.

More often than not, physical assets such as land and real estate are used as collateral. Land is more commonly used as collateral, and is less risky than other forms of security, except in places where legal inhibitions exist on mortgaging agricultural land. The use of land as collateral in rural areas depends on the extent to which the legal system as well as the socio-political environment enables actual foreclosure on agricultural land (Feder, Lan, Lin, and Luo1988). Foreclosure is an easy accomplishment in countries where property rights are clearly defined.

It is also possible for movable assets and crops to be used as collateral especial in areas where some institutional lenders will not accept land as a collateral. However, using assets and crops as collateral has not been easy to maintain. Crops especially need to be stored in warehouses, grain

silos, and a legal framework is needed for transfer of ownership to lenders in the case of default by clients. Where these institutional frameworks are lacking, crops are not reliable as collateral in formal financial markets. Savings funds, guarantee funds, warehouse receipts and insurance policies are other tradable assets that can be used as collateral.

In some cases however, credit market participants have employed a variety of collateral substitutes such as third party guarantees, threat of loss of future borrowing opportunities, tied contracts, loss of reputation and beexcluded from society, especially where the market environment renders most assets less acceptable as collateral or where borrowers possess few collateralized assets.However, land remains the most suitable collateral to use because of information asymmetry between lenders. Institutional lenders are heavily regulated, backed by usury laws, which stipulate a low interest rate; therefore, they cannot charge higher interest rates to compensate for risk posed by other forms of collateral or collateral substitutes.

The roles of collateral in rural credit accessibility have been defined by various theoretical models (Stiglitz and Weiss, 1981; Plaut, 1985; Bester, 1987) as signaling and enforcement functions.

(a) The Signaling Function: These models are based on the assumption that borrowers with a low probability of default are likely to accept an increase in collateral requirements for a certain reduction in loan interest rates than those with a high probability of default. Therefore, borrowers' risk type is determined when they reveal their preferences between collateral and interest rates. Increases in collateral requirements always favour low risk borrowers over high-

risk borrowers. However, according Devinney (1986), collateral will not perform the signaling function when the following conditions prevail:

(i) If interest rates are sticky;

(ii) If the marginal collateralization costs for high risk borrowers are less than for low risk borrowers so that they prefer to offer more collateral for a reduction in loan terms;

(iii) If low risk borrowers have less wealth that can be offered as collateral than high risk borrowers;

(iv) When lenders are not diligent in loan collection, high risk borrowers will be prepared to offer more collateral for lower interest with the hope that they can escape repayment and foreclosure of collateral; and

(iv) In the presence of re-negotiations on loan extension and collateral foreclosing at the end of a contract.

(b) The Enforcement Functions: In these models, the basis lies on the assumption of a legal environment that facilitates loan enforcement and marketability of assets offered as collateral. Collateral performs the enforcement function by either reducing the lender's default loss or making it costly for the borrower to default. Therefore, it is recommended that high-risk borrowers be made to offer more collateral for a given loan size than low risk borrowers.

Restricted access to formal credit for small scale farm households is often linked to inadequate conventional collateral like land. It is imperative therefore for formal lenders to consider the use of other assets rather than land in order to improve rural households' access to formal credit, as has been the case in the informal financial markets. Coetzee et al. (1994) have argued that

alternative collateral (collateral substitute) which is more appropriate at the local level, should be used, which revolve around character-based collateral, referrals, linked contracts and building a relationship between the borrowers and lenders. Another channel to reduce the use of collateral in loan transactions is finding a solution to the persistent problem of information asymmetry in the rural financial markets.

2.4Constraints and opportunities for Increased Lending to Small Scale Farmers in Nigeria

This section examines the environment in which agricultural lending and borrowing take place in order to provide the necessary background for understanding the credit participation of small-scale farmers. The analysis focuses on constraints on credit flow into the agricultural sector, the needs of small-scale farmers and policy incentives by the government to enhance the flow of credit for the benefit of small-scale farmers.

2.4.1 Constraints on Increased Lending to Nigerian Small-Scale Farmers

As Nigerian agriculture undergoes extensive transformation, ramifying the various sub-sectors (crop, livestock, fishery and forestry), the need for debt financing is even more critical than ever before. Farmers are being encouraged to adopt and expand the use of modern inputs and to increase the size of operation in line with the commercial orientation of the ongoing agricultural transformation agenda. With rising poverty and increasing costs of modern inputs, small scale farmers cannot mobilize enough savings to finance their farming operations and transit from subsistence to commercial agriculture. The government is intervening to provide credit incentives; but medium and large-scale farmers and service providers such as agro-input dealers are favored by the banking sector in the disbursement of loans. The commercial banks consider

lending to agriculture to be unprofitable and thus tend to discriminate against the small-scale farmers who dominate operations in the agricultural sector. The farmers on their part continue to lament their restricted access to loans under the various government financial innovations. It is important to stress that for effective delivery of financial services to the agricultural sector; policy makers must understand the constraints faced by lenders and borrowers. Chief among the constraints are policy failures and institutional weaknesses, stringent terms and conditions of financial products and agricultural sector specific risks. In what follows we examine each of these constraints.

2.4.2 Policy Failures and Institutional Weaknesses

The agricultural sector has been poorly served by the financial system, partly on account of the unfavorable policy environment. For years, Nigeria has lacked an enabling environment for efficient operation of the financial system. Until recently, the economy was characterized by weak regulatory regimes, poor physical and financial infrastructure, and policies that repressed financial market development, especially during the 1980s and 1990s, which witnessed negative real interest rates. It is expensive to provide financial services in rural areas, which are typically less dense in economic activity than are urban areas, have poorer infrastructure, and are more subject to risks from weather and agricultural price changes. Furthermore, financial institutions often have a weak institutional capacity to provide financial services in rural areas, and operators within the financial sector often display limited understanding of the agricultural sector and the nature of debt financing required. For example, they often lack understanding of the specificity of farm operations based on time and climatic factors, the gestation period of agricultural

production, and the need for weather-related insurance services. This limited knowledge often spoil their perception of the risks involved in financing the sector.

2.4.3 Stringent Terms and Conditions of Financial Products

The credit market serving agriculture is encumbered by the operational and administrative inadequacies and exploitative tendencies of financial institutions. These include (1) the stringent loan terms and conditions set by financial institutions, (2) the negative attitude of financial institutions, (3) high interest rates, (4) inadequate capacity to offer services and (5) inappropriate financial products and services. Other constraints of a general nature include a poor agricultural statistics and information system and an underdeveloped property rights regime, especially as regards the difficulty in using land as collateral for loans.

Evidence of market failure in the financial sector includes private banks' failure to provide appropriate credit and financial services to small and family farms and rural areas. The agricultural credit market is beset by many imperfections, including market segmentation, covariate risk,scarcity of collateral, information deficiencies, and mass illiteracy of clients. The widespread information asymmetry often leads to problems of adverse selection and moral hazard, which underpin the reluctance of commercial banks to lend to small-scale farmers (Olomola 1996, 1999a). Adverse selection arises when the lenders do not know the particular characteristics of borrowers, especially in terms of their preferences for undertaking risky projects. In the case of moral hazard, the main problem is that borrowers' actions are not discernible by lenders. This heightens the risk of default in the sense that individual borrowers

may be lax in working to make the project successful, or they may change the type of project that they undertake.

2.4.4 Agricultural Sector-Specific Risks

The sector-specific risks manifest in seven distinct categories: (1) production and yield risks, (2) market and price risks, (3) financial risk, (4) legal and environmental risks, (5) risk of loan collateral limitations, (6) human resource risk, and (7) risk of policy instability. These risks characterize agriculture in many developed and developing countries, including Nigeria and details of each category have been provided in the literature, (Olomola, 2011).

2.4.5 Opportunities and Incentives for Credit Participation by Small-Scale Farmers

The agricultural financing reforms implemented since the early 2000s present opportunities for increased involvement by the banking sector in channeling funds to the agricultural sector. Opportunities exist in financial innovations introduced by the Central Bank Nigeria from time to time to keep the credit market operating together with the deregulation of the economy at large. The establishment of the Agricultural Credit Guarantee Scheme Fund (ACGSF) by Decree No. 20 of 1977 and its commencement of operations in April 1978 constitute the most important incentive to induce commercial banks to lend to agriculture in Nigeria. The fund's original share capital and paid-up capital were ₦100 million and ₦85.6 million, respectively. The federal government holds 60 percent and the CBN 40 percent of the shares. The fund guarantees credit facilities extended to farmers by banks, up to 75 percent of the amount in default net of any

security realized. The fund is managed by the CBN, which handles the day-to-day operations of the scheme. The capital base of the scheme was increased significantly to ₦3.0 billion in March 2001.

2.4.6 Recent Performance of the Agricultural Credit Guarantee Scheme Fund

The ACGSF has witnessed various economic regulation regimes and interest rates since its inception. Under the regime of interest rate control between 1978 and 1989, when government stipulated lending quotas for banks, there was a consistent increase in the lending portfolios of banks to agriculture, but since the deregulation of the financial system in the early 1990s, banks have shown considerable restraint in extending credit to the sector, especially to small-scale farmers. The value of loans guaranteed under the scheme increased from ₦806.7 million in 2010 to ₦10.19 billion in 2011 but declined to ₦9.7 billion in 2012. The decline occurred in all subsectors of agriculture except for mixed farming and export commodities. The decline in the value of loans was far less in the case of farmers who borrowed ₦100,000 and above than for those who borrowed between ₦5,000 and ₦100,000. However, the value of loans guaranteed in the former category followed an increasing trend from 2010 to 2012. This contrasts sharply with the latter category (small-scale farmers), which experienced a drastic decline in 2012, in terms of both the value and the volume of loans guaranteed. This is an indication that the discrimination of the banking sector in terms of restricted loan access is more severe in the case of small-scale farmers than it is with farmers in the medium- and large-scale categories. To reverse the declining trend in credit supply, the CBN introduced some financial innovations and products,

such as the Self-Help Group Linkage Banking Program, the Trust Fund Model (TFM), and the Interest Drawback Programme.

2.4.7 Self - Help Group Linkage Banking

The Self-Help Group Linkage Banking program was launched under the ACGS in 1991 and became operational in 1992. Under the program, farmers are encouraged to form groups of between 5 and 15 members on the basis of common purpose (formal and informal). The groups are encouraged to undertake regular savings with a partner bank of their choice. After operating such savings accounts for six months, they can then apply to the partner bank for loans. The amount saved provides partial cash security for loans to savings groups. Bank loans to the groups are normally in multiples of the balance in their savings account at the time of the application for the loan. The group savings security would not be drawn on until the loans are fully repaid. The aim of Self-Help Group Linkage Banking is to inculcate the culture and habit of savings and banking in group members as well as enable them to build up resources for financing their farm projects without recourse to bank borrowing in the long term.

2.4.8 The Trust Fund Model

The Trust Fund Model (TFM) is a framework for enhancing credit supply to the agricultural and rural sectors of the economy. Under the TFM, oil companies, state and local governments, and nongovernmental organizations (NGOs) place funds in trust with lending banks to augment the small group savings of the farmers as security for agricultural loans. The trust fund secures 25 percent or more of the intended loans of the prospective borrowers, the farmers' savings secure another 25 percent, and the ACGSF guarantees 75 percent of the remaining 50 percent, thereby

leaving the lending bank with a risk exposure of only 12.5 percent. Sometimes, the state government, taking cognizance of the low capacity of poor farmers in the state, may decide to increase its stake beyond 25 percent in order to assist peasant farmers who may not qualify for a meaningful amount of loan. By 2010 the total number of memorandums of understanding signed with the CBN under the TFM stood at 56, while the total amount pledged was ₦5.52 billion, compared with ₦5.51 billion in 2009. The ₦5.52 billion remaining in the fund was placed by 18 state governments; 17 local government councils; four federal ministries, departments, and agencies; four multinational oil companies; and 13 individuals and private organizations. However, there was no new placement of funds from 2010 to the end of 2012 and presently.

2.4.9 Interest Drawback

The Interest Drawback Programme (IDP) was developed as an interest rate management framework under the ACGSF to reduce effective borrowing rates without the complication of introducing a dual interest rate regime or contradicting the existing deregulation policy of the government. Under the IDP, farmers borrow from lending banks at market-determined rates but the IDP provides an interest rebate of a determined percentage to the borrowers if the loans are fully repaid as and when due. The IDP has an authorized capital fund of about ₦2.0 billion. The IDP is funded jointly by the federal government of Nigeria and the CBN in the ratio of 60:40. It is regarded as a dedicated fund for interest drawback on agricultural loans and separated from the ACGSF capital.

Available data show that lenders and borrowers have benefited from this incentive. Both the number and value of rebate claims under the program have been trending upward during the last

decade. This implies that the program has induced borrowers to repay on time. Overall, this is likely to have a positive impact on loan repayment performance under the ACGSF.In addition to the ACGSF-related incentives, other opportunities for increased access to funds for agricultural development are created through the Agricultural Credit Support Scheme (ACSS), MFBs, the CACS, and the Nigeria Incentive-based Risk Sharing System for Agricultural Lending (NIRSAL).

2.4.10 Agricultural Credit Support Scheme

Agricultural Credit Support Scheme (ACSS) is an initiative of the federal government and the CBN, with the active support and participation of the Bankers' Committee. The scheme has a prescribed fund of ₦50.0 billion. ACSS was introduced to enable farmers to exploit the untapped potential of Nigeria's agricultural sector, reduce inflation, lower the cost of agricultural production, generate surplus for export, and increase Nigeria's foreign earnings as well as diversify its revenue base. At the national level, the scheme operates through a Central Implementation Committee, while at the Federal Capital Territory and state levels, the scheme operates through State Implementation Committees instituted to ensure that the objectives of the scheme are realized without hindrance. To access loans under the ACSS, applicants (practicing farmers and agro-allied entrepreneurs with means) are encouraged to approach their banks for loans through the respective state chapters of farmers associations and State Implementation Committees. However, large-scale farmers are allowed under the scheme to apply directly to the banks. ACSS funds are disbursed to farmers and agro-allied entrepreneurs at an interest rate of 8.0 percent. At the commencement of project support, banks will grant loans to qualified applicants at a 14.0 percent interest rate. Applicants who pay back their facilities on schedule are

to enjoy a rebate of 6.0 percent, thus reducing the effective rate of interest to be paid by farmers to 8.0 percent. Available data from the CBN show that from the inception of the ACSS in 2006 to the end of 2010 the total amount of rebate claims amounted to ₦844.28 million for 42 projects. There was no settlement of claims in 2011, but in 2012 four projects valued at ₦32.51 million were verified and approved for rebate, thus bringing the number of projects for which interest rebates have been paid since 2006 to 46 and the value of interest rebate payments to ₦876.838 million.

2.4.11 Development of Microfinance Banks

There have been three major reform measures aimed at establishing a strong presence of MFBs in the country to meet the credit needs of small-scale entrepreneurs including farmers, especially at the grassroots level. These were (1) the launch of the microfinance policy in 2005, (2) commencement in 2006 of the process of conversion of community banks into MFBs by the end of 2007, and (3) the transformation in 2006 of NGO-type MFIs to MFBs.

For the conversion of community banks to MFBs the capital requirements stipulated by the CBN were minimum shareholders' funds of ₦20.0 million unimpaired by losses to operate a unit MFB and minimum shareholders' funds of ₦1.0 billion unimpaired by losses to operate a statewide MFB. With regard to the transformation of MFIs to MFBs, a capital base of ₦20.0 million was required. To propel the transformation, the following incentives were also granted: (1) access to state and local government funds to be established with 1 percent of both governments' annual budget; (2) access to the National Microfinance Development Fund; (3) access to the customers' deposit protection scheme of the Nigeria Deposit Insurance Corporation; (4) access to additional

funding through linkage programs between universal, development, and specialized banks and the MFBs; (5) access to the Re-financing and Re-discounting Facility of the CBN; (6) access to the ACGSF by NGO MFIs' customers; and (7) access to the IDP by the NGO MFIs' customers. Since this reform in 2006, the number of licensed community and MFBs has maintained an increasing trend. The number increased steadily from 757 in 2006 to 879 in 2012.

Despite the incentives for the MFBs to finance small-scale agriculture, there seems to be an inverse relation between the growth in the number of MFBs and their lending to agriculture. Like the commercial banks, the MFBs also disdain agricultural lending. The bulk of their lending has always been allocated to commerce and related activities. The share of commerce in community banks' and MFBs' credit was 7.48 percent in 2008; this jumped to 41.4 percent in 2009 and rose further to represent over half the total credit in 2011 and 2012. Although the shares of other sectors witnessed some decline from 2008 to 2012, no other sector witnessed such a precipitous decline as agriculture, whose share fell from 10.41 in 2008 to 5.29 in 2012.

2.4.12 Commercial Agriculture Credit Scheme

As part of its developmental role, the CBN, in collaboration with the Federal Ministry of Agriculture and Water Resources (now the Federal Ministry of Agriculture and Rural Development), established the CACS in 2009 to provide financing for the country's agricultural value chain (production, processing, storage, and marketing). The primary objectives of the scheme are to (1) fast-track the development of the agricultural sector of the Nigerian economy by providing credit facilities to large-scale commercial farmers at a single-digit interest rate; (2) enhance national food security by increasing the food supply and promote low food-price

inflation; (3) reduce the cost of credit in agricultural production to enable farmers to exploit the untapped potential of the sector; and (4) generate employment, diversify Nigeria's revenue base, raise the level of foreign exchange earnings, and provide input for manufacturing and processing on a sustainable basis.

The CACS which is a subcomponent of the federal government's Commercial Agriculture Development Programme, is financed through a ₦200 billion bond raised by the Debt Management Office. Loans to eligible entities under the scheme are disbursed at a maximum interest rate of 9 percent. The subsidy arising from the difference between this stipulated interest rate and the market rate on all loans granted, and the administrative expenses of the scheme, are borne by the CBN. The CBN and the then Federal Ministry of Agriculture and Water Resources jointly ensure that the scheme is implemented successfully. This is achieved through the Project Steering Committee comprising the Honorable Minister of Agriculture and (chairman), the governor of the CBN, representatives of the Federal Ministry of Finance, and commercial farmers, as well as the program coordinator of the Commercial Agriculture Development Programme. The day-to-day implementation of the scheme is undertaken by a Technical Implementation Committee made up of the director of the Development Finance Department of the CBN as the chairman, the head of the Agricultural Credit Support Division of the CBN, and a consulting group as members, and the program coordinator of the Commercial Agriculture Development Programme of the federal government as the secretary.

The CACS is operated in two tranches of ₦100 billion each. The first tranche ran from May to December 2009, while the second tranche commenced in February 2010. As of 2012, a total of

19 commercial banks were participating in the scheme. Nonetheless, disbursement witnessed considerable lag and so the repaymenthave to drag beyond the expected time frame. Available data from the CBN show that by the end of 2012, a total of ₦199.12 billion had been disbursed for 269 projects (239 private projects and 30 projects by state governments, including the Federal Capital Territory).

Under the scheme, each state government can borrow up to ₦1.0 billion for on-lending to small-scale farmers. In 2009, Nasarawa State Government took advantage of this provision of the CACSand borrowed ₦1.0 billion and distributed it to small scale farmers in the state. However, this distribution was manned by the usual Nigerian factors which did not allow the credit reach the small farmers, (Aku, 2011). Nonetheless, the overall impact of the scheme on the flow of credit from commercial banks to agriculture look as if it'snot positive, especially judging by the rising trend in the share of agriculture in commercial banks' total credit to key sectors of the economy. The share rose from 1.4 percent in 2009 to 3.9 percent in 2012. This positive trend cannot, however, be due to the CACS alone; at best it is a reflection of the total effect of all the intervention schemes and government incentives implemented, especially since the mid-2000s.

2.4.13 Nigeria Incentive-based Risk Sharing System for Agricultural Lending (NIRSAL)

In July 2011, Nigeria initiated an agricultural finance framework known as the NIRSAL. It is focused, at the pilot stage, on the development of six commodity value chains: tomato, cotton, maize, soybean, rice, and cassava. NIRSAL, unlike previous schemes that encouraged banks to lend to the entire agricultural value chain without a clear strategy, emphasizes the value chain approach to agricultural lending and insists on coverage of all categories of producers-small-

medium-and large-scale. The NIRSAL implementation procedures are still unfolding, but commercial banks have already started to align their lending to benefit from the various incentives, especially the credit risk guarantee and interest rate rebate. Some banks are also designing value chain financing products based on the NIRSAL guarantee framework. The success of this initiative will depend on the effectiveness of the governance structure, the commitment of the stakeholders to discharge their financial responsibilities under the initiative, and the political will to undertake the sector-specific and fiscal policy reforms necessary for the effective performance of the agricultural sector in general.

2.5 THEORETICAL REVIEW

2.5.1 Introduction

The aim of this section is to address the questions raised in the introduction from a theoretical perspective which are: (i) how can credit rationing be understood and explained on theoretical grounds? (ii) How does credit rationing affect production and investment outcomes of farm households? (iii) Can the prevalence of credit rationing serve as a justification for government intervention? We proceed in several steps by undertaking a journey through the current literature and attempt to clarify what precisely is understood as ‘credit rationing’ in theory. Following this discussion, we aim at consolidating a number of the issues involved by presenting a theoretical model that explains credit rationing as a result of asymmetric information between market participants. Subsequently we discuss the resulting policy implications of this approach, then, we examine the effects of credit rationing on production and investment decisions of farm households in different settings. This provides an important background for the empirical approach of the thesis.

The other aspect of the section reviews the New Institutional Economics theory that relaxes the unrealistic assumptions of neoclassical economic theory such as perfect information, zero transaction costs among others. In the conclusion of the section, we review the empirical literatures that capture the factors that determine credit access and credit rationing.

2.5.2 Credit Rationing: Theoretical Contributions

Credit rationing theory is characterized by a constant and dynamic evolution and has been the topic of extensive research that represents the fields of both macroeconomics and microeconomics. Credit rationing theory can be surveyed from a historical perspective to highlight the contribution of the macroeconomic approach to the microeconomic approach. This consideration allows us to point out the evolution from a supply-side credit rationing theory to a supply-demand theory based on the asymmetry information between borrowers and lenders.

The historic references to Credit Rationing are the usury ceilings (Smith, 1776) and English currency controversies of the 19th century (Viner, 1937). In 1930s, Keynes discussed "an unsatisfied fringe of borrowers" that would like to borrow at the prevailing interest rate but are unable to do so. The number of unsatisfied borrowers depends on the disequilibrium between the volume of loans offered by banks or by alternative sources and the borrowers' demand. Although Keynes did not expand this notion, the availability doctrine developed in the early 1950s is partially based on it. The availability doctrine was originally derived from the monetary control politics of the Federal Reserve in the US. Based on macroeconomic arguments, this doctrine brought forth the subsequent microeconomic approach of credit rationing.

The availability doctrine was first developed by Roosa (1951); Scott (1957a, b); Parker (1972) and Lindbeck (1962) provided a useful explanation of this doctrine by saying that banks are limited by the availability of the funds that they can attract. Due to this supply constraint, credit is always rationed and the credit market balance is purely determined by the supply conditions and real economic activity. In such a context, monetary policy will be a tool to act on the availability of credit. More precisely, changes in the money supply could have direct effects on the credit supply instead of indirect effects channeled via changes in interest rates. Therefore, restrictive monetary policy should significantly reduce resources for business, even if it only induces a small interest rate increase. So, resources are constrained by the availability of credit that was intended for the banks' customers.

As the availability theory is a supply-side theory, it does not consider the characteristics of the demand. Thus, it does not explain why banks cannot increase their interest rates to equate demand with supply and make a greater profit. Hodgman (1960), Jaffee and Modigliani (1969), Smith (1972), Jaffee and Russell (1976) pointed out that the effects of uncertainty contributes to credit rationing theory by including the borrower's risk of default. According to Goulvestre (1980), given the borrower's credit rating, the risk of default increases with the loan size and the expected value of gains increases with the borrower's expected recovery rate.

The concept of credit rationing equilibrium was clarified by Baltensperger (1978), Keeton (1979) and Baltensperger and Devinney (1985). That all things being equal, a rise in the lending rate increases the Borrower's probability of default and a marginal increase in the lending rate can increase the borrower's costs of bankruptcy to a point that leads to a decrease in the bank's

profitability. This trade-off between the costs of bankruptcy and lending rate creates a situation of credit rationing which Baltensperger (1978) sees it as occurring in situations where the price of loan persistently stays at a level that create excess demand over supply of credit. This is consistent with rational lender behavior of when some borrower's demand for credit is turned down, even if this borrower is willing to pay all the price and non-price elements of the loan contract. It is widely known, however, that lenders will not grant arbitrarily large loans even at high loan interest rates. It is known, as well that borrowers with known differences in relevant characteristics get different loan contracts. This point, however, has not always been recognized and it was Keeton (1979) that first proposed a sharper distinction between different types of credit rationing which are:

(i) Type I, or Loan-Size Rationing: Here, some or all loan applicants get a smaller loan than theydesire at the quoted loan rate of interest,

(ii)Type II, or Loan-Quantity Rationing: Some loan applicants are denied a loan even though for the bank they are indistinguishable from accepted applicants.

For both types of rationing, it is required that applicants strictly prefer a larger loan in the sense that they are ready to accept a higher rate of interest in order to secure a larger loan. Though these definitions represent an advance with respect to earlier treatment, the definition of quantity rationing does not help us to understand how quantity rationing actually takes place in credit markets. Normally, quantity credit rationing is assumed to be done by random rejection which is rather unrealistic. Any theory that attempts to explain credit rationing must describe how quantity rationing takes place in rural credit markets. As Keeton (1979) classified two types of credit rationing, (type I and Type II), Jaffee and Stiglitz (1990) presented four types of

Credit Rationing (from type I to type IV). The other is the discouragement theory proposed by Kon and Storey (2003) which is based only on the demand side.

According to Bellier, Annie; WafaSayeh and Stephanie Serve (2012), as those classifications are not actualized and sometimes do not match, the motivation for surveying them is to analyze the differences in credit rationing according to three dimensions: (1) does the definition proposed include the demand size, the supply size or an interaction between demand and supply? (2) What is the magnitude of the asymmetry of information between borrowers and lenders regarding the probability of default? (3) Regarding the demand size, does the definition consider only applicants for lending, or does it include non-applicants?

In Keeton's first classification, only the applicant/borrowers are considered, and two types of credit rationing can be distinguished. A first type of credit rationing which is referred to as type I by Keeton, or size credit rationing occurs when some or all of the applicants receive a smaller loan than they desire, even if they are willing to pay the quoted price. A second type of credit rationing, the type II or pure credit rationing occurs when some applicants are denied a loan even though they are willing to pay the quoted price and cannot be distinguished by banks from other applicants who do receive loans. These are rationed applicants who are randomly selected by the banks.

For both types of credit rationing, the most common hypotheses are that ex ante, the banks can observe the expected return of the project, but the banks cannot observe the borrower's probability of default. Thus, credit will be denied for reasons other than creditworthiness. Then, the difference between types I and II is the magnitude of credit rationing. In the case of type I

credit rationing, all borrowers want to pay the price (the quoted interest rate), but they are size rationed as they receive smaller loans than the amount they desire. This size credit rationing is also called weak credit rationing (Cieply and Dejardin, 2010). In the case of type II credit rationing, some borrowers are fully financed, and some are credit rationed even though they are willing to pay more than the price and even though they accept the non-price elements (loan contracts). Here one borrower is rationed, whereas an identical borrower is financed. This type of credit rationing is derived from the hypothesis of the Stiglitz and Weiss (1981) model. It is also called pure credit rationing and referred to as "type IV" in the Jaffee and Stiglitz's classification (1990). It is also referred to as strong credit rationing (Cieply and Dejardin, 2010). Regarding this framework, acting on price from the supply side is not considered a solution to the credit rationing problem. The rigidity of prices in the credit market is supported by the disequilibrium theory. For developed countries, in the absence of a law on ceiling rates, the high level of competition among banks will strongly limit the flexibility of the price (Cieply and Dejardin, 2010).

Jaffee and Stiglitz (1990) questioned this price rigidity by proposing another credit rationing typology. Their type I credit rationing, referred to as interest rate (or price) credit rationing, differs from Keeton's type I credit rationing on the point that the credit-rationed borrower can obtain a larger loan if he is willing to pay a higher rate. In such a context, even if an individual borrower's probability of default is unobservable by banks, it makes sense to link it with the size of the loan as the bankruptcy costs increase with the size of the loan because larger loans involve higher repayment than smaller ones (Jaffee and Russel, 1976). Thus, a borrower must pay a higher price on a larger loan because his probability of default increases with the size of the loan,

ceteris paribus. Their type II credit rationing, called (divergent views credit rationing) has no equivalent in Keeton's classification, which posited that some individuals cannot borrow at the interest rate they consider appropriate based on what they perceive to be their probability of default. The evolution of the definition of credit rationing is due to the inclusion of the demand size, more precisely by considering the perception of the borrower with regard to the probability of default. Another step is taken with the definition of type III credit rationing, or (redlining). In this type of credit rationing, the asymmetry of information is weaker because the banks know both the applicant's probability of default and the return of the project. The credit decision of the bank will rely on the observance of the risk-return relationship. Given its specific level of risk, the borrower will be rationed when the bank does not obtain the required return of the project. Conversely and finally, type IV credit rationing is the previously defined pure credit rationing (Keeton's type II) in the presence of a strong asymmetry of information.

In addition to the quoted price (the interest rate), the non-price dimension is highlighted by Baltensperger (1978) as another characteristic of the supply side. Non-price elements exclude the macroeconomic determinants of credit rationing provided in the availability theory (such as ceilings on interest rates, discriminatory pricing or exogenous shocks) to focus on microeconomic aspects such as collateral requirements. The importance of non-price credit conditions has been stressed by subsequent credit rationing models. As a matter of fact, non-price elements stem from moral hazard and adverse selection problems in the presence of imperfect information.

An increasing body of analytical work has attempted to explain the functioning of credit markets using new theoretical developments. Challenging the paradigm of competitive equilibrium, they have explored the implications of incomplete markets and imperfect information for the functioning of credit markets in developing countries. These provide a new theoretical foundation for policy intervention. Most of this body of literature has followed from the pioneering work of Stiglitz and Weiss (1981).

The work by Stiglitz and Weiss (1981) marks the beginning of attempts at explanations of equilibrium credit rationing in credit markets. In this explanation, interest rates charged by a credit institution are seen as having a dual role of sorting potential borrowers (leading to adverse selection), and affecting the actions of borrowers (leading to the incentive effect). Interest rates thus affect the nature of the transaction and do not necessarily clear the market.

Both effects are seen as a result of the imperfect information inherent in credit markets. Adverse selection occurs because lenders would like to identify the borrowers most likely to repay their loans since the banks' expected returns depend on the probability of repayment. In an attempt to identify borrowers with high probability of repayment, banks are likely to use the interest rates that an individual is willing to pay as a screening device. However, borrowers willing to pay high interest rates may on average be worse risks; thus, as the interest rate increases, the riskiness of those who borrow also increases, reducing the bank's profitability. The incentive effect occurs because as the interest rate and other terms of the contract change, the behaviour of borrowers is likely to change since it affects the returns on their projects. Stiglitz and Weiss (1981) further show that higher interest rates induce firms to undertake projects with lower probability of

success but higher payoffs when they succeed leading to the problem of moral hazard. Since the bank is not able to control all actions of borrowers due to imperfect and costly information, it will formulate the terms of the loan contract to induce borrowers to take actions in the interest of the bank and to attract low risk borrowers. The result is an equilibrium rate of interests at which the demand for credit exceeds the supply. Other terms of the contract, like the amount of the loan and the amount of collateral, will also affect the behaviour of borrowers and their distribution, as well as the return to banks. Raising interest rates or collateral in the face of excess demand is not always profitable, and banks will deny loans to certain borrowers. The result is credit rationing in credit markets, which refers to two situations: (1) Among loan applicants who appear to be identical, some receive and others do not, with those who don't having no chance of receiving a loan even if they offered to pay higher interest rates. (2) There are identifiable groups of people who at a given supply of credit are unable to obtain credit at any interest rate, but with a larger supply, they would.

(a) Forms and sources of credit rationing

To be more precise is not without difficulty since there are various definitions of credit rationing used in the literature (see Jaffee and Stiglitz 1990, pp. 847-849, and Leathers 1990, p. 782). However, to provide a common reference point for the discussion in this thesis, it is useful to distinguish credit rationing and underinvestment.

Credit is a means to enable investment by solving a liquidity problem. The liquidity problem arises from the fact that outlays triggered by the investment precede expected future returns. Investment in turn is guided by certain higher-level goals such as profit or income generation. Credit rationing is understood as a situation where a lack of sufficient credit inhibits desirable

investment, since the liquidity problem cannot be solved, (Petrick, 2004). That is, credit rationing is seen as the reason for too little or underinvestment.

A potential borrower is regarded as being credit-rationed if his private demand for creditpersistently exceeds the loan amount offered by the lender, with the loan terms showing no tendency to change, (Petrick, 2002). A credit market outcome is characterised by underinvestment if the level of investment carried out by borrowers is persistently below the socially desirable level, (Petrick, 2004). This definition deserves a number of comments. First, a difference is made between private and social desirability. The former is related to the goals of the individual borrower, whereas the latter is concerned with the goals of the society as a whole. These may sometimes harmonise and sometimes not. Similarly, credit rationing may sometimes imply underinvestment and sometimes not.

If credit rationing is believed to be present in a given real-world situation, the preceding tentative definition suggests three major questions: first, which circumstances constitute an ideal situation of absent credit rationing, in which all (privately or socially) desirable investment is carried out? Second, what are the reasons for the observed deviation from this ideal? Third, is it possible and does it make sense to intervenein order to establish or reestablish the ideal situation?

An answer to the first question would provide an important analytical benchmark. This benchmark of an ideal or first-best situation would allow assessing the degree of credit rationing in terms of a deviation from the defined ideal. Possibly it would also give some hint regarding the rationale behind this deviation, which in turn would be helpful for government's intervention.

They would know how much intervention is necessary and could perhaps also measure the success of their action. We try to clarify the first question of what is the benchmark that establishes the presence or absence of credit rationing before, and move to discuss the second and third questions concerning the reasons for credit rationing and the possibility of intervention.

Starting from Adam Smith's notion of the 'invisible hand', which is our benchmark of a perfect capital market, economists have been fascinated by the ideal of a competitive market that achieves a best possible solution to the resource allocation problem of society. Seeing like a paradox, this ideal situation is that prices coordinate the independent activities of purely self-interest participants in the market in such a way that everybody's welfare is maximised. The modern formalisation of this notion is the general equilibrium theory advanced by Arrow and Debreu (1954). Almost all contemporary reasoning in economics takes this neoclassical model as a benchmark. Scitovsky (1990, p. 135), cited in Brandes, Wilhelm (1989) noted that Ever since the paradox was first noted, generations of economists have admired, taught and argued it, and the Arrow-Debreu theory of general equilibrium is the culmination of the profession's long struggle to understand fully all its conditions and implications".

According to Magill and Shafer (1991, p. 1524), much of economic theory can be viewed as a study of the causes and consequences of market failure, where the Arrow-Debreu theory provides the idealised framework in which markets function at their best. In fact, this is precisely the approach taken in this thesis. In line with the given focus of interest, we outline the major assumptions and implications of a perfect neoclassical capital market before challenging them in later sections.

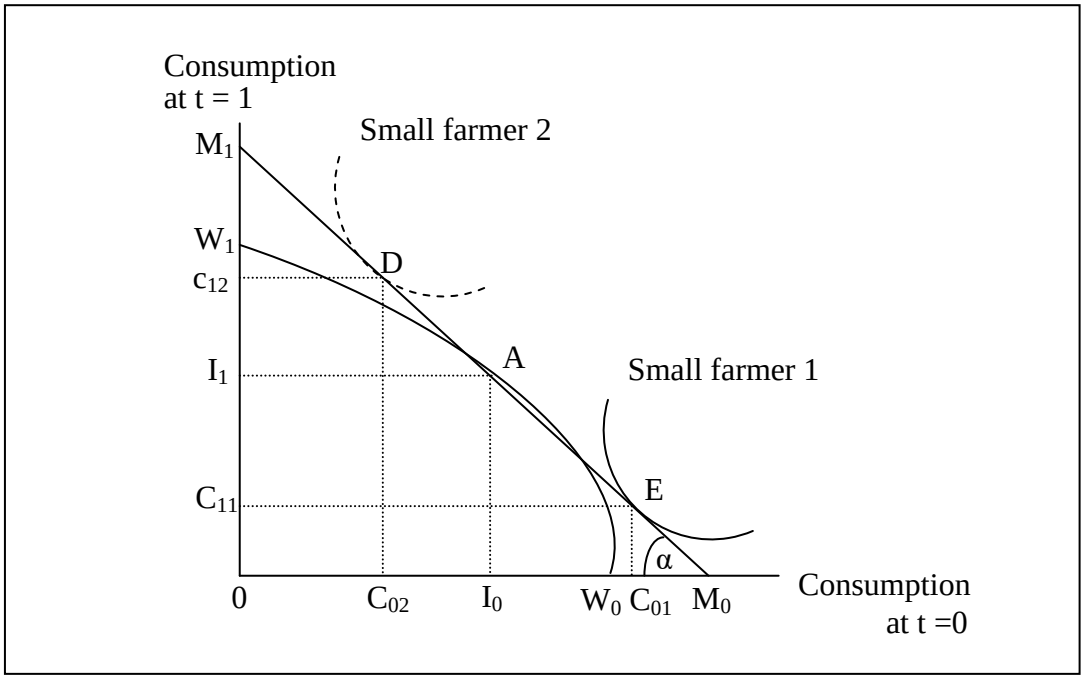
The capital market is understood in an abstract sense as the place where payment streams are traded (see Schmidt and Terberger 1997). The important fact is that payment streams are traded intertemporally. Earlier payment streams are traded for later ones. If the payment stream is such that, in view of the single market participant, outlays precede receipts, we speak of investment or lending. If the reverse holds, we speak of financing or borrowing. Investment and financing, lending and borrowing are treated as completely symmetric. Intertemporal trade is useful since payments have different values at different times due to varying time preferences of market participants. The difference per period is the rate of interest. It says in percent per period how much the value of a later payment exceeds that of an earlier payment. Payment streams may differ in terms of maturity or due date.

Analogically to the neoclassical model of a competitive economy, a number of key assumptions are made that establish the existence of a perfect capital market (see Robison and Barry 1996, p. 34). These include: there are no barriers to entry, no participant can influence the interest rate, transactions are costless to complete, relevant information about the exchanged payment streams is widely and freely available, payment streams within given maturity classes are homogenous, and they are continuously divisible. For this thesis, it is also assumed that expectations are certain. That only payment streams are regarded and are made with perfect certainty.

Under these conditions, there is one interest rate at which payment streams of given maturity and due date are traded. This interest rate represents the opportunity cost of capital for all market participants. Under the further assumption that actors behave in a utility maximising or rational

way, it is possible to analyse the activities on a neoclassical capital market in a graphical model of intertemporal choice due to Fisher (1930), see Figure 2.1. In the model, a rational investor, for example a farmer facing a perfect capital market is endowed with initial wealth and productive investment opportunities. His problem is to maximise intertemporal utility by making optimal investment financing and consumption decisions. Objects of utility are consumption levels today and in a given future period.

Figure 2.1: The Perfect Capital market and optimal intertemporal choice



Source: Adapted from Petrick (2004)

In Figure 2.1, the two axes represent consumption opportunities at time t=0 (present) and time t=1 (future). The investor begins at time t=0 with wealth $0W_0$ which may be consumed or invested (Robison and Barry 1996, pp. 34-37 and Petrick, 2004, pp. 26-27). Wealth $0W_0$ can be invested in (a) a set of productive investments ordered according to diminishing returns along line W_0W_1; or (b) a financial investment with a rate of return r=tan α-1, assumed to exceed zero, along parallels line M_0M_1. Initially, the return on productive investments exceeds return r. Therefore, the rational actor makes productive investments by moving along curve W_0W_1. The profitability of the productive investments relative to the financial investments can be compared at each level of investment. The comparison is between the diminishing marginal internal rate of return (IRR) on the farmer given by the slope of W_0W_1 (which is - (1+IRR) and the market interest rate given by the constant slope of M_0M_1 (which is - (1+r)). The future value of a naira invested in productive investments is equal to the (negative) slope of the productive investment curve. The future value of a current naira invested in the financial market is equal to the (negative) slope of the financial market line.

Beginning at W_0, the optimal level of productive investments is eventually reached at point A, where the marginal IRR on productive investments is equal to the market interest rate r. The optimal level of productive investment, $I_0W_0=0W_0-0I_0$, yields consumption opportunities equal to $0I_1$ at t=1. The optimal level of financial investment, $0I_0$, yields I_1M_1 at t=1. This combination of productive and financial investments has a present value of $0M_0$ or a future value of $0M_1$. The net present value (NPV) described by point A equals the discounted value of future returns less the initial investment.

An important result is that at the optimal level of investment, all productive investment is undertaken that adds to the investor's net present value (NPV). At point A, equilibriumis reached since there is no incentive to change investment plans anymore. Therefore, in equilibrium, those productive investments are made that maximize investors' NPV. Furthermore, all productive investments are made whose internal rate of return (IRR) exceeds the market interest rate.

The optimal investment decision is solely determined by the rates of return on productive investments relative to the market interest rate. Now we consider the investor's desire to consume quantities of goods C_0 now and C_1 in the future. The investor's utility function, $u(C_0, C_1)$, and indifference curves have no influence on the optimal investment under these perfect market conditions. However, the utility function determines the trading activities, that is, lending or borrowing that yield a utility-maximising combination of present and future consumption for the investor given the optimal level of investment. For example, small farmer 1 in Figure 2.1 has a strong time preference for current consumption, as indicated by the location of his indifference curve in the diagram. He will undertake productive investments to point A and then move in the reverse direction by borrowing $0C_{01}$ - $0I_0$, moving along the financial market line M_0M_1 until tangency is achieved with the highest attainable indifference curve. In contrast, small farmer 2, who has a weaker time preference will invest in point A and then save $0I_0$- $0C_{02}$ additional funds moving along the line M_0M_1 until tangency with her indifference curves occurs at D.

The detailed allocation can be seen from Figure 2.1 for both small farmers as follows: The preferred consumption choice for small farmer 1 (C_{01}, C_{11}) is indicated by point E. To reach E, the farmer allocates I_0W_0 of his initial wealth to productive investments, leaving $0I_0$ of initial

wealth for consumption. The optimal consumption plan is then attained by borrowing amount I_0C_{01}, so that present consumption equals $0C_{01}$. The amount of the loan plus interest given by $C_{11}I_1=I_0C_{01}$ (1+r) is repaid from the returns of the productive investment at time t=1, leaving the desired consumption level $0C_{11}$ at t=1. Thus, the utility-maximising consumption levels at point E are $0C_{01}$ at t=0 and $0C_{11}$ at t=1.

The preferred consumption choice (C_{02}, C_{12}) for small farmer 2 is indicated by point D. To reach D, the investor allocates I_0W_0 of her initial wealth to productive investments and saves $C_{02}I_0$, so that present consumption equals $0C_{02}$. The amount saved plus interest given by $I_1C_{12}= C_{02}I_0$ (1+r) increases future consumption possibilities to $0C_{12}$. Thus, the utility-maximising consumption levels at D is $0C_{02}$ at t=0 and $0C_{12}$ at t=1.

In the end, both farmers have the same present values of investment decisions on the one hand, but different utility-maximising financing and consumption decisions on the other. In the presence of a perfect capital market, investment and consumption decisions are separable. For both farmers, at optimal points D and E in the Figure, the slopes of the financial market line, the productive investments line and the indifference curves are equal. Thus, equality occurs among the investor's marginal rates of utility substitution between present and future consumption, the market interest rate and the marginal investment return. In analogy to the neoclassical equilibrium model, these are the conditions under which the capital market operates efficiently.

If there are many investors trading on the capital market, it provides the important service of allowing a redistribution of people's consumption opportunities over time through lending and

borrowing. The prevailing market clearing interest rate reflects the time preferences of investors given their present levels of wealth and their investment opportunities. In equilibrium, all productive investments with a positive contribution to NPV are undertaken. All small farmers realize their utility maximising consumption bundles given their resources and therefore all gains from intertemporal trade are exhausted. This situation is said to be Pareto-optimal since consumption opportunities cannot be reallocated to make someone better off without making someone else worse off.

In all, the assumption of a perfect capital market in connection with rational behaviour has three major implications:

(i) All productive investment that yields at least the market interest rate is undertaken. In equilibrium, rational actors maximise the net present value of their investment portfolio.

(ii) Investment decisions are made independent of consumption and financing decisions. Individual preferences do not influence which investments are undertaken.

(iii) The perfect capital market allows an efficient Pareto-optimal allocation of payment streams. Both the private and the social optimum are reached.

It may be added that these results hold even if expectations are uncertain as long as the assumption of a perfect capital market is maintained. In its most general form, the Arrow-Debreu model allows equilibrium under uncertainty, since every possible future state is covered by a so-called state-contingent claim and perfect insurance is possible (Arrow and Hahn 1971). Also, without such an assumption, Modigliani and Miller (1958) have shown that the market value of a firm facing a perfect capital market is independent of its financial structure. This holds even if

firms differ in their business risk. Therefore, the firm's financial policy is irrelevant for its investment decisions. This is the Modigliani-Miller Theorem, which can be viewed as a counterpart with a given degree of uncertainty to the above-mentioned Fisher Separation Theorem (see Schmidt and Terberger 1997). Finally, Sharpe (1970) has demonstrated in his Capital Asset Pricing Model (CAPM) that under explicit consideration of risk, investment projects can be evaluated in separation from financial decisions. Hence, without going into the many details, the assumption of certain expectations is not crucial for the central neoclassical result. In the presence of a perfect capital market, there is an objective criterion concerning which investment projects should be carried out. Sufficiently profitable projects (taking into account a risk premium) can and will be financed.

Due to its desirable properties, the perfect capital market will serve as the benchmark for further reasoning on credit rationing. However, it is clear from our discussion that in a perfect capital market, all investment projects can be financed as long as they yield at least the given market rate of interest. However, these are precisely the projects that contribute positively to the investor's NPV, so that there is no excess demand and hence no rationing. Even if the investor prefers not to invest his own wealth into the project as shown by small farmer 1 in the Figure, sufficient profitable investment will nevertheless be undertaken via funding from the capital market. For the investor, there is no problem of financing, since he is completely indifferent as to credit versus equity funding. Based on these theoretical reflections, the following definition emerges:

On the basis of the neoclassical model of a perfect capital market, we see credit rationing as being absent if all projects are undertaken whose return is at least as high as the market rate of interest. Here, an 'ideal' situation is established that implies no credit rationing. The definition includes an important restriction which is that in case an investment project does not yield the necessary rate of return equal to the market interest and is not credit funded, there is no credit rationing. Such a project is inefficient and would be a waste of money (see Schneider 1992, p. 629). As an implication, inefficient projects are sort out by the market mechanism without any government intervention.

(b) Problems with the neoclassical view of a perfect capital market

The definition that under certain circumstances, there can be no credit rationing might be regarded as not fully satisfying. For example, it remains unclear what should be used as 'the' market rate of interest. What if no single market rate exists? Does credit rationing automatically prevail in all cases not fully in compliance with the assumptions of the neoclassical model? To answer these questions, a more operational definition of credit rationing is clearly desirable. In fact, the attempt to be more precise about the presence of credit rationing is linked to the problem of how realistic the neoclassical model of a perfect capital market is. Most people would probably agree that the conditions under which such a market exists are hardly met in reality. Not the least observations of phenomena such as credit rationing have fueled skepticism with regard to the appropriateness of this model. In most cases, in the neoclassical model, credit rationing is assumed away which has the implication that there is no credit rationing in a perfect capital market.

Here, a key problem is that in the mainstream theory, the credit rationing as a problem does not occur. Hence, apart from defining a benchmark, neoclassical theory appears to be of little value in explaining real world observations such as credit rationing. The issue of how to deal with observations that are not reconcilable with the orthodox view of perfect markets shows a fundamental problem in a contemporary economic theory. However, we can see three ways out of the dilemma which include:

(i) Ignore the problem. The first solution is to disregard problems of credit rationing or to downplay their importance. This is the view of neoclassical capital market theory. Its representatives and key contributors are Fisher, Modigliani and Miller and Sharpe maintain the assumption of perfect capital markets throughout their analyses.

(ii) Extend the neoclassical model in an appropriate way. Proponents of this solution agree with members of the first group that the insights of the neoclassical model have relevance for the study of economic behaviour. Their strategy is to gradually modify the model to allow the occurrence of phenomena impossible in the pure neoclassical world. In doing so, formal and/or mathematical notation is usually retained. Manyresearchers are in this group. One of the major proponents is Stiglitz in his work of 2002 paper.

(iii) Abandon the neoclassical model altogether. In its extreme version, the third way completely denies that the frictionless, perfect market model has anything meaningful to say about economic events in the real world. In this respect, Demsetz (1969, p. 1) speaks of a "nirvana approach". Representatives of this group thus attempt to explain economic behaviour in

a principally different manner than the neoclassical model, for example by the assumption of bounded rationality and opportunism (such as O.E. Williamson, 1985 and 1993). A formal analysis in mathematical terms is usually rejected, though research topics often parallel those of the former way, for example with respect to a comparative analysis of institutional settings alternative to the perfect market. Within the focus of financial issues, research on 'behavioural finance' seeks to identify and explain behaviour inconsistent with the rationality postulate, (Thaler 1993).

Both the second and third way are usually classified as belonging to the broad 'institutionalist' field of economics, which is why a clear-cut border between the two may be difficult to draw. It is beyond the scope of this section to give a detailed overview of the different branches of the so-called 'New Institutional Economics' (NIE). This is reviewed in the next section below.

The principal approach of this thesis is very much in favour of the second way. The rationale behind this decision is as follows. Since the investigation of credit rationing is one of the major objectives of this study, it is obvious that the first way makes little sense to follow. However, to completely call into question the neoclassical foundations of economic theory as suggested by the third way seems to be unwarranted as well. In particular, there exists no unified theory which may take the place of a central reference comparable to the neoclassical tradition, and which is equally well analysed, understood and accepted. Therefore, we explicitly maintain the neoclassical model as a benchmark. It will serve as an important background for the further discussion of credit rationing similar to most of the theoretical credit rationing literature.

(c) Positive transaction costs

If credit rationing does not occur in the neoclassical model, it is natural to suspect that this may be due to the specific assumptions underlying the model. In this and the following section, we will therefore investigate the consequences of relaxing two major assumptions of the neoclassical theory, namely (a) transaction costs are zero, and (b) relevant information about the exchanged payment streams is widely and freely available.

Transacting on markets involves costs in addition to the nominal price of the good to be purchased or sold. This statement might be illustrated by a passage from Coase (1960, p. 15) who was among the first to point out the importance of positive transaction costs. He noted that, in order to carry out a market transaction, it is necessary to discover who it is that one wishes to deal with, and to inform the people that one wishes to deal with on what terms to conduct negotiations leading up to a bargain which will draw up the contract to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on. These operations are often extremely costly, sufficiently costly at any rate to prevent many transactions that would be carried out in a world in which the pricing system worked without cost.

Transaction costs are the result of activities necessary for search and information gathering, bargaining and decision making, and supervision and enforcement of formal or informal contracts (Furubotn and Richter 1997, pp. 44-45). They can be regarded as the economic equivalent to friction in physical systems (O.E. Williamson 1985, p. 19). Clearly, these costs have a close connection to the fact that individuals are not fully informed about the good to be traded, the other market participants, or the practical and legal aspects of concluding contracts.

Though not all transaction costs are due to imperfect information for example, time expenses for waiting or transportation costs, it is useful to examine the effects of positive transaction costs and asymmetric information jointly. For the moment, however, we concentrate on the cost dimension. Coase already mentions an important consequence of these costs when He said that nonzero transaction costs can make trade activities prohibitively costly and that would have been carried out otherwise. This begs for the question that do transaction costs constitute a case of rationing? Before discussing this question, we first want to raise a second question that has caused some confusion in the literature, namely: can transaction costs be measured? If yes, does this measure provide a yardstick that allows the quantification of credit rationing as a deviation from the neoclassical ideal?

At first glance, this suggestion seems to be quite reasonable. In fact, both with regard to credit markets in general and to rural credit markets in particular, economists have stressed the importance of transaction costs. Benston and Smith (1976) regard transaction costs as the ultimate reason for the existence of financial intermediaries such as banks. Curiously enough, banks have no role to play in general equilibrium theory where they are superfluous (Freixas and Rochet 1997).

With respect to rural credit markets, a strand of literature closely associated with the so-called Ohio State School of rural finance stresses the importance of non-interest loan transaction costs prevalent in developing countries (Adams and Nehman 1979; various contributions in Adams et al. 1984). According to Adams and Nehman (1979, pp. 6-7), loan transaction costs may include first of all loan charges collected by the lender beyond interest payments, such as application

fees, forced purchase of other lender services, bribes, or compensatory balances. Secondly costs due to negotiations with someone outside the formal lending agency such as extension staff, local officials or cosigners and finally travel and time expenses which may be substantial in rural areas and at certain times, for example in planting or harvesting periods. This list suggests that loans made to rural inhabitants can be regarded as quite transaction cost intensive from the borrower's point of view.

These costs certainly can be measured, at least as long as they are actual cash expenses. There are several contributions in the literature presenting figures of loan transaction costs arising in rural credit markets of various countries. For example See Adams and Nehman (1979) on Bangladesh, Brazil, and Colombia and various contributions in Adams et al. (1984) mainly on Latin America, Cuevas and Graham (1986) on Bangladesh, Ecuador, Honduras, Panama, and Peru, Ahmed (1989) on Bangladesh, Meyer and Cuevas (1992) on Bangladesh, Dominican Republic, Honduras, Niger, Philippines, and Togo, and Olomola (1999) on Nigeria. Furthermore, writers of this tradition have claimed that loan transaction costs are the ultimate reason for credit rationing of certain types of borrowers, particularly small farmers (Cuevas and Graham 1986; Ladman 1984; Meyer and Cuevas 1992). There is a tension between the use of the term credit rationing in the cited Ohio State school literature and the more formal agency literature. While the latter in accordance with the definition given above clearly sees credit rationing as a quantity restriction, the Ohio State school writers seem to imply that rationing works through a price mechanism (via transaction costs). The only way to reconcile these two views is by regarding a borrower's demand for credit determined by a hypothetical first-best interest rate. In case the borrower actually faces positive transaction costs, she can afford less than the first-best credit

volume, which restricts the quantity borrowed and might hence be interpreted as an excess demand. It appears useful to formally investigate which consequences the introduction of transaction costs on loan markets has.

In relation to the loan size, positive transaction costs cause an increase in the effective interest rate a borrower has to pay, since they add to the nominal interest. Similarly, they reduce the effective rate a saver may obtain. They then drive a wedge between, in this case, saving and borrowing rates. The general result is a price band between actual sale and purchase prices the decision maker faces (see Sadoulet and De Janvry 1995, pp. 149-159; 254-5).

To decide whether there is any persistent excess credit demand as compared to the ideal situation or whether credit allocation in the presence of transaction costs is socially inefficient depends on the interest rate taken as benchmark. Positive transaction costs distort the unambiguous benchmark of the ideal, neoclassical world in such a way that a definite judgment cannot be made any more.

One way out of this dilemma could be to simply accept transaction costs as a fact of life and treat them similarly to conventional production or transportation costs. Without severe difficulties, 'transaction activities' could be included in an otherwise unchanged neoclassical trade model (see the example in Furubotn and Richter 1997). With a given transaction technology, rational decision makers would economise on transaction costs and this would slightly affect the optimal solution of the model but the property of Pareto-optimality, given positive transaction costs would be preserved. By such a model, interest spreads can be explained. However, the problem of evaluating investment projects as just demonstrated emerges, which is why the situation is

simply declared as being ‘constrained-efficient’ or ‘second-best’ as compared to a world with zero transaction costs. Taking the problem of the Investor as an example, it would be regarded as socially constrained-efficient in a second-best world that his desired investment cannot be carried out, while in a first-best world it would clearly be inefficient to refrain from doing so. On the private level, taking one or the other interest rate as appropriate discount would end up in the same dilemma.

As Dahlman (1979) has pointed out, a fundamental difficulty arises from this logic (see also De Alessi 1983, p. 69). If all constraints of the real world are taken as given, a situation can always be described as Pareto-optimal: “if it exists it must be optimal, and if it does not exist it is because it is too costly, so that it is optimal too” (Dahlman 1979, p. 153). As a result, any reasonable benchmark in terms of efficiency or optimality disappears.

In all, there are examples of transaction costs on loan markets that can be and are measured. However, the introduction of given transaction costs into the formal analysis at the same time undermines the established criterion of efficiency. We can therefore conclude that a judgment concerning the presence of credit rationing in a world of positive transaction costs is impossible as long as the nature of these costs is not investigated further. One decisive question to be posed during this investigation is, as Furubotn and Richter (1997, pp. 62; 460-1) made clear, which transaction costs or which additional constraints of the real world are unavoidable and which can be circumvented?

The next steps in the analysis are therefore guided by the following two issues: (a) a closer examination of the nature or the determinants of transaction costs, and (b) the search for an operational rule that allows assessing whether transaction costs are avoidable. Before going into the details of these issues, we call our attention to an important source of transaction costs regarded as being 'avoidable' by many economists who are in favour of financial liberalisation and deregulation. This source is government intervention.

In developing countries including Nigeria, intervention on financial markets often take the form of foreign exchange controls, interest rate ceilings, selective and sectoral allocation of credit, target groups of borrowers for credit allocation, collateral requirement for certain borrowers, and high reserve requirements leading to a situation of financial repression (Fry 1995, pp. 20-21). Under these conditions, it is quite plausible that potential borrowers find that they either cannot borrow as much as they would like to at current interest rates or are unable to borrow at all (Driscoll 1992, p. 68). Therefore, many economists would probably agree with Baltensperger (1978, p. 180) that "legal ... constraints on loan term adjustments may lead to rationing and certainly may have undesirable efficiency results." This is also the major argument of the Ohio State School of rural finance. Writers in this tradition make transaction costs caused by restrictive government regulation directly responsible for credit rationing of rural borrowers (see Adams 1993; Cuevas and Graham 1984 and 1986; Ladman 1984). In this view, the best intervention to mitigate credit rationing is to remove existing financial policy measures.

Over the years, policies of financial liberalisation have figured prominently world-wide (see Caprio, Gerard; Honohan, Patrick; Stiglitz, Joseph E. (eds.) 2001). They are also an important step in the transition process of developing countries including Nigeria. How far liberalisation is

still due on the Nigerian rural credit market will be taken up in the discussion of the empirical results of this thesis. For the moment, we will not elaborate further on policy issues but come back, on a theoretical level, to the question of the nature of transaction costs.

Indeed, possibly as a consequence of widespread liberalisation policies, there is now a substantial volume of literature investigating the causes of credit rationing on unrestricted financial markets. Compared with the literature emphasizing measurement or observation of transaction costs, which is regarded as not fully satisfying in theoretical terms, this line of research is primarily concerned with more abstract and formal models. It is thus quite close in spirit to conventional, neoclassical equilibrium theory and belongs to a research usually called 'agency theory', 'principal-agent analyses, or 'economics of information' (Bamberg and Spremann 1987). As was discussed above, this thesis attempts to extend the neoclassical model in an appropriate way to make it more flexible for explaining real world events, without throwing all its major assumptions overboard. As the names suggest, the basic premise of this literature is that there is an asymmetric distribution of information between decision makers, which constitutes the so-calledagency problem. Economic actors have to be treated differently according to their information status, which is why the distinction between principal and agent is introduced. As subsequent sections will show, this is tantamount to a much more comprehensive analysis of a variety of institutional arrangements than possible in the orthodox, neoclassical framework. In the terminology of O.E. Williamson's Transaction Cost Economics, this analysis would be described as assessing alternative 'structures of governance'. The next section will outline some basic elements of this theory.

(d) Asymmetric information

The consideration of asymmetric information between market participants has opened a wide arena of economic research that today represents a major branch of institutional economics. One of the earliest contributions in this line of research was Akerlof (1970), who demonstrated the effects of unknown quality of used cars on outcomes of the second-hand automobile market. He observed that, the fact that there are 'lemons', that is, used cars of a poor quality which cannot be distinguished from high-quality cars by potential buyers, may lead to a complete breakdown of the market. In this paper a second market receives attention where similar problems may occur: the market for credit, on which lenders have only limited information about the 'quality' of borrowers, that is their honesty, reliability, or trustworthiness with regard to the due repayment of the loan. This phenomenon also features prominently in the labourmarket, in which other early papers of the asymmetric information tradition focus, for example Spence (1973) and Stiglitz (1974). It may pay the opportunistic borrower to pretend to be honest, and take the money and run after he received the loan. As a result, the lender will think twice whom he will grant a credit. In this case, the lender is called the principal, and the borrower is the agent due to the differential information they possess about each other. In this way, a peculiar type of uncertainty is reintroduced into the analysis.

Later research made clear that the effects of asymmetric information distribution may reasonably be classified according to the sequence of actions of principal and agent. As a consequence, principal-agent problems are often cast in game theoretic terms (see Rasmusen 1994, part II). With regard to credit markets, there are three key problems a lender must contend with. The lender must (a) ascertain what kind of risk the potential borrower is (the problem of adverse

selection), (b) make sure she will utilise the loan properly, once made, so that she will be able to repay it (moral hazard), and (c) learn how her project really did in case she declares her inability to repay (costly state verification). We include the fourth problem which was formulated by Ghatak and Guinnane (1999, p. 197), the problem of the enforcement of the loan contract, which is omitted here since it is not directly related to asymmetric information.

Accordingly, one can distinguish information asymmetries that are ex ante (adverse selection), interim (moral hazard), or ex-post (costly state verification) to the borrowing transaction (Freixas and Rochet 1997, p. 16). We characterize the three phenomena in turn as in Ghatak and Guinnane (1999). Other expositions of the principal-agent problem with increasing degree of complexity are Hoff, Braverman and Stiglitz, (1993), Neuberger (1998), Brandes (1989), Furubotn and Richter (1997), Kreps (1990), and Rasmusen (1994). This list does not claim to be comprehensive.

(i) Adverse selectionin loan markets arises when borrowers have characteristics that are unobservable to the lender but affect the probability of being able to repay the loan. A farmer may be in a better position than the bank to assess whether his soils and his abilities justify investment in a fruit tree plantation. If the bank, therefore, cannot discriminate between borrowers, low-risk investment projects might be withdrawn from the market if they are only offered the average loan contract conditions. This in turn worsens the average quality of the loan applicant pool from the point of view of the bank, which is a process of adverse selection. The presence of high-risk borrowers in the market thus exerts a negative externality on low-risk borrowers. In the extreme case, the result is zero trade, as in Akerlof (1970) lemon example.

Hence, both lenders and low-risk borrowers have an interest to overcome the information asymmetry. This is however not costless, since it involves expenses on screening or signaling activities (Spence 1973).

In credit markets, these are particularly widespread: lenders demand collateral that can be seized in case of loan default and borrowers are required to finance part of the investment by their own wealth or must show extensive business plans, third-party guarantees, and income statements. According to Kreps (1990, p. 651), if the informed side takes the active role, one speaks of signaling (e.g. by offering a third party guarantee), while screening is present if the side without information proposes a menu of contracts (e.g. including different interest-collateral combinations) among which the informed side selects.

(ii) Moral hazardis related to the fact that, once a borrower has taken a loan, the project's payoff depends in part on the borrower's effort. This may be not directly observable by the bank. With the absence of collateral, the borrower does not fully internalise the costs of project failure, so there are incentives for him to maximise his personal welfare to the detriment of the lender. If the project outcome involves some randomness, such as weather events, the agent can always argue that a poor result was attributable to forces beyond his control and not his fault. Moral hazard occurs if the borrower does not take those actions that make repayment of the loan most likely, though the farmer cannot affect whether there is early frost that potentially destroys his farms, he can affect the losses he incurs by taking precautionary action, even if this requires additional effort. Countermeasures include active and costly monitoring of agents by the principal, aiming at preventing opportunistic behaviour.

(iii) Costly state verificationis necessary if lenders cannot easily check whether borrowers who say they cannot fully repay are indeed unable to do so. For the bank to accept partial repayment may prevent it from breaking even, and incur costs to verify the actual project outcome. To solve the double problem of false reporting and costs of state verification, Townsend (1979) has demonstrated that the optimal solution is a so-called standard debt contract the borrower promises a fixed repayment, and the bank seizes the entire cash flow of the project when the borrower claims she cannot repay. However, if information asymmetries regarding project outcomes are pronounced, potential auditing costs may be assessed as being too high, so that again no loan contract materialises at all.

It probably became clear that asymmetric information is not an unalterable fact, but it is costly to counteract and sometimes impossible to fully overcome. Hence, a demand for services or institutions that help to mitigate the negative consequences of asymmetric information is likely to emerge. This in turn provides a rationale for the existence of financial intermediaries, which are superfluous in a world with perfect information. As may be intuitively plausible, there will be economies of scale in screening, monitoring and auditing (as well as in risk diversification), which fosters the creation of specialised firms offering these services. In fact, it may be efficient for borrowers to form 'information sharing coalitions' in order to signal their quality to investors. This argument explains the emergence of specialised financial intermediaries (Leland and Pyle 1977). Similarly, they may emerge if it pays individual lenders (or savers) to delegate the monitoring activity to a specialised institution instead of performing it themselves. This is the

‘delegated monitoring’ theory of financial intermediation according to (Diamond 1984; Freixas and Rochet 1997; Neuberger 1998 and Rühle 1997).

Summing up, the introduction of information asymmetries considerably complicates the neoclassical model of the capital market. Although their effects are sketched briefly so far, it is obvious that they undermine the traditional role of the price as the single allocation mechanism if the quality of the good in question, here, investment projects to be financed, depends on its price, the interest rate, (Stiglitz 1987). Therefore, non-price allocation mechanisms such as collateral, and also honesty or reputation come into play. Interlinkages between different markets may arise, for which trade credit is an example (Jain 2001).

New sorts of externalities emerge. A whole set of institutions in the area of financial intermediation is the response to prevailing informational asymmetries. As was already suggested, even in the presence of such institutions, markets are still unlikely to function perfectly. Some markets, particularly those involving risk, will be missing, and many other markets will be thin and thus imperfectly competitive Hoff, Braverman, and Stiglitz, (1993). The possibility of credit rationing is one of the ultimate consequences.

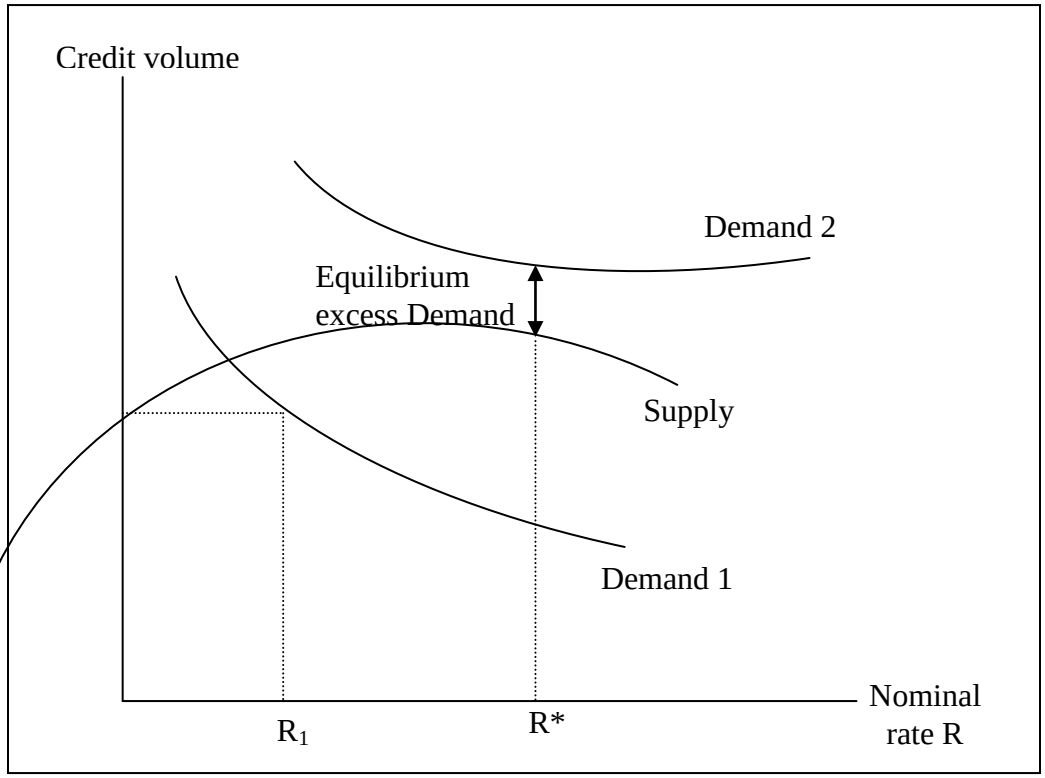
It has been demonstrated in the literature on agency theory that each of the three phenomena of asymmetric information explained above taken alone may lead to credit rationing in a particular narrow sense. See the contributions of Stiglitz and Weiss (1981) on adverse selection and moral hazard and S.D. Williamson (1987) on costly state verification. In this literature, credit rationing is understood as the fact that a borrower’s demand for credit is turned down, even if this

borrower is willing to pay all the price and non-price elements of the loan contract (Baltensperger 1978, p. 173). Non-price elements include collateral, borrower's equity, a stable customer relationship, or the length of the loan period. Quite in line with the definition given above, a situation is thus characterised as 'pure' or 'equilibrium' credit rationing if there is a persistent excess of demand over supply with price and non-price terms showing no tendency to clear the market (Stiglitz and Weiss 1981, pp. 394-5; Jaffee and Stiglitz 1990). In the extreme case, apparently identical borrowers' access to loans is simply by chance, or randomised (Besanko and Thakor 1987, p. 678).

The relationship between credit volume and interest rate may be depicted in a supply and demand diagram as in Figure 2.2. The decisive property of supply is that it is backward bending, as shown in the figure. Under which circumstances such a backward bending supply schedule may occur. For example, it may reflect an adverse selection effect of a rise in the interest rate. For the demand schedule 1, a competitive equilibrium exists, characterised by equality of supply and demand so that the nominal rate R_1clears the market. Throughout this thesis, R is gross repayment including interest, and r is the interest rate, such that $R = K (1+r)$, with K the amount borrowed. However, for the demand schedule 2, supply and demand curves do not intersect. An equilibrium with credit rationing will then occur, characterised by the interest rate R*, in which credit is allocated by means other than the interest rate. Following Keeton (1979) as cited in Freixas and Rochet (1997, p. 155, fn. 2), it may be reasonable to distinguish two types of rationing. Type I rationing occurs when all borrowers receive credit but are restricted in the size of the loan they obtain; type II rationing occurs when borrowers have only randomised access to the full loan size they demand, so that some borrowers obtain the loan they demanded while others obtain no loan at all. If projects are indivisible, rationing is always of type II. If projects

are divisible, rationing would be of type I under decreasing returns to scale and of type II under increasing returns to scale (Freixas and Rochet 1997, p. 140).

Figure 2.2: Equilibrium credit rationing



Source: Adapted from Freixas and Rochet (1997) and Petrick (2004)

This situation is clearly a substantial deviation from the perfect capital market model which was established as a benchmark above. Much less clear are two related key questions, (1) Does such rationing actually exist as an important phenomenon in reality and (2) if it exists, does it provide a case for government intervention?

There is an intensive debate in the literature concerning both questions. Since they are still not answered satisfactorily (see Baltensperger and Devinney 1985 and Hubbard 1998 on the first, Besley 1994 and Driscoll 1992 on the second question) and Petrick 2004 on both, therefore, most of the remaining analysis in this thesis is devoted to further exploring them.

To demonstrate that pure credit rationing actually exists requires clarification on two fronts. First, it may be asked how robust models of equilibrium credit rationing are on theoretical grounds. Since most models work with rather restrictive and stylised assumptions, this may be a central objection. Second, it is necessary to develop empirical tests that conclusively verify or reject the propositions of the models. A fundamental problem in this respect is to find an operational definition of credit rationing that fits into the restrictive assumptions of the theory. Since laboratory experiments are largely impossible in empirical economics, it is probably difficult to isolate certain determinants of credit rationing, if the phenomenon has been operationalised after all. These determinants have to convincingly represent the presence or absence of asymmetric information.

If there is still a long way to go before pure credit rationing as an empirical fact can be verified, it appears even more difficult to think about reasonable government intervention. In theory, the presence of asymmetric information seems to imply that there is almost always space for 'constrained' Pareto improvements via tax policy (Greenwald and Stiglitz 1986). With regard to credit rationing, Jaffee and Stiglitz (1990, p. 868) state that "A market equilibrium with credit rationing ... is not Pareto efficient in general, even when account is taken of the costs of information." However, which type of policy is optimal is often impossible to determine since even simple theoretical models generate irreconcilable implications once the assumptions of the model are slightly modified (see De Meza and Webb 1987). Hoff et al. (1993, p. 19) argue that, as a result of asymmetric information, the justifications for market interventions grow in number but also in complexity and side effects. They plausibly assume that, if asymmetric information is at the core of market failures, better information and more transparency in markets and institutions will be at the core of any solution. However, it is quite an open question whether

governments possess an advantage over private agents in dealing with these problems, for example in gathering information on the varying probabilities of default in the loan market (Stiglitz 1987a). In the end, government intervention aimed at mitigating problems of asymmetric information may create even new agency relations. An example is the introduction of public guarantee schemes for rural borrowers in Nigeria. The Nigeria and other countries' evidence suggest that these programmes tend to result in severe problems of moral hazard and increasing default rates (Gudger 1998; Aku 2011). Practical policy advice might thus be difficult to give. An even more anti-interventionist position is taken by Baltensperger (1978, p. 180) who says that "Endogenous constraints based on imperfect information and screening ... should not be seen as a factor causing inefficiencies and distortions. Rather, they represent an efficient response of the market to the existence of certain cost elements present in the loan market but not in the usual 'textbook' market, namely information and transaction cost elements found in any market with heterogeneous goods (such as, for example, the labour market, the housing market, the insurance market, and many more). They can certainly not be the rationale for any corrective regulatory measures." According to this view, although the private demand for funds may exceed the loan offer but this is not regarded as socially undesirable. Looking back, it becomes clear that agency theory has much to say about the nature and the determinants of transaction costs. However, whether these costs do indicate inefficiency or even provide a rationale for intervention appears almost impossible to judge a priori.

Finally, it is interesting to see how the notion of transaction costs (or 'agency costs', to mention a term used by several writers) changes its meaning in the literature on agency theory (see Terberger 1994, pp. 125-134). Along with a shift towards theoretically more sophisticated, often

highly stylised models goes an increasingly abstract understanding of these costs, up to the point where they are regarded as a superfluous concept at all. A case in point is the paper by Jensen and Meckling (1976) concerning the separation of ownership and control in a corporate firm. These authors define agency costs as the sum of (a) monitoring expenditures by the principal, (b) bonding expenditures by the agent (similar to signaling activities explained above), and (c) the residual loss, which can be regarded in a general sense as the difference between the hypothetical welfare in a first-best world and the welfare actually attained when transaction costs are positive and total welfare is not truly maximised by the actions of the agent. The difference between the first- and second-best solutions are the gross agency costs.

However, these costs can never be measured, since the first-best outcome is generally unknown. As a result, the notion of transaction costs can only be used reasonably in a metaphorical sense (see the dispute between Schneider 1987 and Schmidt 1987). In the end, endogenising the entire institutional structure and thus giving due attention to its specific information and incentive problems may make the quantification of these costs an exercise in futility. As Hellwig (1988, p. 2000) has noted that "...when there is incomplete information, Coasian transaction costs depend on the precise nature of the strategic interactions and cannot be assessed prior to a full analysis of the system. After such an analysis, when one understands the system anyway, it is not clear what additional purpose the concept can serve."

Essentially, a precise measurement of transaction costs is impossible since the correct opportunity costs of transaction activities are unknown. As long as the institutional arrangement used to determine the value of an alternative activity is unclear, these opportunity costs cannot be

calculated. If the optimal institutional arrangement is known, the exact volume of transaction costs accruing in the second-best situation provides little additional value. Therefore, the notion of (measurable) transaction costs plays almost no role in formal agency theory.

Somewhat surprisingly, O.E. Williamson, the 'inventor' of the term 'Transaction Cost Economics', also does not aim at measuring transaction costs, although he acknowledges empirical work (1985, p. 22). Empirical research on transaction cost matters almost never attempts to measure such costs directly. Instead, the question is whether organizational relations (contracting practices; governance structures) line up with the attributes of transactions as predicted by transaction cost reasoning or not." Measurement of transaction costs will again be an issue when it comes to quantifying interest rates faced by farmers in Nigeria, where an empirical model of household decision making is considered. However, in the light of the preceding discussion, it seems unjustified to regard transaction costs in the sense of actual cash or time expenses per se as a useful measure of credit rationing.

(e) Equilibrium credit rationing due to asymmetric information

After having unfold in a literary way the major issues of a theoretical analysis of credit rationing, we now investigate a number of selected problems more formally, and thus more akin in style to the abstract literature on agency theory. Although the discussion is more formal than as discussed above, an attempt is made to use mathematical notation to a moderate extent.

We take as a starting point the model of credit rationing by Stiglitz and Weiss (1981), and ignoring the theoretical literature prior to this seminal work. For the earlier developments, see

Baltensperger (1978) and Baltensperger and Devinney (1985). After an outline of the model, we discuss the relevant literature to question the premises of the model and explore the effects of changes in the assumptions. This leads to a discussion on policy implications and an overview of the theoretical literature concerning measures to credit rationing.

The central objective of Stiglitz and Weiss (1981) is to demonstrate the possibility of a stable equilibrium where demand for loans exceeds supply with no tendency for the interest rate to clear the market. In this situation, banks deny loans to borrowers who are observable not distinguishable from those who receive loans (Stiglitz and Weiss 1981, p. 394) although all market participants behave in a rational, profit maximising way. The ultimate reason for this form of credit rationing is that banks have only limited information about the riskiness of projects to be financed. This fact can explain the existence of a bank optimal interest rate, beyond which, at an increasing interest rate, the loan supply of the bank actually decreases. In the following, we concentrate on the case where a rise in the interest rate leads to an adverse selection process regarding the pool of loan applicants (section I of Stiglitz and Weiss 1981).

Stiglitz and Weiss (1981) consider the lender-borrower relationship on a loan market with the following assumptions. They assume that the bank faces a group of prospective borrowers, each of whom holds a project with uncertain outcome to be credit funded. Borrowers and lenders are risk neutral, and the supply of loanable funds available to the bank is unaffected by the interest rate it charges borrowers. Banks act as price setters on the credit market and as quantity setters on the deposit market. They simultaneously choose a capacity of funds on the deposit market and a nominal loan rate in such a way that their profit is maximised, taking as given the return

demanded by depositors and the loan rates set by other banks (see Freixas and Rochet 1997, p. 140).

Projects are assumed to be not divisible, that is, unless a borrower is successful in getting a loan, the project cannot be carried out. For simplicity it is assumed that the amount borrowed for each project is identical. However, for each project there is a probability distribution of gross return y which cannot be altered by the borrower. All projects have the same mean return but differ by a risk parameter θ which only the borrowers know. The bank thus cannot ascertain the riskiness of an individual project, but it knows the statistical distribution of returns among the population of potential borrowers.

Borrowers are required to pledge a certain amount of collateral C. Since the bank cannot discriminate between borrowers, the bank offers all borrowers the same standard debt contract, in which the borrower either repays a fixed amount R (if she can) or her collateral plus cash flow is seized by the bank. The profit of each borrower can be written as:

$$\Pi(y, R) = \max(-C, y-R) \qquad (2.1)$$

To the contrary, the return to the bank ρ can be written as:

$$P(y, R) = \min(R, C + y) \qquad (2.2)$$

Borrower and bank are affected differently by an increasing riskiness of projects. While borrowers gain if the return of the project undergoes a mean preserving spread, the bank loses. The downside risk is borne by the bank alone. As a consequence, within the pool of borrowers with the same expected project returns, the riskier borrowers generate the largest profits. However, the projects with the lowest risk generate the highest return for the bank. Since all

borrowers are offered the same interest rate, low risk borrowers implicitly subsidise high-risk borrowers, which is a special form of externality.

Under these circumstances, Stiglitz and Weiss (1981) establish that the effect of an increase in interest rates on the bank's return is twofold. On the one hand, it increases the return the bank makes on any individual loan granted to a borrower with given risk. On the other hand, it also decreases the return of the bank as a rising interest rate decreases the profits of borrowers, probably below zero (or any reservation level). The crucial fact is that, as explained above, the projects with the lowest risk drop out of the market first, since they generate the lowest profits for borrowers. In turn, the pool of borrowers becomes riskier, which decreases the return of the bank. Therefore, an increase in the interest rate need not necessarily increase the return to the bank. If the adverse selection effect outweighs the increased return from interest rates, the total return of the bank declines. Whether and when this is the case depends on the distribution of the risk. For some of these distributions, the banks expected return on loans will be single-peaked with a maximum for a repayment R* (Neyer 2000, pp. 95-100). Under the assumption that the supply of deposits is not fully elastic, this results in a backward bending supply of credit and, therefore, a situation of equilibrium credit rationing as shown in Figure 2.2.

Stiglitz and Weiss (1981) also consider a case where moral hazard induces a backward bending loan supply curve. In this instance, each borrower has available a choice of projects with different risks. Increasing the interest rate increases the relative attractiveness of the riskier projects, for which the return to the bank is lower. Raising the interest rate may lead borrowers to

take actions that are contrary to the objectives of the bank. This establishes a similar case to the one above, where the bank may ration credit instead of raising the interest rate.

The results of Stiglitz and Weiss stand in marked contrast to the conventional perfect market model (see Stiglitz 1987; Hillier and Ibrahimo 1993, pp. 284-288) where Equilibrium credit rationing is inconsistent with the orthodox view that in equilibrium, supply equals demand which is the law of supply and demand. Stiglitz and Weiss (1981, p. 409) conclude their paper by saying that the usual result of economic theorizing, that prices clear markets is model specific and is not a general property of markets, for example unemployment and credit rationing are not based on reality.

The other results are that Conventional comparative static analysis breaks down in the presence of asymmetric information. For example, a shift in demand, that is, an increase in demand at every interest rate level would usually be expected to increase both the interest rate and the loan volume traded. If the market is characterized by equilibrium credit rationing neither of the two effects will occur.

Supply and demand are no longer independent, if information asymmetries are important. Suppose that an external shock makes all projects to be financed less likely to be successful. This would affect the demand for funds and also the banks' willingness to supply funds, since both functions partly depend upon the distribution of projects' risk.

If there are observationally distinguishable groups of borrowers, particularly risky groups may be denied credit at any rate. This is known as redlining. This may be the case if there is no interest rate at which the bank receives a certain minimum return. Although these borrowers have profitable projects, the market equilibrium fails to allocate credit to them (Stiglitz and Weiss 1981).

The question is how sensitive these assumptions can change equilibrium credit rationing. To challenge the assumptions of the model presented above, we examine how plausible these assumptions are and how they are critical for the result of equilibrium credit rationing. Without claiming comprehensive coverage of the broad and still ongoing scientific debate spurred by the paper of Stiglitz and Weiss (1981), we attempt to highlight some key contributions that are of importance for the topic of this thesis.

The first line of criticism concerns the fact that even under the conditions assumed by Stiglitz and Weiss (1981), the existence of a bank optimal interest rate is only a possibility. In a study, Neyer (2000) demonstrates that by assuming normally distributed returns to projects, the existence of a bank optimal interest rate crucially depends on a sufficient heterogeneity of projects (p. 100). A second objection is with regard to the availability of loanable funds. Only if there is some restriction of these funds, for example by an upward sloping supply of deposits, will rationing occur (Baltensperger and Devinney 1985, p. 490). Provided that there is a fully elastic supply of deposits at a sufficiently low interest, banks would offer loans at rate R* in figure 2.2 until all borrowers desiring such a loan were served. However, the prevailing interest rate would be higher than in the full information case. Of course, both assumptions of a heterogeneous pool of borrowers and an inelastic supply of deposits are totally hardly to be true.

It is however striking that, in the model of Stiglitz and Weiss (1981), the bank has an absolutely blind spot with regard to the riskiness of projects, whereas it perfectly knows the average return of projects. Since emphasis is on the (indirect) screening effect of the interest rate, the possibility to directly screen borrowers by other means is completely ignored in the model. Though all borrowers have to provide collateral, they are all offered the same standard debt contract which is exogenously given. However, both the bank and the less risky borrowers will have an interest in some type of sorting mechanism that mitigates the negative effects of asymmetric information.

The latter aspect is taken up by Bester (1985), who shows that no credit rationing will occur if banks use collateral as a screening device. This is possible if the bank offers different contracts as a self-selection mechanism. Bester maintains the assumption of Stiglitz and Weiss (1981) that banks cannot discriminate a priori between borrowers who hold projects with identical return but different, only at privately observed risks.

The problem analysed by Stiglitz and Weiss (1981) would imply to take the amount of collateral as given and to investigate the consequences of raising the interest rate. This means that, as soon as the isoprofit curve of less risky borrowers that denotes zero profit is passed, all less risky borrowers withdraw from the market, leaving only high riskyborrowers. However, the less risky borrowers are more profitable for the bank. Hence, even when there is an excess demand for loans, it may not be profitable for a bank to enter the market by raising the interest rate. There may be credit rationing in a competitive equilibrium as long as the bank offers the same contract to all applicants.

In the Bester (1985) model, the plausible assumption that banks employ non-price elements (collateral) in loan contracts to overcome problems of asymmetric information makes credit rationing disappear.

A similar point is made by Milde and Riley (1988), who demonstrate that, as soon as the assumption of fixed loan sizes is relaxed, contract menus including different interest rates and loan sizes have the same effect of removing credit rationing. Is it therefore unlikely that credit rationing as an important phenomenon actually exists? This cannot be answered positively either, as further investigations of the problem have shown.

First, both Besanko and Thakor (1987) and Bester (1987) analyse the case in which the collateral demanded by the bank exceeds the wealth of the borrower. In this case, signaling is not feasible for all borrowers. The result is again a pooling of some borrowers, as in the Stiglitz-Weiss model, which may exhibit rationing.

Second, more generally, Jaffee and Stiglitz (1990, p. 867) claim that as long as the dimensionality of the space of borrower characteristics exceeds the dimensionality of the space of contracts, perfect screening of borrowers will be impossible and rationing may therefore occur. As candidates for additional dimensions, they suggest the wealth or the risk aversion of borrowers.

Subsequent contributions in the theoretical literature have taken up these suggestions and continued to explore the conditions under which credit rationing will be likely to exist. Indeed,

the explicit consideration of varying degrees of risk aversion in connection with asymmetric information make rationing equilibria a likely outcome, even if signaling devices are principally available to borrowers.

An example is Schmidt-Mohr (1997) who demonstrates in a rather general setting with divisible projects that loan-size rationing and self-selection of borrowers may co-exist in equilibrium. On the other hand, no equilibrium involving collateral may exist. The latter point is also made by Coco (1999) who argues that collateral loses its role as a signaling device if more risk-averse borrowers choose safer investment projects and are also more reluctant to pledge collateral. In this case, credit rationing re-appears as an effect of heterogeneous risk preferences of borrowers.

As a supplement to the discussion of collateral, we briefly mention a number of theoretical studies that have examined other types of institutional arrangements that potentially overcome problems of asymmetric information on loan markets. These may be broadly grouped into three categories, depending on whether they emphasise the role of joint liability, multiperiod effects, or interlinkage of credit with other transactions.

The first strand of literature refers to any sort of joint liability, also sometimes called ‘social collateral’. The basic idea is that the social and economic relationship between the borrower and a third person (which may also be a borrower) is utilised to overcome the abundant incentive problems of giving credit. The third person may simply be an outside guarantor as in Besanko and Thakor (1987).

Alternatively, it may be reasonable to form groups of borrowers who are jointly liable and thus have an incentive to monitor each other ('peer monitoring', see Stiglitz 1990 and Varian 1990). This is practised in many developing countries (Ghatak and Guinnane 1999). Informational advantages of peers rationalise the existence of credit cooperatives, which allow a group of otherwise credit-constrained borrowers to raise outside finance (Banerjee et al. 1994).

Social sanctions available in credit cooperatives may also provide incentives to sustain long-term non-opportunistic behaviour of borrowers which leads to the second category of literature stressing the importance of multiperiod effects. The threat of termination of the borrower-lender relationship can be used to encourage borrower behaviour that the lender finds desirable (Stiglitz and Weiss 1983). Borrowers in turn can develop a reputation for being creditworthy over time, which may improve access to funds (Diamond 1989).

The third category of studies examines the case where credit exchange is tied to other types of transactions, also called 'interlinkage'. The most well-known is the trade-credit interlinkage, or trade credit in short. Giving credit to trade partners makes private information about business activities available to the lender at little costs. Screening and monitoring of potential borrowers may thus be greatly facilitated. Furthermore, enforcement of loan repayment may be easy by simply deducting it from the goods sold to or through the lender. The theory of tied credit has been studied both in the framework of developing (Bell 1988) and of developed countries (Petersen and Rajan 1997 as well as Jain 2001).

Before closing this section, a final line of attack against the Stiglitz-Weiss model needs to be introduced. It concerns the specific distributional assumptions underlying the pool of loan applicants. De Meza and Webb (1987) demonstrate that a slight change of the distributional structure of loan returns suffices to turn the credit rationing plus underinvestment model in a model of overinvestment without rationing. They particularly focus on the welfare and policy implications of credit rationing.

Summing up, it can be concluded that the Stiglitz-Weiss result of equilibrium credit rationing is to a large extent driven by the specific set of assumptions chosen. Due to the high degree of abstraction from reality this is only to be expected. The model of Bester (1985) yields the important insight that the possibility of signaling and screening in the lender-borrower relationship is crucial to overcome credit rationing. Although there exists a host of mechanisms to reduce information asymmetries, these mechanisms are unlikely to work perfectly in reality, or may not be available at all. The theoretical prediction of later research, namely that credit rationing is an important phenomenon under a variety of settings, appears plausible. How far the robustness of results extends into the domain of welfare and policy implications is the topic of the next section.

(f) Welfare and policy implications of credit rationing

Does credit rationing due to imperfect information provide a theoretical justification for government intervention on credit markets? It was noted above that many authors seem to suggest this, although policy advice based on theoretical reasoning is far from unambiguous. In

the subsequent section we clarify this point and briefly outline the varying theoretical results in a partial equilibrium framework.

As suggested by the previous discussion, the usual benchmark for welfare comparisons is the neoclassical first-best world of perfect information and zero transaction costs. The question of whether this is adequate will be ignored for the moment, but be taken up latter. In line with a common sense understanding of the term credit rationing as discussed above, a number of authors assume as a working hypothesis that information asymmetries on loan markets and the presence of credit rationing necessarily result in too little investment as compared with a situation of perfect information (Gale 1990, p. 44; Hubbard 1998, p. 197). It can be shown in a slightly modified version of the Stiglitz-Weiss model that underinvestment as compared with full information results from their assumptions. The following is based on De Meza and Webb (1987) and Hillier and Ibrahimo (1993).

Consider again a bank facing a group of observationally indistinguishable borrowers on a competitive loan market. To obtain a tractable version of the Stiglitz-Weiss model, we retain the assumption that each project has a common expected return y. However, for simplicity, the project may either be successful, yielding a project-specific return y^s_i with probability p_i, or fail and yield zero. For all projects the following holds:

$$P_i y^s_i = \check{y} \text{ with } p_i \in (0, 1) \qquad (2.3)$$

Project iis said to be riskier than project j if, under the condition of (2.3), $p_i < p_j$. All other assumptions of Stiglitz and Weiss (1981) as given above remain unchanged except that we set

the value of collateral to zero. This can be done without altering the results since in the Stiglitz-Weiss framework, collateral is not used to sort out borrowers.

Hence, the expected profit of any borrower iis given by:

$$E(\pi_i) = P_i (y^s_i - R), \qquad (2.4)$$

WhereR as before is fixed repayment to the bank (including principal and interest).

Rationally behaving, risk-neutral borrowers will carry out their project if and only if the expected profit exceeds zero, which is given if $y^s_i > R$. Therefore, only projects with a sufficiently high y^s_i will be made. Since (2.3) holds, this is equivalent to say that only projects with a sufficiently low p_i will be carried out. Consequently, as R rises, average p_i in the pool of realised projects will fall and projects become riskier on average. This establishes the adverse selection effect.

Consider now the expected profit of a risk-neutral bank. The density of projects' success is considered. In a pooling equilibrium with competition, the standard debt contract offered to all borrowers earns an expected return to the bank as follows:

$$E(\rho) = R \int_0^{\bar{P}} P_i g(P_i) dP \qquad (2.5)$$

where P is the success probability of the marginal project. This is the project on which borrowers make just zero profit if there is no rationing.

Suppose that at the equilibrium interest rate R* there are borrowers who could make positive profits but are denied loans. A necessary condition for this to be an equilibrium is that change in the expected profit as a result of change in the total loan repayment equal zero ($\partial E(\rho)/\partial R = 0$) at the equilibrium interest rate. In fact, a rise in the total loan repayment may have two opposite

effects. On the one hand, a rising loan repayment increases the expected profit of the bank due to higher interest revenues. However, as a result of (2.3) and (2.4), a rising loan repayment also induces the success probability of the marginal project to fall, so that the average success probability of projects and expected profit tend to fall. The sign of the change in expected profit due to change in loan repayment ($E(\rho)/\partial R$) is therefore ambiguous, depending upon which of the two conflicting effects dominates. A credit rationing equilibrium is possible if in this equilibrium the rate demanded by depositors is such that the supply of deposits is less than loan demand. The latter may well be the case under the Stiglitz-Weiss assumption that deposit supply is not fully elastic. Although this is a valid situation, the situation is different in developing countries including Nigeria where the credit market is heavily regulated. It is possible to compare this outcome with a first-best situation of full information.

In a 'socially efficient' world, all projects are financed that yield at least the safe return, denoted as R. That is, all projects must satisfy:

$$P_i y^s_i \geq R \qquad (2.6)$$

In a first-best world, the marginal borrower makes zero profit and banks in a competitive environment would just break even on marginal loans.

However, the latter is different in a Stiglitz-Weiss world with imperfect information. Due to the inherent asymmetry information between banks and borrowers, all intra-marginal borrowers have success probabilities lower than P and higher profits than the marginal borrower. Would the bank just break even on the marginal loan? It would expect losses on all intra-marginal loans. In equilibrium, investment must be less than the first-best level. Since competitive banks are

assumed to make zero profits in total and the marginal borrower makes high success probability which yields the highest profit for the bank, this profit from the marginal borrower must be positive to allow the bank also benefit. Here, marginal and near-marginal borrowers subsidize borrowers with low success probabilities to make the banks break even.

De Meza and Webb (1987) present a straightforward policy advice for this situation of underinvestment where he proposes a subsidy on deposit interest rates. Such a subsidy on interest income will reduce the gross rate banks must pay on deposits. Banks can therefore expand the credit volume granted at a given loan rate R* up to the socially efficient level, since smaller profits made on the small borrowers will suffice to break even in total.

The question remains whether restoring the first-best situation is a desirable policy goal. De Meza and Webb do not consider the way subsidies are financed, and did not carry out a welfare analysis of government intervention on credit markets. In reality, there is seldom a first-best. It is doubtful a priori whether an artificial establishment of the first-best equilibrium is worthwhile.

In the presence of imperfect information, banks act as intermediaries between deposit and loan markets. While depositors demand a safe rate on their capital, exchange on the loan market is subject to the conditions of the standard debt contract (fixed repayment in case of success). Since banks cannot discriminate between heterogeneous borrowers, they are only able to offer a single, average risk premium and a single interest rate to all loan applicants. Additional loans extended at the margin require higher interest revenues to meet the not fully elastic demand of depositors. Fully informed lenders can negotiate loan contract terms on an individual bases, so that loan

terms of all other borrowers are left unaffected. This is not possible under imperfect information, where a rise in interest rates affects all borrowers and leads to adverse selection. The interest rate required for banks to break even must therefore contain an extra premium to compensate for the lower success probability of the entire borrower pool.

In case that loan supply and demand are intersecting (if loan supply was not backward bending), there would be no perceived rationing. However, interest rates on the loan market would still be above the first-best level and a situation of too little investment would prevail.

Returning to the case of rationing, consider a subsidy on deposit interest rates. As a result of this subsidy, the market supply of deposits will shift downwards. The increased deposit rate induces depositors to increase the volume of deposits to banks and the bank will in return increase the supply of loans. This will create a new equilibrium position in the market.

However, due to competition, loan supply will be expanded up to the new equilibrium, which implies the equality of total revenues and costs. As long as there is perfect competition, banks will therefore be unable to extract any rents from these subsidies. Instead, rents will flow completely to borrowers and depositors. However, paying the subsidy to borrowers will change nothing due to rationing. Their willingness to pay for the loans exceeds the market interest rate.

Borrowers who are able to carry out the full volume of investment obtain an increase rent if successful, assuming that borrowers with the highest willingness to pay are served under rationing. If the rationing means that the total loan volume is distributed randomly among borrowers, the number would even increase. However, this is viewed by the individual success

probabilities of projects undertaken, because if the project fails, the rent for the borrower is zero. The magnitude depends on the expected return of the projects in the applicant pool.

Depending on the elasticity of loan demand and deposit supply and the success probabilities of the financed projects, there may be a gain in net welfare as a result of government intervention. However, if success probabilities of projects are private information, a welfare analysis ex ante is impossible, Furubotn and Richter 1997).

(g) Credit rationing in a two-period farm household model

In this section, we discuss the effects of credit rationing on optimal resource allocation in a neoclassical producer-consumer model. Particular attention is paid to the separate impact on consumption and production decisions, and also on their interdependencies if access to credit is limited. A farm household that both produces and consumes agricultural goods is the type for this model. Accordingly, there are broad literature on agricultural household modeling which we draw (see e.g. Sadoulet and De Janvry 1995; Singh et al. 1986; Witzke 1993).

The starting point for the analysis is the formal model of a rational decision maker acting in a neoclassical environment of exogenous prices. The decision maker is supposed to maximize consumption in periods 0 and 1 as expressed by an intertemporally additive utility function. The utility function is assumed to be twice differentiable and quasi-concave, and defined over consumption in period 0, C_0, and in period 1, C_1, so that $u = (C_0, C_1; Z^h)$. Z^hparameterizes the utility function and summarizes exogenous household characteristics such as number of people in each sex or age category. Agricultural production requires upfront financing such that

expenses on Xare due in period 0, while harvest occurs in period 1. To meet liquidity requirements for input purchases, the farmer can take a working capital loan of size Kin period 0, which has to be repaid in period 1. The production opportunities of the household are depicted by a twice differentiable, quasi-concave production function $y = f(X^k, X^{nk}; Z^y)$. There are two types of variable inputs. X^krepresents a variable input that requires upfront financing (e.g. seed or fertilizer) and is thus subject to a liquidity constraint; $X^{nk}$is an aggregate of all other types of variable inputs. Z^ystands for fixed and exogenous inputs, such as land and machinery.

The farmer faces a budget constraint in each period and a credit constraint in period 0. The budget in period 0 consists of initial endowment with liquid funds, E, an amount of credit taken, K, and exogenous public transfers $T(Z^h)$, assumed to be obtained only in period 0. In equilibrium, the sum of these is equal to the expenses for the variable input which requires upfront financing plus consumption. $P^{xk}X^k$ is expenses on the variable input, with P^{xk} the price of the input, and P^cC_0 expenses on consumption in period 0, with P^c the price of the consumption bundle. The budget in period 1 entails revenues from production $P^y y$, with P^y the price of the output. In equilibrium, this is equal to repayment of credit taken in period 0, consumption in period 1, and expenses on variable inputs not subject to upfront financing. K(1+r) is repayment of credit, with r the interest rate, P^cC_1 expenses on consumption, and $P^{xnk}X^{nk}$ expenses on inputs, with P^{xnk} the price of the input not subject to upfront financing.

We assume that all prices may be understood to include a transaction cost component which adds to the nominal market price. For the decision maker, many of these costs are quite real, for

example travelling or time expenses, although they may be difficult to quantify in order to obtain an objective measure of market efficiency.

Knowing that the borrowers may be denied credit from a competitive loan market and to introduce this into the farm household model, we consider an upper bound of credit $K(Z^h, Z^y)$ the household can obtain. The availability of devices to overcome credit rationing is dependent on household and production characteristics $Z^h$and Z^y, for example collateral or borrowers' reputation.

The farmer's problem can thus be formally summarized as follows:

Max $u(C_0, C_1; Z^h)$ with respect to C_0, C_1, X^k, X^{nk}, K, all > 0

Subject to

$$E + K + T(Z^h) - P^c C_0 - P^{xk} X^k = 0 \qquad (2.7)$$

the budget constraint in period 0,

$$P^y(X^k, X^{nk}; Z^y) - P^c C_1 - P^{xnk} X^{nk} - (1+ r)K = 0 \qquad (2.8)$$

the budget constraint in period 1, and

$$\bar{K}(Z^h, Z^y) - K \geq 0 \qquad (2.9)$$

the credit constraint in period 0. The credit constraint may or may not be binding.

The first-order conditions of the optimal solution are represented by the first derivatives of the Lagrangean with respect to all decision variables and the Lagrangean multipliers. Equations characterize optimal consumption, optimal production, optimal credit demand, and are the conditions that have to be satisfied by an optimal solution. Taken together, these equations constitute the structural form of the model (see Sadoulet and De Janvry 1995, pp. 378 -383) and

the Lagrangean multipliers which denote the marginal value of the constraint in terms of the objective function. They are a measure of the marginal utility of the two budget constraints and the credit constraint, respectively. The Kuhn-Tucker conditions are interpreted as follows. Either the credit constraint is binding, in which the conditions holds with equality and the coefficients greater than zero. In the other case, itdoes not exhaust the credit limit, so that the conditions hold with inequality and the coefficient equal to zero. If all three conditions are satisfied simultaneously, always one of the two cases applies.

We first examine optimal consumption and production if the credit constraint is not binding, that is, the error term equal to zero. With the optimal consumption in both periods, the respective Lagrangean multiplier equates the marginal utility of the consumption good divided by its price, which is usually referred to as the marginal utility of money, (Petrick, 2004). This result is formally analogous to the standard two-good single-period consumption choice problem (see Layard and Walters 1978, p. 134). The only exception is that in the two-period model, there is a single nominal price of the consumption good but two different budget constraints. These are connected by the credit variable, so that substitution of them gives optimal consumption over time if the credit constraint is not binding.

This is simply the conventional optimality condition of intertemporal choice. The left hand of the equation is the marginal rate of utility substitution between consumption in periods 0 and 1, which is sometimes expressed as the derivative $\partial c_1/\partial c_0$. In equilibrium, this equals one plus the market interest rate, or the inverse of the real price relationship between c_1 and c_0. P^c in period 1 is discounted by the market interest rate. This also restates the separation result that optimal

consumption solely depends on the utility function and the interest rate, given the farmer budget. In which relation the budget should be allocated to consumption in period 0 versus period 1 is thus independent of the production decisions of the farm household, and can be chosen separately from them. Production decisions only determine the overall volume of the budget.

Production gives immediate rule that inputs that require no upfront financing should be allocated. The decision is not affected by the intertemporal nature of the household model, so that the Lagrangean multiplier can safely be dropped. Due to the concave production function, the result is the standard condition that marginal revenue should equate marginal cost of input use (see Layard and Walters 1978, pp. 208-212).

With regard to input which requires pre-harvest liquidity, a procedure similar to the consumption analysis can be applied. Again, we substitute optimal credit demand into the first-order condition for optimal production, which yields the price of the inputs. If the input price is normalised to one by division through p^{xk} and the equation is multiplied through by 1+r, the same rule is obtained, namely, that in equilibrium the marginal return on productive investment equals the market interest rate. The optimal price of inputs is independent of the utility function or any household characteristics, which again demonstrates separability of production and consumption choices as long as the credit constraint is not binding.

The solution or reduced form of the model is a set of demand, supply and factor demand functions (Sadoulet and De Janvry 1995, p. 379). We define M as the overall budget constraint:

$$M \equiv E + T(z^h) + \frac{p^y}{1+r} y - p^{xk} x^k - \frac{p^{xnk}}{1+r} x^{nk} \qquad (2.10)$$

The reduced-form equations are then given as follows:

$$c_0 = c_0(r, p^c, M, z^h) \quad (2.11)$$

$$c_1 = c_1(r, p^c, M, z^h) \quad (2.12)$$

$$y = y(r, p^y, p^{xk}, p^{xnk}, z^y) \quad (2.13)$$

$$x^k = x^k(r, p^y, p^{xk}, p^{xnk}, z^y) \quad (2.14)$$

$$x^{nk} = x^{nk}(r, p^y, p^{xk}, p^{xnk}, z^y) \quad (2.15)$$

$$K = K(r, p^c, p^y, p^{xk}, p^{xnk}, z^h, z^y) \quad (2.16)$$

By definition, all of the explanatory variables of reduced-form equations are exogenous, that is not under the control of the small farm household. With regard to the demand functions, (2.11) and (2.12) are true if household demand is treated separately from the production side and M taken as exogenous, as in the standard consumer choice model. However, in the complete household system, M is determined by production decisions, and thus should be replaced by the exogenous variables of the production system (prices and fixed factors) in order to obtain a fully reduced form of the demand functions.

We now turn to the case where optimal credit demand is effectively restricted by the credit limit. The implication is that (2.9) holds with equality and the credit constraint is binding. From the conditions that have to be satisfied by an optimal solution, it has the immediate consequence that

$\mu > 0$. The link between the budget constraints in both periods and the credit constraint is again given by the optimal credit demand.

With regard to consumption choice, adding the optimal consumption into optimal credit demand yields the optimality condition under the binding credit constraint. Under a binding credit constraint, the increased scarcity of liquid funds is thus reflected by a rise in the interest rate relevant for decision making. The optimality condition for intertemporal consumption choice under the credit constraint can be equally written as:

$$\frac{\partial u(.)/\partial c_0}{\partial u(.)/\partial c_1} = (1 + r^*) \qquad (2.17)$$

Where r* is the shadow interest rate or equilibrium interest rate. Hence, consumption in period 0 becomes more expensive.

It may be worth emphasising the effects of an increase in exogenous, for example interest rate r or credit K, as a result of government policy or improvements in lending technology. A rise in r means an additional upward shift of r*, with the same results as before (M* drops). To the contrary, if K increases, its shadow price and eventually equilibrium interest rate r* is reduced, overall budget M* therefore increases.

A particular implication of the binding credit constraint is that it breaks the separability of consumption and production decisions. As a result, input allocation depends on household preferences and consumption choices depend on the production technology, both via the rate of interest. This property of the interdependent household model can be used for an empirical test of

market imperfections. To demonstrate it formally, we analyse the effect that household characteristics z^hhave on r* (Benjamin 1992, pp. 292-295).

The demand function for consumption in period 0 is defined by (2.11) as follows:

$$c_0 = c_0 (r^*, M^*; pc, z^h) \quad (2.18)$$

The demand for the variable input under the liquidity constraint is determined as

$$x^k = x^k(r^*; p^y, p^{xk}, p^{xnk}, z^y) \quad (2.19)$$

To form liquidity equilibrium that implicitly defines the interest rate as:

$$E+k(z^h, z^y) +T(z^h) - p^c c_0(r^*, M^*; pc, z^h) = p^{xk}x^k(r^*; p^y, p^{xk}, p^{xnk}, z^y) \quad (2.20)$$

The left-hand side of this equation is household supply of liquid funds, and the right-hand side is farm demand for funds. Both are equated at the shadow interest rate r*.

It is clear that household characteristics play a central role in the determination of r* and in the optimal allocation of production inputs. As a consequence, the household model is not separable any more. The binding credit ration leads to a similar effect as the direct incorporation of positive transaction costs into the model of intertemporal choice. Under non-separation, all reduced-form equations of the model ultimately depend on all exogenous variables of both the consumption and the production side (see Sadoulet and De Janvry 1995, p. 160). We drop subscripts of consumption goods and superscripts of inputs to have:

$$c = c(r, p^c, P^x, p^y, E, K, z^h, z^y) \quad (2.21)$$

$$y = y(r, p^c, p^{ox}, p^y, E, K, z^h, z^y) \quad (2.22)$$

$$x = x(r, p^c, p^{ox}, p^y, E, K, z^h, z^y) \quad (2.23)$$

With respect to the empirical analysis, it is instructive to emphasize the difference between structural and reduced-form equations of the model (see Behrman and Oliver 2000). Structural equations include only the right-side variables that have direct effects on the outcome. For example, the basic structural equation of the current model is the production function which depicts the direct relation between inputs and output. Right-side variables of structural equations are often endogenous to the model which means that they are themselves determined as a part of the decision-making process in response to other exogenous variables. They therefore give rise to particular problems of econometric estimation. In contrast, the reduced-form equations provide the total direct and indirect effects of exogenous explanatory variables on the demand or supply outcome. However, they cannot disentangle the exact pathways by which the household's objective function and the production function influence behavioral outcomes (Behrman and Oliver 2000, p. 377). For example, the reduced-form output supply equation (2.22) displays the total effect of credit (K) on output supply. Even so, it cannot reveal separately how much credit affects output directly by financing fertilizer as expressed by the production function and how much credit affects output indirectly by providing liquidity for financing consumption expenditures which in turn make family labor more or less productive. Credit may also be simply used for nonproductive purposes, so that there is no indirect effect on output apart from the mere diversion of funds. In line with these thoughts, the reduced-form output supply equation (2.22) has been a focus of interest in the empirical literature on credit rationing of farm households (Feder et al. 1990; Sial and Carter 1996). It is therefore useful to derive another concept which is closely related to the interest rate. We call it the credit-rationed household's marginal willingness to pay for credit, (ρ^*). This is measuring the ability of the household to pay for credit in period 1 given the possibility that some credit was used for consumption purposes in period 0. The

interest rate correctly measures the marginal value of the last unit of liquidity provided, it is used for purchasing inputs. To the contrary, the marginal willingness to pay for credit addresses the question: what interest is the farm household able to pay at the margin, given its preferred use of credit for both production and consumption? If some credit is used for consumptive uses, the interest rate may overestimate the actual payment abilities of the household in period 1. To understand this idea, consider the utility maximizing liquidity surplus of the household in period 1 under credit rationing.

The liquidity surplus in the repayment period 1 is the revenue of the household in period 1, given as the value of the optimal production volume, minus credit repayment and interest and minus input purchases not under the credit constraint. Credit is equal to the gap between the value of input purchases and consumption in period 0 on the one hand and available endowment plus transfers on the other.

The partial derivative of the liquidity surplus with regard to credit indicates what the household is marginally able to pay in excess of the market interest rate. For the moment it is assumed that there are no effects of an increased crediton the not credit-financed input x^{nk}. To enable a direct comparison with the market interest rate, we define the household's marginal willingness to pay for credit under rationing.

This reveals that household's marginal willingness to pay for credit under rationing is a measure of the actual interest payment ability which takes into account the possible use of credit for consumptive purposes. Under the restrictive assumption that credit is fully used for purchasing

inputs, that is $p^{xk}\partial x^k/\partial K = 1$, it follows that the household's marginal willingness to pay for credit under rationing is the same as the equilibrium interest rate. However, if some credit is used for consumption in period 0, it follows from $p^{xk}\partial x^k/\partial K < 1$ that household's marginal willingness to pay for credit under rationing is less than the equilibrium interest rate or the market interest rate.

If there is no rationing, the marginal willingness to pay for credit is equal to the market interest rate r. In an extreme case of diversion, the household's marginal willingness to pay for credit under rationing might even become smaller than r, so that the household cannot fully pay the interest of the debt.

Since consumption of credit funds is both likely to be relevant in reality and has important consequences for the actual repayment capacity of households, the empirical approach in this study focuses on estimating the household's marginal willingness to pay for credit under rationing rather than r*.

2.5.3 New Institutional Economics: Theoretical contribution

New institutional economics (NIE) is an economic perspective that attempts to extend economics by focusing on the social and legal norms and rules that underlie economic activity and with analysis beyond earlier institutional economics and neoclassical economics, (Malcolm Rutherford (2001). It has it's root in two articles by Ronald Coase, "The Nature of the Firm" (1937) and "The Problem of Social Cost" (1960). In the latter, the Coase theorem (as it was subsequently termed) maintains that without transaction costs, alternative property right

assignments can equivalently internalize conflicts and externalities. Thus, comparative institutional analysis arising from such assignments is required to make recommendations about efficient internalization of externalities and institutional design, including Law and Economics, (Alston, 2008).

The term new institutional economics was coined by Oliver Williamson in 1975, (Warren Samuels, 1987; 2008). Among the many aspects in current analyses are organizational arrangements (such as the boundary of the firm), property rights, (Williamson, 1975), transaction costs, (Lueck, 2008), credible commitments, modes of governance, persuasive abilities, social norms, ideological values, decisive perceptions, gained control, enforcement mechanism, asset specificity, human assets, social capital, asymmetric information, strategic behavior, bounded rationality, opportunism, adverse selection, moral hazard, contractual safeguards, surrounding uncertainty, monitoring costs, incentives to collude, hierarchical structures, and bargaining strength.

Although no single, universally accepted set of definitions has been developed for the institutional economics, most scholars do research under the methodological principles and criteria follow Douglass North's demarcation between institutions and organizations. Institutions are the "rules of the game," both the formal legal rules and the informal social norms that govern individual behavior and structure social interactions (institutional frameworks), (North, Douglass C, 1990). Organisations, by contrast, are those groups of people and the governance arrangements that they create to coordinate their team action against other teams performing also as organizations. To enhance their chance of survival, actions taken by organizations attempt to

acquire skill sets that offer the highest return on objective goals, such as profit maximization, (Williamson, 2000).

Oliver Williamson characterizes four levels of social analysis. The first concerns itself with social theory. It is the level of embeddedness and informal rules. The second is focused on the institutional environment and formal rules. It uses the economics of property rights and positive political theory. The third focuses on governance and the interactions of actors within transaction cost economics. Finally, the fourth is governed by neoclassical economics. It is the allocation of resources and its employment. New Institutional Economics is focused on levels two and three, (Williamson, 2000).

According to North, New Institutional Economics is an attempt to incorporate a theory of institutions into economics. It builds on and extends neoclassical theory to permit it deal with the entire range of issues of human nature. The new institutional economics modifies neoclassical theory to permit it handle the entire range of economics, political and social issues. What it retains and builds on is the fundamental assumption of scarcity and competition which are the basis of the choice theoretic approach that underlies micro-economics. What it abandons is instrumental rationality which is the assumption of neoclassical economics that has made it an institution-free theory. As pointed out by Herbert Simon: If we accept values as given and constant, if we postulate an objective description of the world as it really is, and if we assume that the decision-maker's computational powers are unlimited then two important consequences follow. First, we do not need to distinguish between the real world and the decision-maker's perception of it because he or she perceives the world as it really is. Second, we can predict the

choices that will be made by a rational decision-maker entirely from our knowledge of the real world and without knowledge of the decision-maker's perceptions or modes of calculation, (Simon, 1986, p. s 210). Institutions and the way they evolve shape economic performance and together with the technology employed, determine the cost of transacting and producing. So, institutions are the rules of the game in a society and are the humanly devised constraints that shape human interaction, (North, 1993). In consequence they structure incentives in exchange, whether political, social or economic. It is no exaggeration to say that although neoclassical theory is focused on the operation of efficient markets, it simply takes institutions for granted. Institutions in a community may range from property rights, norms and the corresponding relationships between individuals that define the participation as lenders, borrowers, buyers, sellers, renters, landlords, tenants, workers among others. Strong institutions reduce transaction costs of market exchanges between people and increase internal differentiation in wealth accumulation. They stimulate a system of fair negotiation, trust and enforcement of contracts that foster further investment and local trade.

2.5.4 Empirical Literature: A Review

(a) Empirical Evidence on Factors determining Credit Access

A proper identification of the determinants of credit access, especially in the case of agricultural production loans, is important in view of the fact that many socioeconomic characteristics of households have different effects on production loans than on consumption loans. In analyzing the demand for loans, the literature recommends a procedure that jointly examines the factors influencing the decision to borrow and the factors influencing loan demand in a two-step approach based on the Heckman selection model. This approach has been employed in situations

in which rural households or farmers borrow from formal sources (Pastrapa 2011; Ferede 2012; Sanusi and Adedeji 2010; Akudugu 2012) or semiformal sources such as microfinance institutions (MFI) (Cheng 2006) or a combination of these credit sources (Swain 2008; Doan, Gibson, and Holmes 2010; Kiplimo 2013; Eneji et al. 2013). This approach improves upon earlier approaches that used single ordinary least squares and omitted key variables, including output price (Atieno 1997).

The current literature suggests using physical and human capital endowment as explanatory variables to predict the probability of credit participation. Thus, in their study of the determinants of credit participation in the rural areas of Vietnam, Doan, Gibson, and Holmes (2010) employ a probit model in which the gender, age, education, and marital status of the household head, as well as household size, pre-survey income per capita, pre-survey assets, phone ownership, location, and distance to the nearest bank, are included as explanatory variables. The estimates reveal that households that are larger and younger, have higher initial income, own a phone, and live in more rural countryside areas have a higher probability of borrowing. However, gender, education, and assets have no effect on the credit participation of poor households. Further, households in rural wards with presumably better relationships and interpersonal trust have advantages in accessing credit, especially informal credit. Competition by other borrowing neighbors in accessing credit resources, especially subsidized funds, is also an influential factor in credit participation by the poor in urban areas. In the Tobit type II model that the authors employ in estimating the demand for loans reveals that gender plays a role in explaining loan size. Male-headed households received lower amounts of loans than female-headed households. Also, age, initial income per capita, and household size are found to be important determinants of

loan size. However, education level of household heads, marital status, assets acquired prior to borrowing, location dummies, distance to the nearest bank, and the proportion of borrowing neighbors have no significant effect on loan sizes.

Kiplimo (2013) employs a binary logit model to determine the factors affecting smallholder farmers' access to credit in eastern and western Kenya. The variables included in the model are education of household head, access to extension service, marital status of farmer, main occupation, farm size, distance to nearest market, gender and age of farmer, household size, household income, and group membership. The results show that in the eastern region the marginal effects of education, main occupation, group membership, and household income are positive and statistically significant. In the western region, education, main occupation, distance to market, and access to extension services have positive and significant effects.

Dallimore and Mgimeti (2003) show that long distances and high transportation cost constrained the rural poor and small farmers in rural South Africa areas access to formal financial services mainly located in urban areas. In a study by Atieno (2001), Commercial banks and other formal institutions fail to cater for the credit needs of smallholders in Kenya mainly due to their lending terms and conditions. The result of the study shows that it is generally the rules and regulations of the formal financial institutions that create the myth that small farmers are not bankable. Since they cannot afford the required collateral, they are considered as not creditworthy. It also shows that the limited use of credit reflects lack of supply from the rationing behavior of both formal and informal lending institutions. The study concludes that given the established network of

formal credit institutions, improving lending terms and conditions in favor of small enterprises would provide an important avenue for facilitating their access to credit.

Mahabile et al. (2005) in Botswana observed a strong relationship between farm size and access to credit arguing that farmers with secure land tenure (private farms) and larger herds of livestock use more agricultural credit than those relying on communal grazing land to raise cattle. Investments in fixed improvements to land and herd productivity were found to be positively related to secure land tenure via higher levels of liquidity from long term credit. Although collateral did not provide a guarantee for accessing credit, it improves the chances of access. While owning land help to alleviate credit constraint (Hertz, 2009, p. 76), markets for farmland are thin or missing in the rural areas of the country. In the many rural areas, rural land is of limited value as collateral. One of the constraints to maximizing productivity is the farm size and many of these small farmers operate in small farms.

(b) Empirical studies on credit rationing

The interaction between borrowers and lenders is reflected in the modeling of empirical studies on credit rationing. Regarding the causes of low participation in rural credit market, Kochar (1997) reached the conclusion that demand by households affects the credit outcome. This was based on data from a 1981-1982 Government of India household survey of 7053 rural households on credit transactions, indebtedness and household and farm investments. Apart from the issue of credit participation and demand, the rationing of credit to small-scale farmers, which is also addressed in this study, has been recognized as a major problem in both developed and developing countries.

Various authors have considered different aspects of rationing, ranging from quantity rationing (Petrick 2004) to risk rationing and price rationing, and covering formal and informal sources of credit (Doan, Gibson, and Holmes 2010). Consideration of all the various dimensions in a single study has been very rare in the literature; exceptions include Khantachavana et al. (2012).

Using a model of credit rationing based on the inability of the lender to discriminate across borrowers despite the different costs and risks of lending to them, Gonzalez-Vega (1976) and Cavalluzzo and Cavalluzzo (1998) shows how credit rationing reduces access to credit in a non-uniform fashion across applicants. They find that when the inability to distinguish borrowers comes from interest rate policies, credit rationing leads to the exclusion of the poorer applicants from access to credit markets. As a result, the majority of the small rural farmers are left out in the rural financial market.

Credit rationing or credit constraint manifests in many ways in which potential borrowers are excluded from the credit market, discouraged, rejected, or limited to loans that are much smaller than what they might have applied for. According to Doan, Gibson, and Holmes (2010), some of the factors that have been found to be significant determinants of credit rationing/constraint in the literature include age, income, assets, education, occupation, and borrowing experience (Avai and Toth 2001; Chen and Chivakul 2008; Crook and Hochguertel 2005, 2007; Kedir, Ibrahim, and Torres 2007; Jappelli 1990; Zeller 1994). To examine the determinants of credit constraints, Doan, Gibson, and Holmes (2010) employ a probit model with a binary variable representing whether a household was credit constrained or not. Credit-constrained households include

rejected households, discouraged households, and partial borrowers; credit-unconstrained households consist of full borrowers and other households that do not want to borrow because they have sufficient resources to meet their demand for credit. The study focuses on those that were quantity rationed and price rationed. The explanatory variables in the model include household size, income, age, gender, education, assets, proportion of borrowing households within a radius of 1 kilometer, and distance to the nearest bank within a ward. The results show that higher income reduces the likelihood of being credit constrained, even though all the studied households were poor. Income also has a U-shaped effect on the probability of credit constraints- a result that is contrary to Chen and Chivakul (2008), who found an inverted U-shape effect for general households rather than for the poor in Bosnia and Herzegovina.

As evidence of the effect of productivity on demand for credit, Yadav et al (1992) provided two interesting findings after analyzing statistical descriptions of certain variables. The data were from a survey of 190 farm households in Nepal in 1988. First, they found that cropping intensity and the proportion of land irrigated to have significantly positive effect on credit obtained. This supports the hypothesis that modern rice technology raises the amount of loans by increasing input demand. Second, Yadav et al (1992) observed that the amount of formal loans per ha for large farms is less than that of smaller farms, although large farmers can provide land as collateral for formal loans, which is an obvious advantage in access to formal credit. A possible explanation for less borrowing might be the result of inefficiency, that is, the lower yield, in the production of large farms. The higher cost of hiring and supervising labors for a large farm could also make the production less efficient.

In order to analyze the causes of less borrowing by large farms, Yadav et al (1992) tested the effects of farm size on productivity. Productivity was measured by rice yield per ha and cash cost per ha. Cash costs include costs of hired draft animals and tractors, costs of hired labor and the other variable inputs. The estimated results showed that farm site had a significantly and negative effect on rice yield per ha and positive effect on cash costs. He concluded that large farmers, borrow less per ha from the formal sector because of their lower production efficiency.

In addition to productivity, the low demand discussed by Kochar (1997) and, Yadav et al (1992) also result from the terms of loan contracts. Mushinski (1999) identified the reasons for not borrowing in his survey of 761 households in Guatemala. The purpose of his study was to test differences between the outreach of banks and credit unions. The information on non-borrowers allows for a distinction to be made between preemptively rationed households and uninterested households. The definition of preemptively rationed households included those who do not borrow because of insufficient collateral, high transaction costs of loan application and fear of rejection. Two other groups of households were also included. The first group was the households who did not seek a loan because an application made prior to 1992 had been rejected. The second group was households who received loans from moneylenders at interest rates greater than 25 per cent, which is significantly higher than the interest rate charged by banks. The failure of such households to seek a bank loan indicated that they felt no possibility of obtaining a bank loan, even though they desired a loan. Thus, the concepts of notional and effective demand applied in the empirical study. Households with positive effective demand are those who applied for loans. Households with positive notional demand are those with positive effective demand and those who are preemptively rationed. In each sector, i.e. banks and credit

unions, the offer equation is estimated with data from two sub-samples, those with positive effective demand and those with positive notional demand. For banks, the comparison between the two samples revealed that banks lend primarily to households with large land and wealth that are engaged in large-scale agricultural activities.

Zeller (1994) also adjusted for preemptive rationing when measuring the extent of Credit rationing in his study of' informal lenders and formal credit groups inMadagascar. His purpose was to examine the performance of group lending where members of community-based lending groups allocate group loans among themselves. In the survey of 189 households in agroecological regions of Madagascar, the reasons for not borrowing were asked in order to separate preemptively rationed households from uninterested ones.

In a bid to unravel the causes and implications of credit rationing in Ethiopia, Ali and Deininger (2012) focus on the semiformal sector and use a survey-based direct elicitation approach to identify supply- and demand-side constraints faced by potential borrowers. With none of the households having used formal sources of loans, the semiformal sector-defined to include service cooperatives, input suppliers, and MFIs, as well as nongovernmental and governmental programs that provide subsidized loans to targeted groups of farmers-was by far the predominant source of loans. Observed loan applications and lenders' decisions and responses to qualitative questions on borrowers' needs and perceptions are used to infer a household's semiformal credit regime, in line with previous studies on credit markets (Barham, Boucher, and Carter 1996; Feder et al. 1990; Guirkinger and Boucher 2008; Jappelli 1990). Loan applicants are classified into three groups: those who (1) had applications fully or partially rejected (quantity rationed), (2) received

the requested amount but wanted to borrow more under the same terms (constrained, but cannot be classified because the reasons for not applying for more were not asked), and (3) had their demand fully met (unconstrained). Those who had not applied were asked why they had not requested a loan and those who lacked interest because they had access to sufficient resources on their own or considered interest rates too high were classified as unconstrained or price rationed. The remaining households are considered constrained in three ways: (1) those who reported fear of being indebted and the risk of losing collateral (risk rationed), (2) those who reported lack of collateral and fear of being rejected (quantity rationed), and (3) those who lacked knowledge on how and where to apply or pointed toward a lack of local credit supply (transaction cost rationed). The authors identify three relevant findings. First, although quantity rationing is not negligible, risk is by far the most common reason for being credit constrained in the semiformal sector. In fact, with almost half the sample households risk rationed, an exclusive focus on supply-side constraints could be misguided. Finding ways to address smallholders' exposure to uninsured risk would likely reduce the incidence of credit rationing. Second, political and social networks emerged as key determinants of credit access, pointing to a need to further explore the implications for the effectiveness and targeting of public programs in the area. Finally, credit rationing is shown to affect agricultural productivity in a surplus-producing zone where loans are used mainly for purchasing agricultural inputs, and the removal of credit constraints is estimated to increase productivity by 11.4 percentage points. However, crop productivity is estimated to be unaffected by credit constraints in a more drought-prone and food-insecure zone where loans are used for purposes other than crop production, mainly purchase of livestock. Further research in the area is warranted, due to recent developments in the traits, availability, and coverage of semiformal finance.

Another study in Tanzania has also considered the issue of credit rationing (Absanto and Aikaruwa 2013). The study seeks to identify the major factors used in credit screening and to determine whether the methods used for credit rationing influence loan repayment. The authors adopt a case study approach focusing on Victoria Savings and Credit Cooperative Society (SACCOS) in Tanzania. The authors collected data through semi-structured questionnaires distributed to SACCOS members and through interviews held with the SACCOS manager, credit officers, and credit committee members. The analysis is restricted to a rationing situation in which a borrower receives a loan of a smaller amount than desired. In this context, the authors identify factors such as savings, group guarantee, alternative sources of income, collateral, project running experience, and age as factors used in credit rationing by SACCOS. The study also finds that among the factors that SACCOS used in credit rationing; only age influenced loan repayment performance. By and large, the authors' findings are derived from tabular analysis alone. They make no attempt to employ any reliable analytical technique to support or validate their findings. Nonetheless, they conclude that SACCOS's credit-rationing process was weak because it failed to discriminate between credit-worthy and non-credit-worthy borrowers and thus resulted in poor loan repayment performance. Chisasa and Makina (2013) on South Africa verified that at a macro level, credit makes a positive and significant contribution to agricultural output.

In Nigeria the literature employing the foregoing methods of analysis is just developing. A typical example is the study on small-scale farmers' access to formal sources of credit in Ogbomosho zone of Oyo state (Sanusi and Adedeji 2010), which also employs a probit model

based on a purposive sample of 150 farmers. The study reveals that level of education, membership in a cooperative, and contact with an extension agent, and presence of collateral security positively and significantly affect the likelihood of farmers' access to formal credit, while farming experience negatively affects the probability of farmers having access to formal credit. In a more relevant study, Eneji et al. (2013) go beyond the issue of access and attempt to consider credit rationing. The study focuses on the analysis of rural households' access to the credit market as well as factors favoring credit constraints in Nigeria's Cross River State. Households that had borrowed from semiformal (MFIs) and informal sources are included in the study. However, the only aspect of rationing considered in the analysis involves borrowers being able to receive only a part of the loan applied for or nothing; no model is specified to substantiate the determinants of rationing. A probit model is estimated to analyze the determinants of applications for credit and credit constraints. The explanatory variables in the model are family size, number of capable laborers, dependency ratio, industrial and commercial activity, marital status of household head (whether married or unmarried), gender of household head, occupation of household head, age of household head, arable land owned, annual average value of livestock, annual average value of crops, household income, loans from MFIs, loans from rotating credit cooperatives, loans from informal sources, household dissaving circumstances, household education, and value of the household residential house. The study finds that the probability of households applying for credit increases with household total income and decreases with a high level of poverty, a high dependency ratio, and dissaving circumstances. Without estimating any other equations, the authors conclude that the variables included in the probit model play a significant role in determining the demand for credit and rationing. The analytical techniques

seem inadequate to address the objectives of the study and to support the assertions and conclusions of the study.

Ololade et al., (2013) and Nwaru, et al. (2010) found that the lack of access to credit has adversely affected the productivity of farmers in Nigeria. They found that smallholder farmers are credit constrained and are unable to immediately substitute other forms of finance for bank loans. In another study, (Rahji and Fakayode 2009) and (Odoemenem and Obinne 2010) found that the performance and growth of small farmers are hindered by limited access to credit facilities.

Okojie et al (2010), in an interview with self-employed women in Edo State, found that microcredit has had positive impacts on the businesses and family life of rural dwellers that have had access to Non-Governmental Organization Microfinance Institutions' credits.

Oyeyinka and Bolarinwa (2009), studying the impact of credit on the beneficiaries and non-beneficiaries of the Nigeria Agricultural Cooperative and Rural Development Bank now Bank for Agriculture Limited smallholder loan scheme in Oyo State, found that yield, income, and access to improved farm inputs of beneficiaries were higher compared to that of non-beneficiaries. Other impacts include improvements in facilitating economic transactions, managing day-to-day resources, accessing services that improve quality of life, protecting against economic vulnerability, making productivity-enhancing investments, and leveraging assets. Participants in the FGD posited that timely credit provision facilitates the timely acquisition of farm inputs, which help farmers improve their livelihood.

Obilor (2013) observed that commercial banks' credit to agricultural sector for the period of 1984 to 2007 had no significant positive impact on their productivity in Nigeria. He, however, noted that the agricultural credit guarantee scheme loan by purpose led to a significant positive growth in agricultural productivity in Nigeria. Thus, while generally concurring, that credit is a necessary factor in the agricultural production function, Obilor (2013) emphasizes the provision of credit guarantees by government to lenders to allow access by farmers. The credit guarantee scheme indirectly acts as security for the repayment of bank loans advanced to the agricultural firm where loan repayment may be jeopardized by the risky nature of agricultural production. These results confirmed an earlier study by Ammani (2012) in Nigeria.

The strategic role of financial credit in accelerating agricultural production in Nigeria was also analyzed by Sogo-Temi and Olubiyo (2004). It was proved that one of the most important determinants of growth in agricultural output is availability of productive credit. However, it was opined that the insignificance of the parameter estimates could be attributed to diversion of bank credit to nonproductive ventures such as marriage, funeral ceremonies and other social functions. Mbata (1991) investigated the impact of the supervised Agricultural Credit scheme (SACS) first set up by the Rivers State Government in Nigeria in 1975 as a tool for agricultural development.

A comparative analysis of the productivities of two groups of farmers who borrowed from these sources and those who borrowed from informal sources were analyzed. Data covered the 1988/89 cropping season. The findings of the study revealed that farmers who had access to the SACS used more better inputs, obtained higher yields and thus realized greater farm profit per

hectare than their counterparts who obtained credit from informal sources. This shows the direct impact of the SACS on small scale farmers. It was therefore recommended that through extension services, the scope of the SACS should be widened to embrace more farmers in Rivers State in particular and in Nigeria at large.

Nwaru and Onuoha (2010) finds that in the case of farming activities in Nigeria that credit does not contribute to its increase in productivity. They even find that farmers who benefit from credit tend to be less efficient than those who do not, which could be indicative of inappropriate loans schemes. Khan et al. (2013) finds similar results for Pakistani farmers. That credit beneficiaries do not appear to be more productive or enjoy higher income than their counterparts. Some of the reasons have to do with high interest rate, delay in credit disbursement, and lengthy procedure in getting credit.

2.6Gaps in the literature

The literature review above provides interesting insights that inform investigations of small farmers credit access, credit rationing and small farmers performance in Nasarawa State where farming activities are at the subsistence level and very low.

Previous researchers have empirically investigated the existence or otherwise of credit rationing of small-scale farmers in both developed and developing economies. Particularly lacking are the study on the evidence of credit rationing on the individual small farmers as owner-managers of these small farms. To fill this gap, this study examines two sets of data from the small farmers and the credit managers of commercial banks in Nasarawa State.

In the literature, there exist a Controversies and limitations in current wisdom of neoclassical economic theory regarding credit rationing. The theoretical controversies are found in the traditional assumption that markets clear and there is no rationing. Any excess demand or supply is eliminated by the 'invisible hand' of the price mechanism. This stands opposite to real world observations of, for example, persisting credit rationing.

So therefore, this study builds on the theory of the new institutional economics (NIE) and that of credit rationing that consider economic outcomes, especially in the developing countries to be largely dependent on the combined effects of market imperfections and the fundamental forces of resources, technology and preferences. The New Institutional Economics theory relaxes the unrealistic assumptions of neo-classical economic theory such as perfect information, zero transaction costs, unimportance of institutions, perfect enforcement of contracts and full rationality. Instead, it emphasizes the importance of transaction costs, environmental factors, the endogenous nature of institutions and institutional arrangements that determine economic exchanges and performance in any given community while the credit rationing theory considers asymmetric information, moral hazard and adverse selections.

Further, in the literature, micro level efficiency of credit access and credit rationing has been discussed widely under two separate bodies. However, only a limited number of empirical researches attempted to analyze the microeconomic efficiency of credit rationing. Most empirical studies concentrate on the demand side, i.e. borrowers' investment behavior and performance; whereas insufficient information is provided with respect to the supply side, i.e. banks behavior

and lending policy. Therefore, the potential role of financial institutions to improve efficiency of credit allocation is largely neglected. This study aims to bridge this gap by providing valuable information on bank lending behavior and the efficiency of credit allocation under different regulatory conditions.

A key problem for researchers investigating this type of lending is distinguishing statistical discrimination, which reflects measurement problems, from socio-economic discrimination which reflects unjust lending practices. Following Becker's (1957) suggestion that prejudicial discrimination is inconsistent with fully competitive markets, Cavalluzzo and Cavalluzzo (1998) used the Herfindahl-Hirschman index, which measures the degree of banking market competition to help distinguish socio-economic conditions from statistical discrimination. To do this, i.e., to distinguish socio-economic from statistical discrimination, we propose following Boot and Thakor's (2000) observations about lenders being producers of relationship and transaction loans and about differing degrees of competition in the markets for relationship and transaction loans. Specifically, we propose using loan type and lender type indicators in much the same way Cavalluzzo and Cavalluzo used the Herfindahl-Hirschman index to distinguish statistical and discriminatory lending.

Despite the large body of theoretical literature concerning credit rationing, there is little evidence to show about the economic significance of credit rationing in the economies of developing countries. Empirical tests on the theories of equilibrium credit rationing in developing countries are scanty. This is mainly due to the lack of micro data on the contractual terms of individual commercial bank loans. Most empirical tests have used macro data sets rather than micro data in

their investigation of the existence and significance of credit rationing, and this has led to inconsistent results.

This study differs from previous studies on credit rationing, in that micro data was applied. This allows the study to analyse the empirical implications of the credit rationing result. One other way in which this study differs from other studies is that it used data on the small farmer's access to bank credit rather than the business. Parker (2002) has called for more empirical research on the existence of credit rationing, its impact and extent among socio-economic groups.

Overall, the theory seems relatively clear about how information asymmetry could generate credit rationing that could be based on non-market mechanisms, such as small farmers, gender, and how in turn, credit rationing can adversely affect small farmers' access to credit, efficiency and performance. However, on the empirical side, the literature appears to be less settled when it comes to the extent of small farmers' discrimination, and how it translates into any productive efficiency gap. In the end, an empirical study that focuses on the specific nature of the functioning of the credit market, both on the demand (borrowers) and supply (lenders) sides, would be capable of providing any accurate picture. This is particularly true in countries like Nigeria, where the various public policies have sought to deal with a hypothetical small farmer-based discrimination in the credit market.

Credit access can be seen as the supply side phenomenon of credit markets, because the lenders decide whether borrowers can access credit or not. The credit process involves two distinct stages. In the first stage, borrowers who have demand for credit decide how much funds to apply

for and from which particular lender (formal or informal sector) at the prevailing market interest rates. This process constitutes the demand side. In the second stage, the lenders decide who accesses credit and what amount, that is, rationing which constitutes the supply side. Market imperfections and information asymmetry problems raise the probability of default risk; thus, lenders do not sell loan contracts to every willing buyer (borrower) at the prevailing market price (interest rate). The interest rate as the price for credit therefore fails to play its market-clearing role of equating credit demand and supply, thus giving rise to equilibrium with credit rationing.

This study differs from previous studies on credit rationing, in that micro data was applied. This allows the study to analyse the empirical implications of the credit rationing result. One other way in which this study differs from other studies is that it used data on the small farmer's access to bank credit rather than the business. Parker (2002) has called for more empirical research on the existence of credit rationing, its impact and extent among socio-economic groups.

This study, therefore, attempts to fill the academic gap in the African region and empirically investigate the empirical significance of credit rationing of small-scale farmers of small farms in a Nigerian state context. This study also attempts to replicate and extend previous research by focusing on the human and social capital profile of small farmers and their access to external finance. Also, this study attempts to investigate which type of small farmer is actually more likely to be credit rationed.

As in many countries in Sub-Saharan Africa, the majority of small farmers in Nigeria are left out in the financial (credit) market systems. It has been argued that most rural small farmers in

Nigeria are too poor and cash-strapped to benefit from any kind of access to credit. They are shut out of credit services because they did not meet the traditional criteria for borrowing.

Given the nature of small farmer's performance and the way it is conceptualized in Nigeria, it is argued here that, it is the intersection between access to credit, income, services and assets that the issue of overall performance trends among the rural small farmer should be examined. Even when small farmers have access to some credit, they may still have a binding constraint *i.e.* they may not be able to borrow as much as would be optimal under given terms and prices. They may face terms that are inconsistent in timing with the investment. This is what this thesis sets to reveal.

Unlike some of the studies reviewed, the present study extends the analysis of credit rationing beyond quantity rationing and presents explicit models for analyzing the determinants of three types of credit rationing: quantity rationing, risk rationing, and price rationing. This approach has been applied to small-scale farmers in China and Mexico but rarely in the case of Africa or Nigeria in particular. The focus of the analysis in this study is on small-scale farmers rather than rural households in general. Emphasis is also placed on formal credit, unlike some of the other studies, which have focused on semiformal and informal loan sources.

2.7 Theoretical and conceptualframework

It is the theory which decides what can be observed. Therefore, the framework of this thesis builds on the theory of the new institutional economics (NIE) and that of credit rationing that consider economic outcomes, especially in the developing countries to be largely dependent on

the combined effects of market imperfections and the fundamental forces of resources, technology and preferences. The New Institutional Economics theory relaxes the unrealistic assumptions of neo-classical economic theory such as perfect information, zero transaction costs, unimportance of institutions, perfect enforcement of contracts and full rationality. Instead, it emphasizes the importance of transaction costs, environmental factors, the endogenous nature of institutions and institutional arrangements that determine economic exchanges and performance in any given community (Stiglitz and Weiss 1981; North 1990; Bardhan 1993; Kherallah and Vandenberg, 2002). The credit rationing theory considers asymmetric information, moral hazard and adverse selections. Information asymmetry models assume that at least one party to a transaction has more, better or relevant information than the others (Brown, et al. 2004). This creates an imbalance of power in transactions, which can sometimes cause the transaction to go awry. According to Stiglitz (1989), financial contracts include elements that lead to the basic problems of adverse selection and moral hazard. In adverse selection, the ignorant party lacks information while negotiating an agreed understanding of or contract to the transaction, whereas in moral hazard the ignorant party lacks information about the performance of the agreed-upon transaction or lacks the ability to retaliate for a breach of agreement (Aboody and Baruch, 2000; Brown, et al., 2004).

So, the framework of this work shows linkages between policies, institutions, markets, technology, vulnerability issues and access to credits that are all vital for small scale farmer's performance. These interactions define effective supply and demand for credits, opportunities and constraints that small rural farmers face. The presence of markets for inputs and outputs can create a broad-based rural development through better exchange of assets, goods and services.

Conversely, the joint combination of imperfect markets and information asymmetries in rural areas create high transaction costs in virtually all output and input markets. This in turn, creates direct interrelations between demand and supply of credit and performance, which further limit loan quantities that can be supplied and the level of market participation.

Berger and Udell (2002) observe that banks and nonbank intermediaries use at least four different lending technologies which are (1) financial statement lending, (2) asset-based lending, (3) credit scoring, and (4) relationship lending. The first three technologies are similar, being made chiefly on the basis of "hard" information and often for the purpose of financing specific transactions. These three technologies are sometimes referred to collectively as "transaction lending." For small scale farmers, financial statement lending is likely irrelevant to a discussion on lending to small farmers because lenders use it chiefly for firms with audited financial statements and access to public capital markets. The remaining three technologies are relevant to smaller firms including small farmers. With asset-based lending, creditors lend on the basis of collateral (usually accounts receivable or inventory) which they subsequently monitor closely. Credit scoring, which according to (Mester 1997), has been applied to small business loans uses historical data about a business owner's credit history and wealth to generate a score that reflects the borrower's default probability. This information is completely absent among small farmers in Nasarawa State. Transaction and Relationship lending which are our concerns here is lending chiefly on the basis of proprietary information an intermediary gather over time about the farm and its owner. The borrowing decision of the small farmer is taken after careful consideration of the principal, amount of the loan required, repayment capacity of the borrower, terms of the

loans and security to be offered for the loan. When the small farmer is satisfied with these conditions, he will apply for the loan.

The lending decision of the Bank is done after the credit analysis is performed by a loan officer who receives loan applications from small farmers. Such an analysis enables him determine the ability and willingness of the small farmer to repay the loan. The analyst looks at the small farmer's past record (reputation) and his business prospects. He appraises the purpose of the loan, amount of the loan applied, terms of the loan, earnings from the loan to the bank, repayment arrangement and security offered to support the loan when evaluating the small farmer. The Credit analyst traditionally appraises the crucial factors such as capacity, capital, conditions, character and collateral of the borrower. Banks can have more or less information about the small farmer's capital, capacity, condition, collateral, and character depending on how much information they gather about the farmer. For example, if the bank has had a relationship with the farmer, it will necessarily have access to more information than a bank that has no such relationship. Character is very important when it comes to loan repayment and as such it's evaluated properly. The measure of the small farmer's character is its reputation regarding previous credit relationships.

Taking that the bank is faced with two credit applicants. Suppose that the applicants are all small farmers but that one of them has had a relationship with the bank ('relationship' lending), while the other one is making the credit application for the first time ('transaction' lending). The relationship lending literature would claim that the relationship bank has access to private information about the small farmer's creditworthiness. The transaction bank, on the other hand,

only has access to public sources of information about the farmer, plus any information that it can gather about the small farmer's creditworthiness. Since, the relationship bank has observed closely the small farmer and gathered information that could substitute this external (public) measure of reputation, we expect the behavior of relationship banks to be different from the behavior of transactions bank.

In the literature, it is assumed that if the small farmers have a bad reputation (measured by a high value of unpaid debt) then the banks will lend using transaction information to grant the loan with a lower probability than farmers with a good reputation. However, relationship banks would rely less on this variable because they have gathered private information which is more superior.

In the extreme, if the information gathered in the course of the relationship is good enough, these privately informed banks shall substitute completely the public reputation with their own information. According to Ongena and Smith, (2000) and Elsas, (2005), the relationship lending literature identifies several measures to account for the existence of a relationship and the construction of binary variables. For example, the time duration of the relationship has been widely used to proxy for the strength of a bank-farmer relationship. Another common proxy is the scope of the relationship, measured by the number of services provided by the bank (Petersen and Rajan 1994, Berlin and Mester 1999). Other measures involve the banks' self-assessments of their status as relationship banks (Elsas and Krahnen 1998, Elsas 2005) or whether the farmer and the bank had a personal relationship (Berger, Miller, Petersen, Rajan and Stein 2005).

The framework for this study also benefited from the theoretical model of Iqbal (1983), which has been further modified by other works, including Olomola and Gyimah-Brempong (2014) and Swain (2008) and in the microeconomic theory of the behavior of farming households in the use of loans for production and consumption (Geron 1989). In some of these studies, the interest rate is taken to be endogenous on account of the fact that the sampled farmers have the same source of loans and on the assumption that the interest rate is household specific depending on the amount borrowed and on the capability of the household to repay the loan. In this study the farmers surveyed borrowed from various formal sources, and the interest rate varies from one institution to another. It is therefore assumed, as in other studies (Wiboonpongse, Sriboonchitta, and Chaovanapoonphol 2006), that the interest rate can be treated as exogenous. The unchanging part of the theoretical framework, however, is that demand for loans is affected by the interest rate, farm production characteristics, and socioeconomic characteristics of the household, output price, and wage rate (Swain 2008). Essentially, this study is concerned with the behavior of a farmer whose demand for a loan is for production purposes. The farmer has a given initial endowment of productive farm assets and socioeconomic characteristics. The amount borrowed by the farmer is considered to be equal to the total outlay on inputs, which will be used to produce the desired level of output based on the availability of other productive farm assets. This implies that input expenses are entirely financed by borrowing. The farmer is assumed to be interested in maximizing his or her net income, and the loan demand will therefore depend on the interest rate, the output price, and the farmer's endowment of other productive resources. Theoretically, the loan demand will be a decreasing function of the interest rate and an increasing function of the output price and productive assets.

For the credit rationing, the framework is a little complex. Conventionally, credit rationing is broadly defined as a situation in which the demand for loans exceeds the supply of loans at the going interest rate. According to Jaffee (1971), credit rationing is defined as the difference between the quantity of loans demanded and loans supplied at the going interest rate. Jaffee and Russel (1976) made a pioneering attempt to predict what would happen in the absence of the institutional arrangements found in actual loan markets in which "honest" and dishonest" borrowers operate without the lenders having adequate knowledge of their behavior. The authors provide equilibrium analysis of the credit market, which reveals that credit rationing is caused by adverse selection and moral hazard. Subsequently, Stiglitz and Weiss (1981) theorized that excess demand for credit resulting in credit rationing can be explained in terms of short-term or long-term disequilibrium. It is viewed in the short term as a temporary disequilibrium phenomenon characterized by an exogenous shock in the economy, and stickiness in the price of capital (interest rate) leads to a transitional period during which rationing of credit occurs. Long-term credit rationing is explained by institutional constraints imposed by government policies and other regulatory actions. In their theoretical development of credit rationing, the authors build a model of competitive equilibrium in the sense that banks compete by choosing the interest rate that maximizes their profits, such that there are interest rates at which demand for loanable funds equals supply of loanable funds. However, such interest rates cannot be regarded as equilibrium interest rates because at those interest rates, banks could increase their profits if they so desired by lowering the interest rates charged to borrowers. Consequently, the authors conclude that it may not be profitable to raise the interest rate or collateral requirements when a bank has an excess demand for credit; instead, banks deny loans to potential borrowers. Thus, according to the authors, credit rationing refers to circumstances in which either (1) among loan

applicants who appear to be identical some receive loans and others do not, and the rejected applicants would not receive a loan even if they offered to pay a higher interest rate, or (2) there are identifiable groups of individuals in the population who, with a given supply of credit, are unable to obtain loans at any interest rate even though they would with a larger supply of credit.

In his conceptualization, Padmanabhan (1981), emphasizes loan size and considers credit rationing as a situation in which borrowers receive a smaller amount of loan than they requested at a given loan rate. Jaffee and Stiglitz (1990) broaden the classification and identify three aspects of credit rationing: situations in which a borrower may receive a loan of a smaller amount than desired, some individuals cannot borrow at the interest rate they consider appropriate, or a borrower may be denied credit when a lender thinks it may not be able to obtain its required return at any interest rate.

In the specific case of agricultural and rural credit, several years of investigation have resulted in a better understanding and a refinement of the underlying theory over time. Credit rationing in rural and agricultural communities of developing countries is endemic given the lack of competitive credit markets. The basic problem is that of information asymmetry, resulting in credit rationing either in the form of outright refusal of loans or granting smaller amounts than requested. Thus, lenders must contend with several issues. They need to ascertain what kind of risk the potential borrower is (adverse selection) and ensure proper utilization of the loan based on the agreed terms to ensure compliance with the repayment schedule (moral hazard). Moreover, they need to effectively supervise the loan once made and design methods to ensure

repayment (enforcement) or design institutional arrangements to provide incentives for prompt recovery of loans when due (Olomola 1996; Ghatak and Guinnane 1999).

Further refinements of the theoretical justification for credit rationing to address some of these problems have emerged in the recent literature and are beginning to be subjected to empirical investigation (Guirkinger and Boucher 2008; Boucher, Carter, and Guirkinger 2008; Boucher, Guirkinger, and Trivelli 2009; Khantachavana et al. 2012). In this connection, Guirkinger and Boucher (2008) build a model that shows that collateral requirements imposed by lenders in response to asymmetric information can cause not only quantity rationing but also transaction cost or price rationing and risk rationing. Quantity rationing (outright rejection or lending less than the amount requested) derives from supply-side restrictions and borrowers' inability to meet the collateral requirements of lenders. Transaction cost rationing arises on account of the high costs of loan processing, monitoring, and recovery. Risk rationing arises in situations in which potential borrowers would be unwilling to access a loan even if it were available to them because they fear the risk of being indebted and possibly losing the assets pledged as collateral (Boucher, Carter, and Guirkinger 2008). Farmer-borrowers who are either transaction cost or risk rationed, unlike their quantity-rationed counterparts, voluntarily decide not to participate in the loan market even though their projects would be feasible in competitive markets for loans.

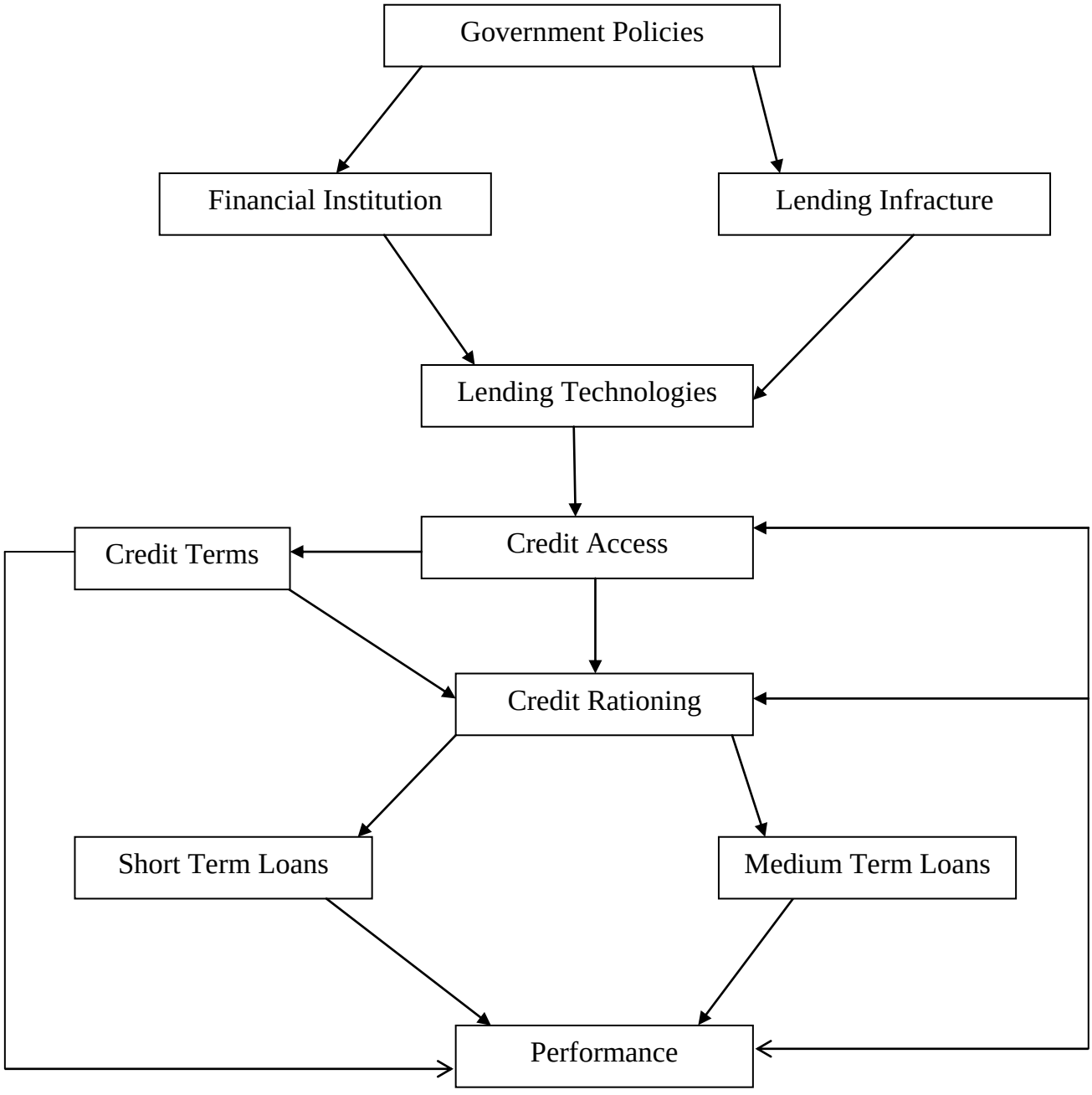
In their study, Boucher, Carter, and Guirkinger (2008) make clear distinctions between quantity rationing, transaction cost rationing, risk rationing, and price rationing; this is the only study to make a concrete attempt to place risk rationing in a theoretical context which holistically consider the various sources of credit constraints that include quantity and price rationing. Their

model is based on asymmetric information that leads to loan contracts with high collateral, such that farmers who default will lose productive assets. Thus, farmers will self-ration out of the market in order to preserve their capital. In the model, both financial and productive wealth can be used as collateral. The authors show that an increase in financial or productive wealth tends to relax quantity rationing. As regards risk rationing, they postulate that the financially wealthy will be risk rationed. They also argue that there is a relationship between risk rationing and productive wealth. Exploiting the land with risky activity yields a higher return. As farm size increases, returning to safe activity becomes increasingly costly. But the land wealthy will choose to participate in the credit market and fully exploit their productive asset (land).

Despite the relevance of Boucher, Carter, and Guirkinger's (2008) theoretical framework to the understanding of agricultural credit rationing in developing countries, it has not been applied to African agriculture. So far, the only application has been to small-scale farmers in China and Mexico (Khantachavana, Turvey, and Kong 2011; Khantachavana et al. 2012). Our study applies this theoretical framework to Nigeria and Nasarawa State in particular. Consistent with this theoretical framework, three categories of credit rationing are considered in the analysis: (1) quantity-rationed or supply-side-constrained farmers; (2) risk-rationed farmers, who do not face a binding limit and therefore do not have excess demand for credit (the only limiting constraint comes from the demand side); and (3) price-rationed or unconstrained farmers, who may either borrow or not and are satisfied with the loan amount at the price offered. Price rationing can be external or internal. External price rationing can occur if the lender raises the interest rate or transaction costs so that free choice along the credit demand curve results in a utility maximizing

position. Internal price rationing occurs when a borrower chooses whether or not to borrow at fair market prices and transaction costs.

Figure 2.3: A Framework for credit access, Credit Rationing and Performance of Farmers



Source: Adapted from the Models of Matchaya (2010) and Berger and Udell, (2006)

The literature on credit rationing (see Guirkinger, and Boucher (2008); Doan, Gibson, and Holmes. 2010; Ali, and Deininger. 2012; Ali, Deininger, and Duponchel, (2014) suggests that

they can cause a misallocation of resources in agricultural production. This misallocation of agricultural inputs causes credit rationed farmers to maintain lower levels of productivity than their unconstrained counterparts. This lower productivity comes in line with the conventional argument in production theory. If a typical household is tied with binding liquidity constraint, it will have lower investment levels in production and also suffer misallocation of variable inputs which will result in lower level of productivity (Foltz, 2004).

In agriculture, at the beginning of the production period, farm households need to allocate their available resources between current period consumption, purchase of variable inputs for production, and investment. The household unconstrained in the capital market can separate consumption decision from farm production decisions. Households can then choose production inputs optimally for production process they face. In this scenario the levels of inputs in production and investment will not be affected by the level of credit they receive. However, in the case of credit constrained farm households, the choices they make in acquiring inputs for investment and production depends on the amount of credit they receive. They will have a productivity impact on constrained households (see Diagne and Zeller, 2001; Foltz, 2004; Guirkinger and Boucher, 2008; Ali and Deininger. 2012**)**. All tried to derive testable relationships between credit rationing, credit constraints and potential outcome variables using the framework of the standard agricultural household model that combines both consumption and production decisions of farm households developed by Singh and Strauss. 1986**)** under imperfect market situations.

In an ideal world of perfect and complete markets, the recursive property of the model implies that farm households' production and consumption decisions will be separable. Decisions about input use will thus be independent from households' initial resource endowments and output per area unit will be unaffected by the level of liquidity and initial endowments of resources such as land and family labor. But these arguments no more hold in scenarios with market imperfections, in which credit market failure is the one. Production and consumption decisions of households are simultaneous, implying agricultural input use will no more be independent of the availability of capital and initial endowments. Those households who face binding credit constraints may fail to afford the maximum desired levels of input use which will in fact lower productivity than if the other case happens.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section is aimed at presenting a detailed description of all the processes that are employed in the execution of the study. It contained a description of the study area, theoretical framework, Analytical Techniques, Descriptive statistics, Econometric approach, models specification, sampling Procedure, techniques of Data Collection and Sources and nature of Data.

3.2 Study Area: Socio-Economic and Demographic Profile of Nasarawa State

The study is conducted in Nasarawa State of Nigeria. Nasarawa State was created out of Plateau State in October, 1996. Its area of jurisdiction is made up of thirteen local government areas which are Akwanga, Awe, Doma, Karu, Keana, Keffi, Kokona, Lafia, Nasarawa, NassarawaEggon, Obi, Toto and Wamba local government areas. The State covers a relatively small area of the total land of Nigeria. It is in the North Central Region of the country with about 95 percent of its vegetation within the savannah zone and lies in the equatorial climatic zone that is characterized by moderate temperatures. Topographically, it is an undulating plain that slopes gently towards the bank of River Benue where water flow by gravity from one point to another.

The Soil of the area is sandy loam. Like most soils of Tropical Africa, Nasarawa State land fertility is very high. The direct influence of climatic factors like rainfall, temperature, evaporation, humidity and sunshine makes the state very favorable for producing various crops under whatever method. It is a humid part of Nigeria with rainy season lasting for up to 190 days (April to October), and has the effect of recharging the rivers thereby making more water

available for farming all the year round. The mean annual rainfall of Nasarawa State is about 1,383mm per annum and the mean air temperature ranges from 34.1^0C in August to 44.2^0C in March. Humidity ranges from 33 percent to 97 percent, being lowest in January and highest in August. Although the combination of temperature, relative humidity and light intensity will influence the growth of crop in the land, these weather conditions are adequate throughout the year and support the growth of many crops and tubers. The availability of water in sufficient quantity throughout the year is a crucial factor to the success of farming and the state is lucky to have the Benue River, which is reputed to be one of the major Rivers in Nigeria.

According to NBS Survey of (2011), the population of the state which was 1,869,377 in 2006 increased to 2,107,717 in 2010. It is made up of Akwanga - 111,902, Awe - 113,083, Doma - 138,991, Karu - 216,230, Keana - 81,801, Keffi - 92,550, Kokona - 108,558, Lafia - 329,922, Nasarawa - 187,220, Nasarawa Eggon - 148,405, Obi - 148,977, Toto - 119,051 and Wamba - 72,687 local government areas. The age-sex composition is very vital in the population of every country. It has some implications on farming. The population pyramid of the state reveals that there are generally more males than females with percentages of 55.2 and 44.8 respectively, (NPC 2006). Further investigation shows that more females dominate at the lower ages (0-24 years) while their male counterpart dominates at the higher ages, (25-54 years). This could be associated with the effect of immigration which is both age and sex selective. The age structure shows high working population ratio of 59.0 signifying that more economic opportunities need to be put in place for the wellbeing of the residents.

A place may be designated an urban area based on its size, population, age, function or morphology. If based on the size of its population, Nasarawa state is almost entirely rural. As at 1977, there was no settlement with a population of 5,000. The biggest urban areas were Lafia (4995 people), Karu (3,556 people) and Doma (3, 460 people). However, with the creation of the state in 1996, movement of people from every part of the country especially Plateau state has affected the state with most of the villages now urban settlements.

The State is endowed with considerable natural resources, which give it a significant economic importance within the context of national development. Nasarawa State is one of the most economically active States in the country. Both agriculture and industry feature prominently in the State's economic activities and the influence of the demographic complexities of the various 13 local government areas of the state play an important role. The target population is the small-scale farmers in the State who applied for credit from Banks.

Nasarawa state in Nigeria has high agricultural potentials. The Agro climatic condition of the State favors both crops and livestock production. There are no irrigation schemes of any type across the state and production is reduced by lack of supporting infrastructure and services, poor maintenance of equipment, lack of management and marketing skills and political conflicts. The state has a high density of semi-subsistence farmers. Between 75-90 percent of the rural households enjoy some access to arable land. Somewhere between a quarter and a half of households, own sheep and goats, although the great majority of herds are less than ten head. More stock ofsheep and goats are owned by few households than cattle, but average herd sizes are not substantially greater.

Many rural households are effectively self-sufficient in their staple foods. Small-scale livestock farmers sell limited numbers of livestock through private livestock traders for cash needs. Estimates of agricultural income in terms of cash sales and produce consumed within the producing household show great variability but most studies put it at between 10 percent and 25 percent of average household income of which the greater part is accounted for by direct consumption.

Levels of infrastructure development are well behind national averages. Ten percent or less of households have pipe bone water with some 80 percent of the population relying on natural sources of water, such as untreated springs, streams, rivers and dams. Sanitation service levels are extremely low with more than 50 percent of households having no sanitation. School attendance in the area is good, but education levels remain low. There is a shortage of health services (NBS, 2011).

Access to the area is limited mostly to gravel roads, leading from the cities towards the villages and this seriously hampers development opportunities and provision of services. The economy of the State is characterized by uneven development. This is evident in a number of dualisms: between the urban centres and the rural areas of the homelands of the people; between a developed commercial farming sector and a subsistence agricultural sector; and between concentrations of fairly well developed and efficient social and economic infrastructure in the urban parts of the state and its virtual absence in the villages (NBS 2011).

3.3 Sampling Procedure

Purposive and multistage random sampling technique was used to select respondent farmers for this study. A population of small-scale farmers in agricultural activities was identified in the study area of Nasarawa State, with the help of the local government offices of the Ministry of Agriculture, All farmers Association office in Lafia and Nasarawa State Agricultural Development Programme offices. This included both credit and noncredit users. Since there is no official register of individual small farmers operating in these local government areas, it was not possible to have a listing of the small farmers. Respondents were therefore randomly selected from the population in the selected areas using a random start. Systematic random sampling was then used to pick subsequent respondents.

The first stage involved the selection of operational base as the three senatorial regions that constitute the local government areas of the state. The local governments are divided into three senatorial districts namely Northern, Southern and Western Senatorial regions. From these, three local government areas were purposively selected from each of the senatorial region based on their relative importance in bank spread and farm production. The second stage involves the selection of nine local government areas proportional to the number of populations in the selected senatorial regions in the state.The selection of 9 local government areas proportional to the populations and banking services in the senatorial regions were also done at this stage. A reconnaissance survey was conducted to identify farmers that have applied for credit in the study period in these areas. The proportionality factor used is stated thus:

$$Xi = {}^{n}/_{N^*}\,9 \qquad (3.1)$$

Where X_i = number of local government areas sampled in each senatorial region

n = number of local government areas in a particular senatorial region

N = Total number of local government areas in all the selected senatorial regions

In the third stage, twenty (26) villages were selected using another proportionality factor such that the number of villages selected from each Local Government Area is proportionate to the total number of senatorial regions in all the State. The proportionality factor used is stated thus:

$$X_j = p/P^*26 \qquad (3.2)$$

Where X_j= number of villages sampled in each Local Government Area

P*=number of villages in a particular Local Government Area

P= Total number of villages in all the selected Local Government Areas

In the three stages above, total selected for the senatorial regions, Local Government Areas and villages was based on their relative importance in rain-fed rice production. In the final stage 702small scale farmers (Table 3.1) were randomly selected from the selected villages in a ratio proportional to the size of the population of farmers who apply for credit on sole basis. However, only 592 were used for analyses. The remaining 110 were rejected due to inconsistencies in the responses. Information on the population of the small-scale farmers was obtained from the All farmers Association of Nigeria office and the State's Agricultural Development Programmes through agricultural extension agents working in the selected villages. The sample farmers are taken from this farming population that seek for credit from commercial banks and Bank of Agriculture in the state. A random sampling technique is used to select 702 small scale farmers

in the state who are expected to have applied for loans to finance their farming activities and received or did not received the loans in 2015.

Respondents were restricted to those that had applied for credit within the year of the survey. To complement this, the representative banks and All farmers association of Nigeria, Nasarawa State branch were contacted.

The sample size was extracted from the population of farmers of the state. The factors that are considered in deciding on the size of the sample for the study include:

(i) The degree of precision required between the sample population and the general population,

(ii) The variability of the population and

(iii) The sampling method.

According to Araoye (2003), sample should not be too large in which case it will not conserve resources which are usually limited. The availability of resources sets the upper limit of the sample size while required accuracy sets the lower limit. Therefore, in view of resource constraints, the sample size for this study is 702 of crops farmers. The selected sample of 702 loan applications in 2015-2017 represented 74.13 percent of the total number of farmers that need loans to finance their activities from the selected sample of branches of the banks during 2015-2017 in the state. The proportional sample size for the crops farmers is further divided into four crops, viz Cassava, Rice, Yams and others.

3.1: Sample size of small farmers that need credit by senatorial regions and village areas in Nasarawa state

Senatorial regions	Total Number of LGAs	Local government areas	Selected Villages	Sampling frame	Number of farmers randomly selected
Northern	3	Akwanga	iAndaha	40	30
			ii Gudi	30	21
			iiiShamaki	26	15
		NassarawaEggon	iAkun	30	21
			ii Mada station	35	25
			iii Wulko	45	35
		Wamba	iLagga	35	27
			ii Mama	41	30
			iii Nakere	45	32
Southern	5	Awe	iAkiri	32	21
			ii Azara	41	30
			iii Mahanga	28	17
		Keana	i Giza	31	21
			ii Kadarko	30	20
			iii Kwarra	40	32
		Lafia	iAgyaragu	35	25
			ii BAD	33	22
			iii Shabu	35	25
Western	5	Keffi	iAgwada	26	30
			ii Gauta	37	39
		Nassarawa	iLaminga	45	34
			ii Odege	43	31
		Toto	iGadabuke	48	37
			ii Karmo	45	34
			iii Katakpa	37	26
			iv Umaisha	34	22
	13	9	26	947	702

3.4 Collection of Data

The study used both primary and secondary data from financial institutions and individual small farmers that have received credit from formal credit institutions as well as those who did not. The primary data was collected by structured questionnaires administered to a cross section of rural farm household heads that had applied or not applied for credit from formal financial

institutions in the state. The formal financial institutions considered in this study are first bank of Nigeria Plc, United bank for Africa Plc and Union Bank of Nigeria Plc for the commercial banks and Bank of Agriculture located in each of the local government areas of the state. The Bank of Agriculture located in Akwanga, Lafia, Keffi and Nasarawa towns of the state. The primary data was collected by administering structured questionnaires to the sampled respondents while the secondary data was collected from the bank and individual small farmers' statement of financial reports. Small-scale farmers engaged in farming were selected as the units of study.

Information collected in the survey include data on farmers' socio-economic and demographic characteristics of the household heads, land tenure, livestock ownership, asset ownership, credit and savings, income and expenditure variables and household levels indicators. Control questions were included in the questionnaire to verify the consistency of the answers. In addition, the enumerators were trained to use other control questions not included in the questionnaire whenever there seemed to be inconsistencies in a respondent's answers. Secondary data was also collected from the sample banks, as a supplement to the data collected on the field. We know that some of the respondents could neither read nor write. The original questionnaires were read to them verbatim in Hausa and we in turn jot down their responses accordingly. Collections of data on business annual turnover, income, assets and liabilities of the farmers and the Banks cost of lending was from original records.

3.5 Analytical Techniques

With the aim of achieving the objectives of the study stated in chapter one, and in line with the analytical framework, descriptive statistics and binary logistic and probit regression were used as analytical tools.

For methodological simplicity, we first used descriptive methods of analysis to examine socioeconomic and demographic factors that are necessary to access agricultural credit by the smallholder and discussion related to credit rationing and their linkages with selected variables in chapter four. Mean and percentage descriptive analytical tools have been used under a clearly understandable frequency distribution sketch. Finally, we empirically investigate the effect of credit rationing on Agricultural productivity and investment profile of the small-scale farmers and those factors that determine farmers to be credit rationed using the econometric estimation procedure. Under this procedure we estimated the productivity loss of being credit rationed.

3.5.1 Descriptive Statistics

To address the first objective, descriptive statistics such as mean, median, percentages and frequency distribution are used in describing the socio-economic and demographic characteristics as well as the structure and sources loans to small-scale farmers in the state.

3.5.2 Econometric Approach

To address the second and third objectives and given the dichotomous nature of the dependent variable, small scale farmer credit denial, an inverse proxy for credit access renders ordinary least squares regression inappropriate. As a corollary of this, models including linear probability models, logit and probit models are considered.

(a) Logistic Regression Model

To estimate the determinants of household access to credit, the probability of household access to credit is assumed to be determined by an underlying response variable that captures the true households' socio-economic status. In the case of credit access status (*i.e.* with access or without access), the underlying response variable *A** is defined by the regression equation:

$$A^* = \Sigma X_i\beta + \mu_i \quad (3.3)$$

In the equation (3.1), A* *is* not observable, as it is a latent variable. What is observable is an event represented by a dummy variable *A* defined by:

$$A = 1 \text{ if } A^* > 0 \text{ and } A = 0 \text{ otherwise} \quad (3.4)$$

From equation (3.1) and (3.2), the following expression can be derived:

$$\text{Prob}(A_i = 1) = \text{Prob}(\mu_i > -\Sigma X'_i\beta) = 1 - F(-\Sigma X'_i\beta) \quad \text{and,}$$

$$\text{Prob}(A_i = 0 \backslash \beta, X_i) = F(-\Sigma X'_i\beta) \quad (3.5)$$

Where *F* is the cumulative distribution function for μ_i.

The observed values of *A* are the realisation of the binomial with probabilities given by equation (3.3), which varies with X_i. Thus, the likelihood function can be written as:

$$L = \prod_{Ai=0}[F(-\Sigma X'i\beta)] \quad (3.6a)$$

This can be written as:

$$L = \prod_{Ai=1}[F(-\Sigma X'i\beta)]^{1-A}\,[1 - F(-\Sigma X'i\beta)]^{Ai} \quad (3.6b)$$

The log likelihood function for the two equations above (3.4a and 3.4b) can be written as:

$$l = (\beta) = logL(\beta) = \sum_{i=0}^{n} Ailog\big(1 - F(-\Sigma X^{'} i\beta)\big) + (1 - Ai)logF(-\Sigma X^{'} i\beta) \quad (3.7)$$

The functional form imposed on *F* in equation (3.5) depends on the assumption made about the error term $u_i$in equation (3.1). The cumulative normal distribution and logistics distribution are very similar, yielding the same result (Maddala, 1983). In addition, from Amemiya (1981), once

the parameter of estimates is obtained from the logit model, it is possible to derive the would-be estimates of a probit model. Hence, in this study the logit model is used. In this study, the logit model is specified by assuming a logistic cumulative distribution of $u_i$in F (in equations (3.4a) and (3.4b). The relevant logistic expressions are:

$$1 - F(-\Sigma X'i\beta) = \frac{e^{\Sigma X'i\beta}}{1+e^{\Sigma X'i\beta}} \quad (3.8)$$

$$F(-\Sigma X'i\beta) = \frac{e^{\Sigma X'i\beta}}{1+e^{\Sigma X'i\beta}} = \frac{1}{1+e^{\Sigma X'i\beta}} \quad (3.9)$$

Where β refers to the vectors of parameters that reflect the impact of changes in X on the probability of having access to credit source. The choice of a particular form for the right-hand side of the equation (3.6) leads to an empirical model. Adopting the logit analysis, the probability that a household would have access to a formal credit source is given by the regression model:

$$\text{Prob (A = 1)} = \left(\frac{e^{(\beta' X)}}{1+e^{(\beta' X)}}\right) \quad (3.10)$$

Equation (3.1) is a logistic cumulative distributions function where:

$$\beta' X = \beta_0 + \Sigma\beta_i X_i + \mu_i \quad (3.11)$$

And;

e = base of natural logarithm

β_0 = the constant term

β_i= the vector of coefficients

X_i= the vectors of explanatory variables, and

u_i= the error term

The estimation of equation (3.9) using the maximum likelihood methods helps to identify statistically significant explanatory variables. In the preceding discussions, list of factors was

identified that influenced accessibility of credit for rural poor households. Some of these factors would be used in the analysis. It is hypothesized that household access to credit could depend upon the gender, age, educational status, monthly income, land ownership, value of assets, savings, remittances and pension, dependency ratio, awareness of credit institution, repayment capacity and social capital.These characteristics are important as they can influence household demand for credit and even Potential lenders are likely to base their assessment of borrowers' creditworthiness on them.

(b) Probit Regression Model

The probit model is another way of estimating the behavior of dichotomous dependent variables and it is used in this study. In the probit model, our concern is the probability of rationing credit as a function of socioeconomic variables. Its assumptions are consistent with having a categorical dependent variable assumed to be a proxy for a true underlying continues normal distribution. Probit regression is based on the assumption that the categorical dependent variable reflects cumulative normal distribution. In probit model, the normal cumulative distributive function (CDF) is applicable not its log odds as in the logit model.

The normal cumulative distribution function for X which follows normal distribution with mean μ and variance σ^2 is given as:

$$f(x) = \frac{1}{\sqrt{2\pi\sigma 2}} e^{-\frac{1}{2}(\frac{X-\square}{\sigma})} \qquad (3.12)$$

The cumulative density function (CDF) is given as:

$$F(X) = \int_{-\infty}^{X_0} \frac{1}{\sqrt{2\pi\sigma 2}} e^{-\frac{1}{2}(\frac{X-\square}{\sigma})} \qquad (3.13)$$

In the case of the probit coefficients, the coefficient is how much difference a unit change in the dependent variable makes in terms of the cumulative normal probability of the dependent variable. This means that the probit coefficient measures the effect of the independent on the Z scores of the dependent. It is not a linear function of Z, but rather its cumulative normal function.

The probit model is appropriate to address categorical dependent variables (Ruspini 2003 pp.117). While logistic regression concerns itself with the natural log of the odds, the probit model concerns itself with the inverse of the standard normal cumulative distribution function.

3.6 Measuring Access to Credit and Credit Rationing

There are two methodologies for measuring household access to credit and credit rationing or constraints. The first and indirect method detects the presence of credit constraints from violations of the assumptions of the life cycle or permanent income hypothesis, while the second involves the collection of information directly from household surveys on whether households perceive themselves to be credit rationed and credit constrained. In this study, we shall restrict ourselves to the latter which relevant to our study.

The detection of Credit Rationing by directly asking households whether households perceive themselves to be credit rationed and credit constrained is mostly used in empirical studies for detecting the presence of credit constraint uses information obtained directly from household members on their participation and experiences in the credit market to determine whether they are credit constrained or not. In practice, several qualitative questions regarding household loans applications (or lack of) and rejections during a given recall period are asked and households

based on their responses are classified as credit constrained or not. This classification is then used to analyse the determinants of the likelihood of a household being credit constrained and the effects of this likelihood on various household outcomes in reduced form regression equations. Examples of this approach known as the direct elicitation methodology (DEM) include Petrick (2004) who evaluates the impact of credit constraints on farm output in Poland; Foltz (2004) who evaluates the impact of credit constraints on farm profit in Tunisia; and Carter and Olinto (2003) who examines the impact of credit constraints on investment level in Paraguay.

This method was first used by Jappelli (1990) with data from the United States 1983 Survey of Consumer Finances. Feder *et al.* (1990) using data from a household survey in China also employed this method. It was subsequently adopted by Zeller (1994), Schrieder and Heidhues (1995), and Barham *et al.* (1996) with data from Guatemala and Zeller, *et al.* (1996) with household survey data from Madagascar, Cameroon and Pakistan. The theoretical justification for the direct elicitation method, (*i.e.* by directly asking the households if they are credit constrained or not), can be found in the extended version of the life-cycle/permanent income model that explicitly allows for the possibility of a credit constraint. For instance, Jappelli (1990), in analysing the determinants of the likelihood of a household being constrained used credit constraint inequality in the extended model to derive reduced-form equations. According to Browning and Lusardi (1996), an important contribution toward empirically identifying the respective effects of liquidity constraint and precautionary behaviour in life-cycle models is the information on household credit market experiences collected in the direct method.

3.7 Model Specification

3.7.1Model of Credit Access for small scale farmers in Nasarawa State

In order to achieve objective two of the study, the framework discussed above was adopted to formulate the model that determine factors that affect credit access in the study area. The use of this measure enables us determine the number of applicants that are completely rejected, satisfied and non-applicants.

A major analytical issue in the estimation of a farmer-borrower demand or access model of this type is the bias due to data truncation resulting from the omission of non-borrowers from the analysis. This problem is addressed in this study by including non-borrowers among the farmers surveyed and account for selection bias. According to Olomola (2018), the analysis of demand and/or access for production loans encompasses participation in the loan market and the factors that prompt farmers to decide to borrow from formal sources. Aside from the determinants of loan demand, such factors are crucial in understanding the functioning of the loan market and the extent to which farmers' effective demand for loans has been met. This implies that in addition to estimating a loan demand model, a choice model that describes whether or not a farmer decides to borrow needs to be estimated because the decision to borrow will affect participation and the amount of loan obtained in the loan market.

Let D* be a farmer's loan demand based on his own valuation of credit need and D be the market demand based on lenders' assessment of his creditworthiness. A farmer participates in the loan market if D > D*, otherwise he is not considered a participant in the loan market. In the sample there is observation on D for those who participate in the market, while there is no observation on D for the nonparticipants. For farmers not in the loan market, all that is known is that D* ≥ D. In other words, the sample is incidentally censored, and yet the need often arises to use the sample data to estimate the coefficients in a regression model explaining both D* and D. This challenge underscores the need to model the sample selection process explicitly. A probit model is employed to address the inherent selectivity bias. It is associated with datasets in which the values of the regressand are not available for some observations, although values of regressors are available for all the observations (Gujarati 1995). The dependent variable has zero values for a substantial share of the survey data but is positive for the rest of the data. The model can be specified as follows:

$$d_i^* = x_i\beta_i + \varepsilon_{1i} \qquad (3.14)$$

Where x_i is a vector of exogenous variables and d_i^* the value of the loan obtained by the i^{th} farmer. To characterize the borrowing status of the farmer in terms of whether the person borrows or not, a second equation, which is a binary choice model, is specified as follows.

$$\text{Selection model: } b_i^* = z_i\alpha_i + \varepsilon_{2i}, \qquad (3.15)$$

$$d_i = d_i^*,\ b_i = 1 \text{ if } b_i^* > 0, \text{ and} \qquad (3.16)$$

$$d_i \text{ not observed, } b_i = 0 \text{ if } b_i^* \leq 0, \qquad (3.17)$$

where b_i^* is a latent endogenous variable and z_i is a vector of exogenous variables determining whether a small farmer will borrow or not. If $bi*$ is greater than a threshold value of 0, then the observed dummy variable $b_i = 1$ and otherwise $b_i = 0$. The regression equation observes value di

(value of loan) only for b_i = 1 (that is, for the borrowers). The distribution assumption for the unobserved errors (ε_{1i}, ε_{2i}) is a bivariate normal with expectation 0, variances σ^2_1 and σ^2_2, and covariance σ_{12}. The signs and magnitude of the estimated coefficients may differ across equations (3.16) and (3.17).The model is estimated in accordance with the Heckman (1979) two-step procedure. The estimation is based on the following regression.

$$d_i = x_i\beta_i + \sigma_{12}(z_i\alpha_i) + \nu_i, \qquad (3.18)$$

where $\lambda_i = \phi(z_i\alpha_i)/\Phi(z_i\alpha_i)$ is the Heckman's lambda, otherwise known as the inverse Mills ratio, $\phi(.)$ is the standard normal density function and $\Phi(.)$ is the standard cumulative distribution function. The estimation task is to use the observed variables (d, x, b, z) to estimate the regression coefficients β that are applicable to the sample of small farmers whose values of d equal both 1 and 0. The contents of the λ_i term are estimated by a first-step maximum likelihood probit model regression of b_i on z_i. The second step is to estimate the regression model using ordinary least squares with the estimated bias term (inverse Mills ratio) as an explanatory variable. A positive coefficient on the inverse Mills ratio suggests that unobservables in the probit equation that increase the probability of participating in the loan market also increase the amount of loan obtained (Heckman 1979; Halkos 2007; Pastrapa 2011). The predictors included in the probit model are indicated as follows.

$$b_i = \alpha_o + \alpha_1X_1 + \alpha_3X_3 + \alpha_9X_9 + \alpha_7X_7 + \alpha_{18}X_{18} + \alpha_6X_6 + \alpha_5X_5 + \alpha_{15}X_{15} + \alpha_{19}X_{19} + \varepsilon_{1i} \qquad (3.19)$$

The estimating equation for credit access has the following variables:

$$d_i = \beta o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + \beta_{12}X_{12} + \beta_{13}X_{13} + \beta_{14}X_{14} + \beta_{15}X_{15} + \beta_{16}X_{16} + \beta_{17}X_{17} + \beta_{18}X_{18} + \beta_{19}X_{19} + \varepsilon_{1i}, \qquad (3.20)$$

Where the dependent variable for the logit model is of dichotomous nature indicating small rural farmers' access to credit and the Independent variables are the farmers' socio-economic characteristics, credit characteristics and government incentives that encourage lending to the sector. As there is no direct measurement of credit accessibility, the accessibility is measured by using observations on farm household borrowings such as obtained loans and did not obtain loans. This is in accordance with previous studies which adopted observable formal or informal borrowings as indicators of credit accessibility (see for example, Yehuala, 2008; Ravi, 2003; Mohamed, 2003; Vaessen, 2001). Specifically, the dependent variable (d) takes a value of 1 for farm households who have secured loans from bank and 0 for farm households who have not secured loans.

Key Variables and measurements

These variables are derived from the combination of various models and practice of bank lending behavior. The combination is justified by the need to bring together borrowing decision process of the small-scale farmers as they affect the efficiency of their operations. These variables allow us to link borrowing with the activities of the farmers leading to accessing credits in the state. The synthesis allows us to analyze the interactive behavior of borrowers and lenders in the provision of bank credits within government monetary policy thrust. The key variables are as presented below.

Dependent Variable

Farmer Credit Access: Small scale farmers which answered 'applied and got everything, or 'applied and got every of it are defined as credit extended whereas small farmers which

answered or applied but refused because cost too high, or applied but was rejected are credit denial. Credit extended is measured as 1 and credit denial is measured as 0.

The independent variables used in the logit model include the following variables:

Independent variables

X_1= Age (-): age of household head (in years);

X_2= Gender (-): gender of household head (1= male; 0 female);

X_3 = Marital Status (+): whether the farmer is married. (If the farmer is married = 1 and 0 otherwise)

X_4= Location (-): geographic location of the village where household is living (1= Southern region, western region = 2 and Northern region = 3);

X_5= Household size (+/-): number of people living in household;

X_6= Farm size (+): 1 if the farmland area is 10 Hectare or less; 0 if the area is larger than 10 Ha

X_7 = Farm Income (+/-): Household annual income in ₦'000;

X_8= Self-employment/Non-farm income (+): 1 if household head is engaged in self-run business; 0 otherwise;

X_9= Total assets (+/-): total value of household assets (in ₦'000);

X_{10}= Savings (+): household savings with a bank (1=yes; 0=otherwise);

X_{11}= Attitude (-): household attitude towards debt (1=averse; 0 otherwise);

X_{12}= Alternatives (-): access to other sources of credit (1=yes; 0=otherwise);

X_{13}= Official status (+): 1 if household head is a member development association in a village or township committee; 0 otherwise;

X_{14}= Distance: a vector of dummy variables indicating distance between the household dwelling-place and the bank office (where $X_{14}(1)$ = 1for within 10 km, 0 otherwise; $X_{14}(2)$ = 1 for between 11and 20 km, 0 otherwise; $X_{14}(3)$ = 1 for more than 20 km, 0 otherwise);

X_{15}= Education: a vector of dummy variables for educational attainment of farm household head (where $X_{15}(1)$ = 1 for no education, 0 otherwise; $X_{15}(2)$ = 1 for secondary school or less, 0 otherwise; $X_{15}(3)$ = 1 for post-secondary, 0 otherwise).

X_{16} = Farming Experience (+):The number of years a farmer has managed the farm is expected to increase his productivity and thus positively influence a lender's assessment. This variable is highly correlated with age. If younger farmers are perceived as being more innovative, the effect on the supply of credit will be negative.

X_{17} = Land Ownership (+): (Family Land, Freehold or Family land Certificate = 1, 0 otherwise)

X_{18} = Non-farm income (+ -): Monthly income is posited to affect access to credit. Higher value has positive effect while the reverse is the case. Its sign is expected to be positive and negative respectively.

The positive and negative signs in parentheses indicate the apriori relationship between the variables and farm household accessibility to credit. For example, *Age* (-) means that age of the small farm household head is negatively related to small farmer's access to credit.

Farm size and self-employment are hypothesised to positively affect farm households' access to credit. By the same token, there is a higher probability for farm households who are running self-business in addition to agricultural production to access credit owing to the higher potential need for financial support. Official status is a variable describing whether a household has family

members working as village or township officials. It is assumed that households with members working as officials have higher accessto credit for off-farm investment and thus are more inclined to access credit (Cheng, 2006).

Such official status also reflects households' social standing and connections with local organisations which could facilitate the households' access to credit. Furthermore, savings is used as a proxy for households' relationship with the Banks. Depositing money with the banks to some extent imply a higher capacity of repaying loans. It is expected that households who have savings with the Banks are more willing to apply for loans if they need to borrow. Household demographics such as age and gender of the household head are hypothesised to negatively affect households' access to credit.

Besides, older farmers may find it difficult to understand the operations and loan conditions of credit programmes, further reducing their propensity to access credit. Okurut (2006) and Mohamed (2003) have confirmed that the probability of borrowing from formal and semi-formal credit sources decreases as people become older. In addition to age, a female-headed household is assumed to be more disadvantaged in securing loans than a male-headed household. This is because rural women might have less access to information, information technology in particular, due to their limited freedom and mobility, which potentially lowers their demand for credit as an input to improve production and thus reduces the likelihood of accessing credit. Even when they have a financing need, women might be inhibited from taking loans due to the perceived low repayment capacities manifested by the weaker control over economic resources compared to men (Yehuala, 2008; Evans et al., 1999; Zeller, 1994).

Geographic location is also hypothesised to have a negative impact on farm households' accessibility to credit. Households living in rural areas would have less exposure to information and consume less due to transportation inconvenience. As a result, such households have low demand for credit and thus have lower probabilities of accessing credit. Further, it could be possible that credit programmes are not available to villages in rural areas (Sharma and Zeller, 1999).

Distance and Education dummy variables are hypothesised to influence households' accessibility to credit. For example, ceteris paribus, households living 20 km or more away from Bank branches will be less likely to access credit than those who reside within 10 km. This is because households living further away would incur a higher borrowing cost if they decide to borrow due to the high transaction costs (such as travelling expenses and time opportunity costs) involved (Ho, 2004; Vaeseen, 2000). In addition, educational attainment of the household head reflects household human capital and is hypothesised to facilitate households' access to credit. For example, assuming all else equal, farmers with formal education (for example, secondary or post-secondary education) are likely to have more exposure to the external environment including risks and possess more skills, and therefore they might require more credit for consumption and/or production, compared to uneducated farmers. In addition, educated farmers can better understand the terms and conditions of small loans and might be more ready to comply with the formalities required by credit providers such as the banks (Yehuala, 2008; Okunade, 2007; Okurut, 2006; Vaessen, 2001).

Vaessen (2001) stresses that household's attitude towards debt plays an important role in affecting household's borrowing decision. It is assumed that a household holding an adverse

attitude towards debt may refrain from accessing any type of credit including credit. Moreover, access to other sources of credit might discourage household's borrowing from credit programmes/banks because the transaction costs of acquiring a loan from an alternative source might be lower or the loan contract provided by an alternative lender is more attractive, compared to banks credit. This has been confirmed by Mohamed (2003) and, Diagne and Zeller (2001) who reveal that many poor households choose informal credit instead of formal credit because of the advantages possessed by informal credit such as flexible lending terms and rapid loan application processing.

The relationship between households' accessibility to credit and variables, such as household size, income and assets, however, is ambiguous according to the literature. The ambiguity of the effects of the three variables on households' access to credit arises from their uncertain effects on households' demand for credit. For example, a large family may have a higher desired for consumption and hence may demand more credit. However, a larger family size also implies a lower repayment capacity due to smaller future expected income per capita, which in turn decreases the demand for credit (Nguyen, 2007; Ruiz-Tagle, 2005; Ho, 2004). Similarly, household's annual income and total assets, on the one hand, have an 'income effect' and households with higher level income and/or assets may feel rich and consume more. This has a positive effect on households' demand for credit (Cheng, 2006; Ruiz-Tagle, 2005). At the same time, income and assets represent the initial capital of households and a higher level of income and/or assets indicates a less constrained budget of the households, which might potentially weaken the households' demand for credit (Umoh, 2006; Ruiz-Tagle, 2005; Zeller, 1994).

Given, that in this case some variables are binary while others are not. For example, assets, liabilities and age of the applicants are time-series data that have quantitative values. Since in this model, the dependent variable is binary while some explanatory variables are quantitative, the regression model is designed to explain the demand and supply of credit where access is qualitative while the borrower's characteristics including assets, liability, and farm profits among others are quantitative.

3.7.2 Model of Credit rationing among small scale farmers in Nasarawa State

To achieve the third objective, the model specification is derived from the conceptual and theoretical framework and the model of Aguilere (1990) and Olomolaand Gyimah-Brempong(2014). Aguilera is a four equation that allow for the interaction of loans size, collaterals, type I and II credit rationing and loan default as function of the factors that affect lending to small farmers. The model is given with the assumptions that more stringent restrictions on the lender's credit evaluation operations will lead to:

(i) Loan size decrease;

(ii) Collateral requirements increase;

(iii) Type I or loan-size rationing increase;

(iv) Type II or loan-quantity rationing increase;

(iv) The number of defaulting loans increase. Olomola is a set of equations that described credit rationing by a series of dichotomous variables defining the possible categories of rationing which are quantity, risk and price rationing.

In the econometric analysis, credit rationing is described by a series of dichotomous variables defining the possible categories of rationing. Typically, farmers' rationing status is characterized by the unobserved latent counterpart of the observed variable captured in the survey, and it can be expressed implicitly as follows.

$$y^*_i = x'_i\beta_i + \varepsilon_i \quad (3.21)$$

The observed variable is y_i, which equals 1 if $y^*_i > 0$, in which case a farmer belongs to a particular rationing category, and 0 otherwise. x_i is a vector of explanatory variables, β_i represents coefficients to be estimated in the model, and ε_i represents the error term. Three aspects of credit rationing are modeled in the analysis: quantity rationing, risk rationing, and price rationing. The equations for the three models are expressed as follows.

$$y_{1i} = \alpha_i x_i + e_i, \quad (3.22)$$

$$y_{2i} = \beta_i x_i + \mu_i, \text{ and} \quad (3.23)$$

$$y_{3i} = \gamma_i x_i + \nu_i, \quad (3.24)$$

where y_{1i} is a dichotomous variable with a value of unity for a quantity-rationed farmer iand 0 otherwise. In the same vein, y_{2i} has a value of unity for a risk-rationed farmer iand 0 otherwise, while y_{3i} has a value of unity for a price-rationed farmer iand 0 otherwise. xi represents a vector of explanatory variables; αi, βi, and γiare coefficients to be estimated; and ei, μi, and νiare random error terms. The explanatory variables included in the model are farm size, household size, farming experience, share of farm income in total income, nonfarm income, savings, educational attainment, gender, marital status, borrowing status, and location (region) of the farmers. All the explanatory variables are assumed to be exogenous or predetermined at the time of loan application.

The choice of explanatory variables is based on some considerations. For instance, the presence of credit rationing is determined both by supply and demand; thus, explanatory variables should also include observable characteristics that guide lenders' decisions. This is particularly important for factors such as collateral availability or the reputation of the borrower, which are likely to mitigate or worsen the effects of asymmetric information. Moreover, consumption choices of household members should also be considered, as they are equally likely to affect the perceived rationing status of the household. The included variables reflect these considerations and play different roles in accordance with our a priori expectations. Land (farm size) is taken as an indicator of collateralizable wealth. Experience of the farmer is measured as years of farming. Credit rationing is expected to be inversely related to farming experience. The years of schooling represent educational attainment. It is expected that the higher the educational attainment, the lower will be the probability of being credit rationed. The effect of household size is ambiguous, as it is possible that a higher number of household members may both increase (via increased consumption) and decrease (via generation of other earned income) the liquidity shortage. Marital status is an indicator of the reputation of the farmer. In the reckoning of lenders, a married farmer is held in higher esteem than one who is single. This social status, in addition to the economic benefits that may be conferred on farmers by being married, is expected to make it less likely for married farmers to be credit rationed than their unmarried counterparts.

The seemingly unrelated regression model is employed in the analysis. This approach has been used recently in similar studies (Khantachavana, Turvey and Kong 2011; Doherty, Dee, and O'Neill 2012; Korosteleva, Isachenkova, and Rodionova 2012; Nilakantan, R., S. C. Datta, P. Sinha, and S. K. Datta. 2013). Considering the general tendency of formal lenders to

discriminate against small-scale farmers in their loan operations, there is no denying that the socioeconomic characteristics of the small-scale farmers will influence their rationing status. In other words, the variables that affect quantity rationing can also affect risk rationing and price rationing, although the effects should be different. It is therefore conceivable that the model will be characterized by cross-equation correlation of error terms, hence the use of seemingly unrelated regression. Estimating each model as a separate equation will therefore lead to inefficient estimates (Greene 1997). A positive sign of the correlation coefficient is consistent with the unobserved heterogeneity in the discriminatory (rationing) tendency against the farmers. However, a negative value for the coefficient is consistent with the interpretation that factors that cause farmers to be placed in a particular rationing category may make them less likely to be placed in another category.

Arising from contemporary theoretical literature on credit rationing among small-scale farmers in the context of developing countries (Boucher, Carter, and Guirkinger 2008), our analysis is guided by two working hypotheses: (1) quantity rationing is decreasing in financial wealth and productive wealth and (2) risk rationing is decreasing in financial wealth and productive wealth. Financial wealth is represented by nonfarm income, share of farm income in total income, and savings, while productive wealth is represented mainly by farm size and other related variables such as household size, education, and farming experience.

However, data limitation problems make simultaneous estimation of the entire system impossible. As discussed in chapter one, there are no publicly available data on endogenous variables such as the probability that a loan requested by a good applicant be granted, probability

that a loan requested by a bad applicant be rejected, the probability of collecting from loan defaulters and probability that a loan request comes from bad applicant. Since the estimation of the impact of different regulatory parameters on these variables can explain the credit rationing, it is impossible to know their direct influence on credit rationing by small farmers. Nevertheless, the model is reviewed by substituting different regulatory parameters on related variables such as quantity rationing, risk rationing, and price rationing and bad-debt loans. These aspects of credit rationing and bad debt are modeled for the analysis. The equations for the four models are expressed as follows:

$$y_{1i} = \alpha_1(BORR)_i + \alpha_2(TERM)_i + \alpha_3(REG)_i + \mu_1 \quad (3.25)$$

$$y_{2i} = \beta_1(BORR)_i + \beta_2(TERM)_i + \beta_3(REG)_i + \mu_2 \quad (3.26)$$

$$y_{3i} = \gamma_1(BORR)_i + \gamma_2(TERM)_i + \gamma_3(REG)_i + \mu_3 \quad (3.27)$$

$$y_{4i} = \lambda_4(BORR)_i + \lambda_5(TERM)_i + \lambda_6(REG)_i + \mu_5 \quad (3.28)$$

i=l, 2, ..., n (borrowers).

where y_{1i} is a dichotomous variable with a value of unity for a quantity-rationed farmer iand 0 otherwise. In the same vein, y_{2i} has a value of unity for a risk-rationed farmer iand 0 otherwise, while y_{3i} has a value of unity for a price-rationed farmer iand 0 otherwise. $BORR_i$ represents the vector of the i^{th} borrower's characteristics, $TERM_i$ represents the vector of the price and non-price elements of the loan contract offered to the i^{th} borrower, REG_i is the vector of the regulatory parameters affecting the loan transaction of the borrower i, the α_i, β_i, γ_i and $\lambda_i$are coefficients to be estimated; and μ_1, μ_2, μ_3 and μ_4 are random error terms. The coefficients to be estimated, and μ_i (i = 1, 2, 3, 4) is a random disturbance assumed to follow a normal distribution with zero mean vector and constant variance. It is also assumed that disturbances are independent across observations and exogenous variables. Since the vector of explanatory

variables is the same in each equation, it is possible to proceed to estimate each equation of the system separately.

For (1) $BORR_i$, (2) $TERMS_i$ and (3) REG_i, the main data will include (1) Borrower Characteristic Variables such as age/sex, literacy, size of household, household income, type of land, acres of land under cultivation, land ownership by individual farm household, liabilities etc. (2) Lender Conditionality Variables and Loan Characteristic Variables which comprise such things as credit rationing procedures, screening/incentives technologies, repayment levels, finance type, income, turn over, loans terms and conditions among others. (3) Regulatory Variables such as source of funds, regulatory conditions, for example, interest rate, type of collaterals among others.

Variables definitions for the determination of Credit Rationing

These variables are derived from the combination of various models and practice of bank lending behavior. The combination is justified by the need to bring together borrower and lender decision process and the performance of small-scale farmers of banks as they affect the efficiency of their operations. It allows us to link credit rationing with the yield from investment holding of the small farmers leading to the availability of credits to small farmers loan repayment in the state. The synthesis of the models allows us to analyze the interactive behavior of borrowers and lenders in the provision of bank credits that can lead to the efficient performance of the small-scale farmers.

The key variables are as presented below.

Dependent Variable

Credit Rationing: Whether or not the Farmer is credit rationed. Following the definition of credit rationing for the empirical analysis, farmer in the following categories are credit rationed by formal lenders: Applied and got everything, not credit rationed; Applied and got most of it (between 75% and 100%); applied but only got a limited part of it (between 1% and 74%) and applied but was rejected are credit rationed. Credit rationed is measured as 1 and credit not rationed is measured as 0.

y_{1i} = Quantity Rationing: It represents the magnitude of loan size rationing as defined in equation 3.20.in Quantity rationed, or supply-side-constrained, farmers may have either had a loan application rejected, or a non-applicant who knew that he would be rejected. A quantity rationed farmer faces a binding credit limit; therefore, the limiting constraint comes from the supply side. A quantity rationed farmer is expected to have excess credit demand.

y_{2i} = Risk Rationing: It represents loan quantity rationing. It is a dichotomous (dummy) dependent variable that takes on the value of 1 if the Loan request has been granted and zero if the loan requests have been rejected. Risk rationed farmers do not face a binding limit and therefore does not have excess demand for credit. The limiting constraint comes from the demand side. Their demand is lower because of the risk-sharing rules associated with the loan contract. Asset wealth, financial wealth, risk aversion, prudence and property rights are all aspects of the risk rationing problem that the farmer faces.

y_{3i} = Price Rationing: It represents cost of loan incurred. It is a dichotomous dummy dependent variable that takes on the value of one if the Loan request has been granted and zero if the loan request has been rejected. Price rationed or unconstrained farmers are those who may either

borrow or not, and are satisfied with the loan amount at the current market price. It may be internal or external. External price rationing can occur if the lender raises interest rates and/or transaction costs, so that free choice along the credit demand curve results in a utility maximizing position. Internal price rationing occurs when a borrower chooses not to borrow at fair market prices and transactions costs. Price rationing in this context is determined by cost-quantity tradeoffs along the demand curve and the degree by which these tradeoffs take place is determined by individual credit demand elasticities which differ among borrowers.

y_{4i} = Bad Debt: It is a dummy variable that takes on the value of 1 if by the end of 2017 the loan obtained in 2015 was total or partially overdue at least 30 days after the due date for the final term payment or the installments of longer term loans, respectively, (Prudential Guidelines for Licensed Banks, 1990).

Independent Variables

X_1 = Gender (GENDER): (Male =1, 0 otherwise) - Male are expected to have greater access to credit and attract larger amount of credit than Female.

X_2 = Male household head (MHHead): (Male =1, 0 otherwise) - Male are expected to have greater access to credit and attract larger amount of credit than Female.

X_3 = Female household head (FHHead): (Male =1, 0 otherwise) - Male are expected to have greater access to credit and attract larger amount of credit than Female.

X_4 = Marital Status (MSTATUS):(If the farmer is married = 1 and 0 otherwise)- MSTATUS is marital status of the farmer, with a value of unity if the farmer is married and 0 otherwise.

X_5 = Education(EDU): (number of years spent in School)- The coefficient is expected to be positive. Higher levels of education imply better technical knowledge and skills, more information on markets and facilities provided by financial institutions.

X_6 = Farm Experience (FEXP): The number of years a farmer has managed the farm is expected to increase his productivity and thus positively influence a lender's assessment. This variable is highly correlated with age. If younger farmers are perceived as being more innovative, the effect on the supply of credit will be negative.

X_7 = Interest Rate (IR): The variable IR refers to interest rate.

X_8 = Savings: Household savings with a bank (1=yes; 0=otherwise);

X_9 = Land Ownership (LANDO): (Registered Land Certificate = 1, 0 otherwise)- Land ownership as oppose to rental and other form of access to land is expected to increase the long run investment incentives and the Collateral value of the land to lenders. Title land will have a positive effect on the supply of credit while freehold will have no effect.

X_{10} = Farm Income (PROFIT): Profit is operating profit from the farming enterprises.

X_{11} = Farm size (FSIZE): FSIZE is farm size in hectares of land.

X_{12} = Land Collaterals (LANDC): (Titled land = 1, 0 otherwise)- The provision of land as formal collateral greatly reduces the risk to the lender and thus is expected to increase the amount of credit offered above the amount offered when no collateral is provided. As argued earlier, possession of a legal title increases security of ownership and thereby increases investment incentives. A larger demand for investment translates into a larger demand for credit, thus possession of title is expected to affect the demand for credit positively.

X_{13} = Assets (ASSETS): Land owned Initially, Capital owned Initially, these are the measures of initial wealth estimated through the farmer's recollection of the endowments He had when He became the decision maker for the farm enterprise. These initial endowments affect positively the amount of capital and land owned at present, which in turn, affect productivity. Land owned by Father (an indicator of the initial wealth of the farmer), which may have affected the farmer's

accumulation of capital positively. Assets value is estimated in naira. It is the value in Nigerian naira of the total assets declared by the applicant at the moment of requesting for a credit. The coefficient is expected to be positive, especially if the value is high. It could serve as collateral for credit obtained.

X_{14} = Non-Farm Income (NFI in naira): Monthly income is posited to affect access to credit. Higher value has positive effect while the reverse is the case. Its sign is expected to be positive and negative respectively.

X_{15} = Formal Loan (FLOAN): The variable LSOURCE is also a dummy; it refers to the source of a formal loan, with a value of unity if the source is a bank and 0 otherwise.

X_{16} = Liability (LIAB): (estimated in naira)- It is the value in Nigerian current naira of the total liabilities declared by the loan applicant at the moment of requesting for the loan. The coefficient is expected to be negative especially if the value is high.

X_{17} = Liabilities to formal Lenders (LIABFL): This is an amount of debt owed other Banks. Outstanding debt to a bank drains a farmer's cash resources and is therefore expected to have a negative effect on the amount of credit a farmer is offered. Debt to informal lenders is not included as a factor that affects the supply of Bank credit because it is not easily observable or verifiable by formal lenders.

X_{18} = Borrower's Status (APPLICANT): (very honest or hard Working =1 risky or dishonest or had an unpaid loan =0)- It is a dummy variable that takes on the value of 1 if the applicant was considered either as very honest or hardworking customer by the bank before deciding to grant or reject the loan, and zero if the applicant was a risky customer or dishonest one, bad or had an unpaid loan. As expressed in table 4.7, repayment defaults and in litigation are considered bad

borrowers, paid with areas, rescheduled and without collaterals are considered risky while those their payments are current and paid without areas are the honest and hardworking borrowers.

X_{19} = Repayment record (REPMT): (Good repayment record = 1, 0 otherwise)- It is posited that clients who repaid their previous loans are perceived as creditworthy and are provided with more in the subsequent season or year. Past default on payments to bank loan is expected to have a negative effect on a farmer's credit-worthiness and hence the supply of bank credit offered to him. As in X_{17} above.

X_{20} = Group Collateral (GCD): (A value equal to the Number of groups belonged)- Belonging to a social network may be representative of a client social relationship and may signal his ability to fulfill obligations. Its expected sign is positive.

X_{21} = Creditworthiness (CWORTHINES): (five C's of credit evaluation, i.e., character, capacity, capital, collateral and conditions)- Character and Capacity of the Borrower are the essential ingredient of the loan quality while collateral, Capital and conditions are terms to determine credit quality. They have positive impact on the supply of credit.

X_{22} = Relationship length (RL): It is a dummy variable that takes on the numbers of years in connection with the financial institution.

X_{23} = Commercial Bank Own fund (CBF): It is a dummy variable that takes on the value of one if the loan is funded with funds provided by the Commercial Banks with the aim of making profits and zero otherwise. These funds impose normal commercial banks lending conditions that allow for the selection of the type of Borrowers.

X_{24} = Bank of Agriculture fund (BOAF): It is a dummy variable that takes on the value of one if the loan is funded with funds provided by the government with the aim of financing the

agricultural sector like Bank of Agriculture limited funds. These funds impose restrictions on the selection of the type of borrowers, but not on the type of activity to finance.

X_{25} = Terms of loan (TOL): It is a dummy variable that takes on the value of one if the loan is funded with resources provided either by the government as incentives to development the agricultural sector. For example, the Agricultural Credit Guarantee Scheme fund (A CGSF), Small and Medium Enterprises Equity Investment Scheme (SMEEIS), Agricultural Credit Support Scheme (ACSS), and Large-Scale Agricultural Credit Scheme (LASACS) among others.

X_{26} = Source of Credit (SOC): Commercial Bank fund, Bank of Agriculture fund and Government fund with Banks. It is a dummy variable that takes on the value of 1 if the loan is funded with funds provided by the Banks and 0 for Government own fund with banks. For example, the Agricultural Credit Guarantee Scheme fund (ACGSF), Small and Medium Enterprises Equity Investment Scheme (SMEEIS), Agricultural Credit Support Scheme (ACSS), and Large-Scale Agricultural Credit Scheme (CACS) among others.

X_{27} = Senatorial Region (SREGION): SREGION is a variable for geographical location with a value of 1, 2 and 3 for Southern, Western and Northern senatorial part of the state respectively.

3.7.3Behavioural Foundation andmodel on Effect of Credit Rationing forsmall Farms' Productivity

To achieve objective four, it would be possible to base an empirical productivity function on the credit rationing theory and the farm household model. The literature on credit rationing and credit constraints (see Guirkinger and Boucher, 2008; Dong, Lu, and Featherstone, 2010; Ali and Deininger, 2012; Ali, Deininger, and Duponchel, 2014 etc.) suggests that they can cause a misallocation of resources in agricultural production. This misallocation of agricultural inputs

causes credit rationed farmers to maintain lower levels of productivity than their unrationed counterparts. This lower productivity comes in line with the conventional argument in production theory. If a typical household is tied with binding liquidity constraint, it will have lower investment levels in production and also suffer misallocation of variable inputs which will result in lower level of productivity (Foltz, 2004).

In agriculture, at the beginning of the production period, farm households need to allocate their available resources between current period consumption, purchase of variable inputs for production, and investment. The household unconstrained in the capital market can separate consumption decision from farm production decisions. Households can then choose production inputs optimally for production process they face. In this scenario the levels of inputs in production and investment will not be affected by the level of credit they receive. However, in the case of credit constrained farm households, the choices they made in acquiring inputs for investment and production depends on the amount of credit they receive. They will have a productivity impact on constrained households (see Diagne and Zeller, 2001; Foltz, 2004; Guirkinger and Boucher, 2008; Ali and Deininger, 2012 and Ali, Deininger, and Duponchel, 2014). All tried to derive testable relationships between credit constraints and potential outcome variables using the framework of the standard agricultural household model that combines both consumption and production decisions of farm households developed by Singh, Squire, and Strauss (1986) under imperfect market situations.

In an ideal world of perfect and complete markets, the recursive property of the model implies that farm households' production and consumption decisions will be separable. Decisions about

input use will thus be independent from households' initial resource endowments and output per area unit will be unaffected by the level of liquidity and initial endowments of resources such as land and family labor. But these arguments no more hold in scenarios with market imperfections, in which credit market failure is the one. Production and consumption decisions of households are simultaneous, implying agricultural input use will no more be independent with the availability of capital and initial endowments. Those households who face binding credit constraints may fail to afford the maximum desired levels of input use which will in fact translate into levels of productivity below than if the other case happens, i.e. levels of productivity if the household is free of liquidity constraint. Therefore, before we directly go through our econometric model specification, it is better to build an extension of the conventional agricultural household model which is compatible with credit market imperfections as stated below.

As usual, let's start from a simple peasant economy where smallholder farm households are both producers and consumers. They make both production and consumption decisions simultaneously using the below mentioned formal utility maximization theory, which is widely covered in the neoclassical empirical literature. The following inter temporal model (which show the households' choice for period 0 and 1) is developed from a study by Briggeman, Towe, and Morehart, (2009) which based its analysis on neoclassical literature too.

$$\text{Max}U(c_0,c_1;z^h) \qquad c_0>0,c_1>0,x>0,\text{B}\geq 0 \qquad (3.29)$$

Subject to the following list of constraint equations

$$a+B-c_0-PX=0 \qquad (3.30)$$

$$f(x;z^q)+O-c_1-(1+r)B=0 \qquad (3.31)$$

and

$$\bar{B}(z^h;z^q) \geq B \quad (3.32)$$

Where

$\boldsymbol{c_0}$=consumption in period 0

$\boldsymbol{c_1}$=consumption in period 1

$\boldsymbol{a}$=liquid funds on hand

$\boldsymbol{f(x;z^q)}$=Q=production function

$\boldsymbol{\bar{B}(z^h;z^q)}$=borrowing constraint in period 0

P = price of variable input

B = borrowed funds which will be paid in period 1 including interest

$\boldsymbol{U(c_0,c_1;z^h)}$ is a twice differentiable quasi-concave utility function, noting utility is additive between the two periods 0 and 1

x represents variable inputs used in the production process

$\boldsymbol{z^q}$ represents the total of fixed and exogenous inputs used in production

O represents the aggregate of all income generating activities by the household

$\boldsymbol{z^h}$ is exogenous household characteristics

r is price of borrowed funds which ultimately depend on the demand and supply of funds

Equation 3.29 outline the consumption and production choices the household make for the ultimate objective of utility maximization. But in the normal course of welfare maximization, the house hold is constrained by the budget constraint (expressed in equations 3.30 and 3.31) and the credit constraint indicated by equation 3.32. The last constraint states the credit market conditions the household will involve in, in case of limited liquidity in hand. Therefore, before constructing the farm households' productivity equations it is procedural first to find the optimal

conditions in line with the argument's equations 3.29 -3.32 hold when the household is credit unconstrained using the following Lagragian equation.

$$\boldsymbol{L}=\boldsymbol{U}(\boldsymbol{c_0},\boldsymbol{c_1};\boldsymbol{z^h})+\boldsymbol{\lambda}(\boldsymbol{a}+\boldsymbol{B}-\boldsymbol{c_0}-\boldsymbol{PX})+\boldsymbol{\mu}(\boldsymbol{f}(\boldsymbol{x};\boldsymbol{z^q})+\boldsymbol{o}$$

$$-\boldsymbol{c_1}-(\mathbf{1}+\boldsymbol{r})\boldsymbol{B})+\boldsymbol{\pi}(\bar{\boldsymbol{B}}(\boldsymbol{z^h};\boldsymbol{z^q})-\boldsymbol{B}) \qquad (3.33)$$

After executing the model by following the conventional maximization procedures first assuming the household is unconstrained in the credit market, we will get the following optimal condition for production.

$$\boldsymbol{\partial}(\boldsymbol{f}(.)/\boldsymbol{\partial x}=\boldsymbol{p}(\mathbf{1}+\boldsymbol{r}) \qquad (3.34)$$

Since variable inputs are purchased initially and farm revenue is obtained latter, p needs to be inflated by r in our ideal model. Then we can evaluate the amount of the optimal input from equation 6, and let we denote it by $x^{unrations}$.

Finally, when we evaluate equations 3.29-3.31 when the household is tied with credit constraint, the optimal production condition will be different, i.e

$$\boldsymbol{\partial f}(.)/\boldsymbol{\partial x}=\boldsymbol{p}((\mathbf{1}+\boldsymbol{r})+\boldsymbol{\pi\mu}) \qquad (3.35)$$

Respectively, π and μ represents the Lagragian multipliers for the borrowing constraint in period 0 and the budget constraint in period 1. And the model assumes that the two multipliers are strictly positive.

By following similar procedure, we can evaluate optimal production inputs from equation 3.35 and let we call it $x^{rations}$.

Theoretically, when a household is credit constrained it will purchase less productive inputs, i.e. $x^{rations} < x^{unrations}$. Therefore, the credit constrained household will produce lesser output than the unconstrained one, other things remain constant. Finally, we can develop an estimable model as follows with all due respect to our conceptual and behavioral sketches so far.

(a) The Model of the effect of credit rationing of productivity in Nasarawa state

In estimating the effect of credit rationing on productivity, Feder, Lau, Lin, and Luo. (1990), outlined two issues that may arise in the estimation and we consider them important in this study. The first is heterogeneity between the two groups of sample smallholders, that is, rationed and unrationed. These two groups of households are not homogenous with respect to their credit demand and access. Some non-borrowers do not borrow, because they have enough liquidity so they do not need any sort of credit, while others do not borrow because they cannot borrow due to credit conditions that affect them from accessing the credit they need. The effect of endowments on agricultural productivity may not be independent of credit status. For the credit rationing borrowers, factors of production may have different effects on agricultural productivity than the case of borrowers who are not rationed. Therefore, the main significance of regression for this study is that it allowed us to control both selection and unobserved issues that may arise in the basic estimation procedure. Because the main weakness of the other straight forward methods that treat credit ration dummy as an explanatory variable is due to their failure to take into account the problems of both selection and heterogeneity.

In this study, a household is credit rationed if the household requested more loans than were supplied, or if it required loans but was unable to borrow due to various reasons. So after separating credit rationed households from others, we then empirically explored the relationships between productivity and endowments of land and liquidity, including various demographic and socio-economic factors for the rationed and un-rationed households exclusively (see similar studies by Guirkinger, and Boucher, 2008; Dong et.al, 2010; Ali and Deininger, 2012 and Ali, Deininger, and Duponchel, 2014).

Consider the following model as presented by Maddala (1983), which describes the behavior of an agent (in our case the farm household) with two regression equations defining two regimes, and a function that determines which regime the agent faces.

Let the latent variable I*i (representing excess demand for credit) be expressed as

$$I^*_i = \gamma Z_i + U_i \qquad (3.36)$$

The value of the latent variable is unobservable. It has been identified based on the succeeding two separate equations defining a dichotomous outcome for the latent variable.

$$I_i = 0_i f \gamma Z_i + U_i \leq 0 \qquad (3.37)$$

Equation 3.37 is defined for those groups of households that are credit unrationed. Because their excess demand equation valued either zero or negative (implying excess supply which means the household doesn't experience a binding credit constraint)

$$I_i = 1_i f \gamma Z_i + U_i > 0 \qquad (3.38)$$

The above equation 3.38 applies for those groups of individuals whose excess demand function for credit assumed a positive value. This means smallholders under this group face a binding

credit rationing. Following the above arguments from equation 3.37 and, a continues productivity equation for both rationed and unrationed regimes can be explicitly represented as

Regime 1: $Y_{1i} = \beta_1 X_{1i} + \in 1 \text{ii} f_{Ii} = 0$ (3.39)

Regime 2: $Y_{2i} = \beta_2 X_{2i} + \in 2 i i f_{Ii} = 1$ (3.40)

In the above model Y_{ji} represents the dependent variable, i.e. agricultural productivity proxied by crop productivity (value of selected crop yield per hectare of land). Equations 3.39 and 3.40presents the production equation for credit unrationed and rationed households respectively. These equations are formed based on the screening procedure under the selection equation. While X_{1i} and X_{2i} are vectors of the exogenous variables. β_1, β_2 and γ are vectors of population parameters that are estimated. Our model relies on the assumption that the error terms are white noise with normal distribution, with mean vector zero and zero covariance represented by the following matrix sketch.

$$\begin{bmatrix} \delta_u^2 & \delta_{u1} & \delta_{u2} \\ \delta_{1u} & \delta_1^2 & - \\ \delta_{2u} & - & \delta_2^2 \end{bmatrix}$$

On the above covariance matrix, δ_u^2 represents the variance of the error term in the selection equation 3.29. on the hand, δ_1^2 and δ_2^2 are variances of error terms in the continuous equations 3.30 and 3.31 respectively. μ_i and $\in_{1i}$ has a covariance of δ_{1u} and u_i and $\in_{2i}$ has a covariance of δ_{2u}. The model assumes that Y_{1i} and Y_{2i} cannot be observed simultaneously, implying their corresponding error terms don't have a defined covariance. The model further assumes that $\delta_u^2 = 1$, that is, γ is estimable only up to a scalar factor.

Based on our argument on the distribution of disturbance terms, the logarithmic likelihood function can be formulated following the procedure by Zurab and Sajaia (2004) who follow the procedure by Madalla (1983).

$$InL = \sum_{i=1}\{Iiwi[In(F(\eta_{1i}) + In(f(\frac{\epsilon 1i}{\delta 1})/\delta 1)]+(1=I_i)w_i[In(1-F(\eta_{2i}))+In(\frac{\epsilon 2i}{\delta 2})/\delta_2]\} \quad (3.41)$$

Where F(..) represents a cumulative normal distribution function

F(..) denotes a normal density distribution function

W_i is an optional weight for observation i

η_{jj} is defined as $\eta_{jj} = \frac{\gamma Zi+\frac{\rho j \epsilon ji}{\delta_i}}{\sqrt{1-\rho_j^2}}$ where j = 1,2

ρ_1 is the correlation coefficient betweenϵ_{1i} and μ_i which is defined as $\rho_1 = (\frac{\delta_{iu}^2}{\delta_u \delta_1})$

ρ_2 is the correlation between ϵ_{2i} and u_i which is defined as $\rho_2 = \delta_{2u}^2 / \delta_u \delta_2$

The estimates of parameters in the endogenous regression can be obtained by using the Full information maximum likelihood estimation. The robust and meaningful standard errors and correlation coefficients are obtained simultaneously in the FIML estimation procedure (Madalla, 1983, Lokshin and Sajaia, 2004).

After estimating the models' parameters by using the standard procedure, the following conditional expectations are consideredin our due procedure.

$$E(Y_{1i} / I_i=0,X_{1i})=X_{1i}\beta_1+ \delta_1\rho_1 f(\gamma Z_i)/F(\gamma Z_i) \quad (3.42)$$

$$E(Y_{1i} / I_i=1,X_{1i})=X_{1i}\beta_2- \delta_1\rho_1 f(\gamma Z_i)/(1-F(\gamma Z_i)) \quad (3.43)$$

$$E(Y_{2i} / I_i=0,X_{1i})=X_{2i}\beta_1+\delta_2\rho_2 f(\gamma Z_i)/F(\gamma Z_i) \quad (3.44)$$

$$E(Y_{2i} / I_i=1,X_{2i})=X_{2i}\beta_2- \delta_2\rho_2 f(\gamma Z_i)/(1-F(\gamma Z_i)) \quad (3.45)$$

Given the aforementioned conditional expectations, the average impact of credit constraints on agricultural productivity can be computed as the difference between the expected value of crop productivity by the unconstrained smallholders and that of constrained households.

$$\Delta Y_i = E(Y_{1i} / I_i=0, X_{1i}) - E(Y_{2i} / I_i=1, X_{2i}) \quad (3.46)$$

Previous studies on the impact of credit rationing on agricultural productivity used a similar approach by using an equivalent mathematicalequation.

Finally, a quantitative estimate of the impact of credit rationing on agricultural productivity is estimated which indicates by how much the smallholders will be better off if all types of credit rationings are eliminated. In doing so, we used an estimation strategy first developed by Guirkinger and Boucher (2008) and later used by Dong et.al (2010) in china, Ali et.al (2012) in Ethiopia and Ali et.al (2014) in Rwanda. The effect is quantified by using the following mathematical equation.

$$\Delta Y_i = X_i(B^U - B^C) \quad (3.47)$$

Where ΔY_i represents the percentage change in agricultural yield for rationed households, i.e. an increase in the productivity of credit rationed farmers after relaxing all types of credit rationings; X_i are vector of explanatory variables whereas $BUandBC$ are slope coefficients of the unrationed and rationed groups of households respectively. After fitting the values of each of the respected beta coefficients in the model and executing the process, finally we observed a productivity gap.

Variables selection mechanism for small farmers' productivity

Ingeneral, a statistical model yields valid inferences only if the units, in this case farmers are sampled at random. Selection bias may arise when the selection mechanism depends on

unobservable variables correlating with the error term of the statistical model of interest. In our case, a farmer who operates at low productivity may have higher demand for credit as compared to more productive farmers. This may create selection bias in the estimators. A classic way to avoid the selection bias is to add an equation which explicitly models the selection mechanism (Heckman, 1979).

The sample selection model for farm productivity using panel data can be written as a system of equations for the substantive equation (productivity) and the selection equation (credit constraint). By treating the responses as repeated measurements nested within individuals, the sample selection model fits neatly into the multilevel framework (Skrondal and Rabe-Heskcth, 2004). Although there exist several other parametric (Wooldridge, 1995) and semi-parametric (Kyriazidou, 1997) techniques to deal with residual selection using panel data, we prefer to use multilevel analysis because it allows us to use the entire set of data without using a sample of farmers for which the constraint regime does not change across periods, as others techniques do. Let us label with $y_{it}$the output production for farmer i where (i = 1, ... N) at time t (t = 1, …, T). The binary variable CC^*_{2it}simply indicates the presence or absence of all three categories of credit constraints (quantity, Price and risk rationing). The non-separability should be tested for those farmers whose choices are constrained by credit market imperfections either because of collateral, price, or risk. The farm productivity can be observed only if a credit constraint (CC^*_{2it} = 1) is met. The joint model is thus defined by the following equations:

$$y_{1it} = \beta x_{it} + \varepsilon_{1it} \quad (3.47)$$

$$CC^*_{2it} = \gamma z_{it} + \varepsilon_{2it} \quad (3.48)$$

Where $x_{it}$and z_{it}, represent the vectors of explanatory variables affecting output production and credit constraint status, respectively. The coefficients γ and β are the parameters to be estimated.

To take into account the panel data structure and induce the dependence between both residuals, the residual in equations (3.28) and (3.29) are discomposed as $\varepsilon_{1it} = \xi_{1i} + \lambda\delta_{it} + \mu_{1it}$ and $\varepsilon_{2it}= \xi_{2i} + \delta_{it} + \mu_{2it}$. The three terms capture the unobservable heterogeneity: ξ_{1i} and ξ_{2i} are the random intercepts for each individual, normally distributed with zero mean and constant variance, and zero covariance. $\delta_{it}$is a shared random effect to induce dependence between substantive and selection equation by the factor λ, normally distributed with zero mean and constant variance. μ_{1it} and μ_{2it} represent random error specific for output production and credit constraint status, respectively, and are assumed to be normally distributed and independent of $x_{it}$and $z_{it}$with zero mean and constant variance. Therefore, equations (3.28) and (3.29) can now be rewritten as:

$$y_{1it} = \beta x_{it} + \xi_{it} + \lambda\delta_{it} + \mu_{1it} \quad (3.49)$$

$$CC^*_{2it} = \gamma z_{it} + \xi_{2i} + \delta_{it} + \mu_{2it} \quad (3.50)$$

In the system of equations (3.30) and (3.31) there are six variance-covariance parameters. However, there are only four quantities to estimate. The residual variance of y_{1it}; the variance of ξ_{1i} and ξ_{2i}, identified through the intraclass correlation in the substantive and selection model respectively can correlate between the total residual of the two equations

Therefore, it is necessary to impose two restrictions. One restriction comes directly from the binary nature of the selection equation, so the constant variance is implicitly fixed to a valuedetermined in the model estimated in the selection equation. We use the probit model for the selection model, hence the constant variance should be unity. The second restriction needed

for identification must be stated explicitly: here we fixed the factor variance to one, (see Skrondal and Rabe-Hesketh 2004).

The estimation of the correlationis relevant in the model because it gives statistical evidence of the sample selection bias in the model.The estimation of this model is by maximum likelihood, with the likelihood function evaluated by the adaptive quadrature numerical technique shown by Rabe-Heskethat al. (2005). This technique is shown to be superior to standard quadrature methods, particularly where the number of cross-sectional observations is large and/or the intra-class correlation is high. Maximization of the likelihood function over the set of parameters is achieved by the Newton-Ramhson algorithm. The productivity function is estimated to include random effects for households-level heterogeneity (Rabe-Hesketh 2004).

Description of Variables used in the study

Below are the explanatory variables that are used in explaining the dependent variables in both the selection (Probability of being credit rationed) and production (crop productivity) equations are listed with their expected sign in each of the equations. These listed explanatory variables are recruited based on their theoretical relationship with each of the dependent variables and learned implications from similar works that have been done so far.

Explanatory Variables	**Expected sign in Productivity and land**	**Expected sign in selection equation**
Liquidity in ₦1000s	+	+
Value of fertilizer per hectare	+	+
Farm size	-	-
Male headed household	+	-
Age of household head	+	-
Household size	+	+ -
No Education dummy	+	-
Primary education dummy	+	-
Secondary education dummy	+	-

Post-Secondary education dummy	+	-
Households in the northern region dummy	-	+
Households in the central region dummy	-	+
Households in the western region dummy	-	+
Risk averse household dummy	-	+
Number of oxen in household	+	Not applicable
Hired labour dummy	+	+
Farm ownership dummy	Not applicable	-
Livestock ownership	Not applicable	-
Assets	+	-
Bank account dummy	Not applicable	-
Net saver dummy	Not applicable	-

Note: *The "Not applicable" command indicates that the variable is not included in that equation*

3.7.4 Model of the Effect of credit rationing on investment of small farmers in the State

To achieve objective five, it would be possible to base an empirical investment function on the flexible accelerator. The optimal capital stock is a function of the arguments of land improvement M(.) including optimal equity E, which in turn is determined by the household's preferences (Kuiper and Thijssen 1996, p. 458). A broadly similar approach has been used in the adjustment costs literature, although devoid of equity E, for example by Lopez (1985). However, estimation of the capital adjustment coefficient B is not the primary goal of the present study. In contrast, in the empirical analysis, we focus on the basic implication of the financial constraints that make investment depends on available collateral and credit access. We, therefore attempt to extract the essence of the model reduced-form investment equation. This can be written as follows:

$$I = I(E, E, Z, p) \qquad (3.51)$$

In this equation, the capital stock, the output price, and the existing volume of equity E are taken as given at the beginning of the planning period. The change in E, denoted by change in credit E,

is the result of the optimal plan of the farmer in the current period. Z as borrower's and production characteristics and p as price of inputs and outputs.

Unfortunately, the empirical implementation of (3.51) faces a number of problems related to change in E. First, change in E is difficult to measure if interpreted as a general improvement in collateral availability or even more broadly in credit-worthiness. Second, change in E is not exogenous because it is ultimately determined by the consumption preferences of the household. Furthermore, as argued by Witzke (1993, p. 266), dynamic or long-term adjustment decisions of the household via change in E may generally be regarded as unimportant if the equilibrium of the system is distorted in each period by newly incoming information (for example with regard to the access to credit function) and a subsequent revision of the optimal plan. Accordingly, borrowers know the marginal cost of borrowing dependent on their E and thus the amount of credit they obtain, assuming that it should exclude any perceived excess credit demand.

For these reasons, we replaced change in E by the change in net borrowing, K. The observed level of net borrowing K might be regarded as the ultimate outcome of household preferences, its credit worthiness, plus all types of short-term distortions. The inclusion of change in net borrowing K has three further advantages: first, change in net borrowing K is easily observed. Second, change in net borrowing K can be assumed to be exogenous for rationed borrowers who said that they wanted to borrow more. Third, it opens the opportunity to directly investigate the relationship between new borrowing and investment. The latter is of particular interest for this study due to its policy implications. Since the government actively supports credit expansion in the farm sector, the marginal effect of credit on investment is valuable information. If the change

in net borrowing K is included into the investment equation, E can be dropped, since its only effect on Investment is through it.

We used two dummies indicating the year of investment, and thus capturing any effects of changed in the overall price relations and other year specific effects similar to Calomiris et al. (1986, p. 458). Year effects is included because, although the data-set is cross-sectional in nature, it comprises pooled investment data for a period of three years. The estimating investment equation is therefore:

$$I_i = I_i(K_i, Z_i, \zeta_i) + \varepsilon_i \qquad \text{iff} \boldsymbol{\gamma}\mathbf{z}_i + u_i > 0 \qquad (3.52)$$

The determination of the change in net credit K is analysed by the Probit equation, which contains variables of collateral availability and creditworthiness as well as demographic characteristics of the household. We briefly restate the expected signs of the parameters to be estimated in (3.52). The relation between change in net borrowing and investment should be unambiguously positive. The effect of Z on investment $I_i$depends on the size of the desired capital stock or farm size. A negative sign implies that farm sizes converge over time, whereas a positive sign implies diverging farm sizes. A dummy indicating whether the farm has permanent bookkeeping is taken as a measure of management skills of the farmer. It is likely that more skilled farmers invest more. A second dummy has the value of one if the farm is located in the northern, Southern and Western regions. The effect on investment is likely to be positive.

As noted earlier, the potential effect of new borrowing on investment is of key interest due to its policy relevance. A marginal effect of credit on investment equal to or larger than 1 implies that additional funds are completely used for productive investment. This describes a situation where subsidised credit is fully used for investment and even triggers the additional mobilisation of

other financial sources, which is clearly desirable from the point of view of the government. On the other hand, a marginal effect smaller than one implies that the marginal unit of credit is only partly used for the supposed investment purpose. However, the marginal effect is unlikely to be constant over the entire range of observations, as would be imposed by a linear model. It is of interest whether there are any size effects of credit use, or whether more credit implies a higher marginal investment effect. Due to the complex interactions between creditworthiness and investment via the access to credit function, substantial nonlinearities can be expected to be present. The change in the marginal credit effect can be investigated by evaluating the second derivative of the investment function with regard to credit. Therefore, the latter effect should not unduly be constrained by the choice of functional form.

CHAPTER FOUR

ANALYSIS AND RESULTS OF THE STUDY

4.1 Introduction

This chapter discusses the findings of the credit accessibility, credit rationing and the effect of credit rationing on productivity and investment of small farmers in Nasarawa State. The chapter is structured into five sections. The next is section 4.2which presents the characteristics and credit profileof small farmers in Nasarawa state and discusses the estimated results of the factors that determine small scale farmers' access to credit in the state. Household-level factors that influence households' accessibility to credit are identified and analysed. Section 4.3present the characteristics and factors that determine credit rationing among small-scale farmers in Nasarawa state. Section 4.4 discusses the effectof credit rationing on productivityof small-scale

farmers in the state. 4.5analysed the effect of credit rationing on farm investment bysmall-scale farmers in Nasarawa state and 4.6 Discussion of the findings.

4.2 Characteristicsand credit profile of Small farmers' credit accessibility in Nasarawa State

To address the first objective, the analysis of borrowers' participation in the loan market begins with a description of some of the social (gender, location, education), demographic (age, marital status, household size), and economic (occupation, household income, farm size) characteristics of the small-scale farmers covered in the study, substantiating the differences between borrowers and non-borrowers with regard to some key variables.

About 78.3 percent of the farmers are males and 21.7 percent are females. The borrowing status of the farmers reflects this gender disparity. While 80.5 percent of the borrowers are males, only 19.5 percent are females. The proportion of married farmers (91 percent) is much higher than that of their unmarried counterparts (9 percent); thus, the proportion of married borrowers is much higher than that of unmarried borrowers, just as the proportion of married non-borrowers is higher than that of unmarried non-borrowers.

Table 4.1summarises the primary farm household variables used in this research for the whole sample according to the status of respondents' access to credit. The farm households' access to credit is strongly associated with Gender, Education, Self-employment, Farm size, Geographic location, Distance to formal credit institutions, Savings, Aversion to debt, and Alternative credit source.

Out of the sampled farm household heads, 81% are credit borrowers that accessed credits. In terms of gender, the sample comprises 61% male household heads and 38.96% female household heads. Approximately 83% of the sampled male household heads are borrowers of credit and 20% of the sampled female household heads are engaged in the same source. However, the borrowers group mainly consists of males (see Table 4.1).

The age of the respondents ranges from 24 to 72 years old and the overall mean age for the sample is around 41 years old. When grouped into different age categories, a substantial proportion 76.3% of the borrower respondents fall into the 36-55 years old category while majority 73.9% of the non-borrower respondents belong to 24-45 years old category. The average age of the borrower and non-borrower respondents is very similar.

The survey respondents are divided into three groups with respect to educational attainment, including those without education, those with secondary school education or less, and those with post-secondary education. It can be seen from Table 4.1 that the vast majority of the respondents have obtained some education and only 3.8% of the respondents reported have no education. The proportion of those without education for the borrowers is only 1.8%, much lower than that for the non-borrowers 10.4%.

Approximately 92.4% of the borrowers and 80.2% of the non-borrowers have acquired secondary education or less. However, the proportion of non-borrowers with post-secondary education is higher than that of borrowers 9.4% versus 5.8%. It is an indication that among the

sample of small-scale farmers included in the study, those without any formal education cannot be said to have been marginalized on account of their educational attainment, as far as access to loans is concerned.

Approximately 29.3% of the surveyed households have three or fewer family members and only 2.1% have seven or more members in their families. In addition, more than 70% of the borrowing households as well as non-borrowing households reported to have four or more family members and the survey results do not show much variation in the average household size between the two groups of households (see Table 4.1).

Another important characteristic of the farmers is their engagement in economic activities other than farming. Some are petty traders, artisans, civil servants, or workers in the private sector. The highest proportions 54% are petty traders, followed by 20% civil servants, 19% artisans, and 7%private-sector workers. The data reveal that petty trading is the dominant secondary occupational group, which also comprises the highest proportion of borrowers (52 percent) and non-borrowers (48 percent). Among the borrowers, petty traders are followed by civil servants (21 percent), artisans (19 percent), and private-sector workers (8 percent). The same pattern occurs among the non-borrowers, with slight changes in the proportions of civil servants (18 percent), artisans (26 percent), and private-sector workers (8 percent). Within each occupational group the proportion of borrowers is much higher than that of non-borrowers, and there seems not to be much variation across the groups. The highest proportion (78 percent) of borrowers is within the group of artisans, while the lowest is in the group of petty traders (73 percent). This

shows that even though petty trading is the dominant secondary occupation, the returns may not be as high as what the farmers can derive from the other activities.

Our survey results reveal that only a small proportion (24.3%) of the respondents is engaged in self-employment. The results also suggest that the borrower respondents are more likely to take up self-run business compared to the non-borrower respondents (26.5% versus 18.7%).

Table 4.1 Demographic and Socio-Economic Profile of the respondents (Borrowers and Non-Borrowers)

Profile	Non-Borrower		Borrower		All respondents		Statistical test
	N_1	% to n_1	N_2	% to n_2	N3	% to n_3	
Demographics							
Gender							
Male	79	70.8	386	80.5	465	78.3	$\chi2 = 4.07$
Female	33	29.2	94	19.5	127	21.7	
Total		100		100		100	
Marital Status							
Married	88	79	451	94	539	91	
Unmarried	24	21	29	6	53	9	
Total		100		100		100	
Education level							
No education	12	10.4	8	1.8	20	3.8	
Secondary education or less	89	80.2	444	92.4	533	89.6	
Post-secondary education	11	9.4	28	5.8	39	6.6	$\chi2= 17.2$***
Age (in Years)							
24-35	37	33.3	105	21.9	142	24.0	
36-45	45	40.6	251	52.2	296	50.0	
46-55	19	16.7	116	24.1	135	22.8	
56-65	7	6.3	8	1.8	15	2.5	
66-72	4	3.1	0	0	4	0.7	
Total		100		100		100	
Mean	41.02		41.28		41.22		$\chi2 = 0.22$
Household Size							
1-3	31	28.1	142	29.6	173	29.2	
4-6	76	67.7	331	68.9	407	68.8	
7-10	5	4.2	7	1.5	12	2.0	
Total		100		100		100	$\chi2 = 0.12$
Mean	4.18		4.16		4.17		
Other Economic Activities							
Petty Traders	54	48	250	52	304	52	
Civil Servants	20	18	101	21	121	20	
Artisans	29	26	91	19	120	20	

Private Sector Worker	9	8	38	8	47	8	
Total	112	100	480	100	592	100	
Self-Employment							
Yes	21	18.6	127	26.5	148	24.3	
No	91	81.4	353	73.5	444	75.7	
Total		100		100		100	$\chi 2 = 3.92^{**}$
Income (in Naira)							
<50,000	89	79.1	382	79.5	471	79.6	
50,001-100,000	22	19.9	82	17.2	104	17.6	
>100,000	1	1.0	16	3.3	17	2.8	
Total		100		100		100	$\chi 2 = -1.19$
Mean	31.862		52.619		47.920		
Main Income Sources							
Agriculture	90	80.2	360	75.0	450	76.0	
Non- Agriculture	6	5.2	13	2.7	19	3.2	
Both	16	14.6	107	22.3	123	20.8	
Total		100		100		100	$\chi 2 = 3.76$
Assets (in Naira)							
50,000 or less	59	53.1	353	73.2	412	69.6	
50,001 -100,000	30	26.4	114	23.8	119	20.1	
More than 100,000	23	20.5	13	3.0	61	10.3	
Total	112	100	480	100	592	100	
Mean	13,667		12,278	100	12,592		$\chi 2 = 2.47^{**}$
Farm Size (in Ha)							
5.0 or less	97	86.5	341	71.0	438	74.0	
More than 5	15	13.5	139	29.0	154	26.0	
Total	112	100	480	100	592	100	$\chi 2 = 9.30^{***}$
Land Tenure Status							
Registered private lands	6	5.5	24	5	49	8	
Tenants Unregistered	7	6	77	16	65	11	
Unregistered Family Land	99	88.5	379	79	478	81	
Total		100		100		100	$\chi 2 = 2.23$
Agric. activities Financed							
Cassava		63.6		51.3		49.4	
Cereals		21.7		12.2		21.6	
Yams		14.7		36.5		29.0	
Total							
Availability of Collaterals							
Land	1	1	5	1	12	2	
Vehicles	00	0	5	1	6	1	
Crops Lien Pledges	3	3	24	5	30	5	
No Collaterals	58	96	446	92	544	92	
Total		100		100		100	$\chi 2 = 2.32$
Other Characteristics							
Geographic Location							
Northern	62	55.4	164	34.2	226	38.2	
Southern	34	30.4	164	34.2	198	33.4	$\chi 2 = 6.35^{**}$
Western	16	14.2	152	31.6	168	28.4	
Total		100		100		100	
Distance from Bank (in Km)							

1-10			300	62.5	359	60.6	
11-20			158	32.9	193	32.6	
20 and above			22	4.6	40	6.8	
Total				100		100	$\chi 2$ = 13.97***
Savings							
Yes			204	42.4	273	46.1	
No			276	57.6	319	53.9	
Total				100		100	$\chi 2$ = 10.86**
Bank of Agriculture							
Yes			92	19.2	128	21.7	
No			388	80.8	464	78.3	
Total				100		100	$\chi 2$ = 5.29**
Commercial Banks							
Yes			207	43.1	223	37.7	
No			273	56.9	369	62.3	
Total				100		100	$\chi 2$ = 0.14
Official Status							
Yes			417	86.9	433	73.1	
No			63	13.1	159	26.9	
Total			480	100	592	100	$\chi 2$ = 0.14
Credit Sources							
ACGS			346	72.1	390	65.9	
CACS			48	10.0	90	15.2	
ACSS			86	17.9	112	18.9	
Total				100		100	$\chi 2$ = 38.56*
Aversion to Debt							
Yes	63	56.3	116	24.1	179	30.2	
No	49	43.7	364	75.9	413	69.8	
Total		100		100		100	

Source: Computed from field survey, 2018
****, **, and ***, represent the 10%, 5%, and 1% significance level, respectively.***

The small farm household annual income is divided into three levels in the sample. The annual income for most of the borrowing farmers as well as the non-borrowing farmers is no higher than ₦50,000 with 79.6% and 79.1% of group respondents respectively having income of ₦50,000 or less. The mean annual income for the borrowing farm households is ₦20,752 higher than that of the non-borrowing farm households, but this difference is not statistically significant. A total of 450 respondents (76.0%) rely on agriculture (crop farming, livestock raising, fishery, etc.) as their major source of income while only 19 of the respondents (3.2%) are engaged in non-agricultural income-generating activities.

Approximately 22.3% of the borrowing farm households earn income from both agricultural and non-agricultural activities, whereas 14.6% of the non-borrowing farm households source their income from non-agricultural activities in addition to agriculture production.

The small farmers' asset value of the respondents varies from ₦50,000 to ₦100,000 and the overall mean asset value is ₦62,592. Our result shows that the borrowing farm households tend to possess relatively low value assets since the majority (73.2%) of them own assets valued at less than ₦50,000. In contrast, almost half of the non-borrowing households possess assets worth more than ₦100,000. The mean household asset value of the non-borrowers is higher than that of the borrowers' ₦63,667 versus ₦62,278.

Almost all the respondents operate on family farmland. The overwhelming majority (91.7%) of the respondents have not registered their farmland while 8.3% farms are registered. In terms of farm size, up to three quarters of the respondents work on farms less than 5 Ha. In addition, the proportion of borrowing farm households who work on large farms (more than 5 Ha) is 29%, which is more than two times higher than that of the non-borrowing households (13.5%). This implies that farm households with larger farm sizes are more likely to become Bank's credit borrowers.

The potential of farmers to provide collateral for formal loans is examined vis-à-vis their borrowing status. Four categories of farmers are identified based on what they can offer as collateral. Farmers who have pledge crops lien as collateral represent the highest proportion (52

percent), followed by those who have nothing to offer (28 percent), those who agree to offer their vehicles (14), and those who have land to offer (6 percent).

The data show that there is a tendency for collateral status and borrowing status to be positively related. For instance, the highest proportion (52 percent) of non-borrowers is found among farmers who have no collateral to offer. Moreover, the highest proportion (55 percent) of borrowers is found among farmers who can offer crops as collateral. However, the proportion of borrowers without collateral is lower than the proportion of non-borrowers without collateral. A consideration of the borrowing status within each group of farmers with different types of collateral reveals that the highest proportion (94 percent) of borrowers is found among those with crops, followed by those with nothing (87 percent), and those with lands (8 percent). The highest proportion of non-borrowers is in the no-collateral group (52 percent) and the lowest in the land group (1 percent).

Land tenure status in the sample was also classified into three main categories. First are private land owners with well-established property rights. Second are tenants, usually rural producers renting or share cropping in someone else's lands. Third are borrowers whose land has been provided by third parties (usually an extended family member) free of charge.

The agrarian family land beneficiaries without provisional titles accounted for 79.3 percent of the total access to loans during the period. Private Land owners and borrowers that rent lands accounted for 5 and 16 percent of the total loans during the period respectively.The agricultural activities financed by the loans can be classified into three principal categories. First, Cassava. Second, cereal crops such as rice, maize and sorghum and Third, yams.

A close look at the number of borrowers by type of investment indicates that even though the banks financed a variety of agricultural activities, its loans tended to be fairly concentrated in food crops (mainly cassava, yams, sorghum and rice) and livestock activities. Loans to these two purposes accounted for 90 percent of the total number borrowers. This high concentration of loans in these activities reflects the production of the produce such as rice, cassava for household consumption. The lack of diversification suggests, however, that the banks are very much exposed to the performance of few sectors.

Loan applicants were classified prior to accept or reject of the application in six main categories. Applicants classified as excellent, very good, or good, did not have any delinquent loan at the moment of applying for a new loan. Excellent applicants have always paid without arrears, while the very good and good customers could have had some arrears before. Fair customers are clients that normally pay their loans with arrears. New are recent bank customers. Finally, loan debtor refers to applicants that had a delinquent loan at the moment of applying for a new loan. A high proportion are new loan applicants (338). 57 percent of the total number of applicants that accessed credits were new applicants. This reflects the high-risk exposure faced by the banks. These new applicants are those from the agricultural programmes' funds. As explained above, in this case the lender's credit evaluation operations are absolutely limited by the Government and the Credit programs. The Bank of Agriculture and Commercial Banks must accept these new applicants as a condition for receiving these funds. Only 30 percent of the bank's customers are classified as good or better applicants, that is, excellent accounted for 9%,

very good, 7% and good accounted for 14%. Fair, loan debtors and no rating borrowers accounted for 7 percent, 4 percent and 2% respectively with new as explained above.

The loan repayment performance index used here measures the ratio between the unpaid amount of past due loans and the total value of outstanding loans. This is clearly not adequate to analyze loan repayment performance. The index underestimates the true magnitude of the loan repayment problems faced by the banks. On the one hand, the numerator of this ratio includes only the unpaid amount of past due loans that have completed their maturity term and were in default 90 days after the final term due date. Hence, it does not include unpaid installments of medium and long-term loans, rescheduled loans, or loans finally paid with arrears. Rescheduling and arrears are also repayment problems that must be analyzed, since at least in the short-run they may affect the bank's liquidity. On the other hand, the index is not easy to interpret. While the payment of an installment reduces both numerator and denominator by the same magnitude, the disbursement of new loans reduces the index by only increasing the denominator. Thus, portfolio quality may artificially appear to be improved with the rapid disbursing of, particularly, new long-term loans.

The repayment performance of these loans within the period of the study is examined on the basis of a classification of outstanding balances into six categories as expressed by the Central Bank of Nigeria prudential guidelines to licensed banks. First, default refers to the unpaid amount of loans with completed maturity, in arrears at least 90 days or more after the due date for the final payment (total default and lost), (Prudential Guidelines for licensed Banks issued by CBN, 1990) as unpaid installments of longer term loans already due for 90 days (partial default

and substandard). The second class is labeled in litigation and it refers to the amount of unpaid loans in the process of judicial collection. Third, rescheduled loans refer to those for which the repayment period has been extended, without altering the sum of the principal and interest outstanding. Fourth, paid with arrears comprises all loans of completed maturity that were eventually repaid, in full or in part, 90 days after the due date. The fifth category refers to current loans, for which no payments were yet due. The sixth category refers to loans paid without arrears, for which payment, for term installments or completed term loans had been made before or within 90 days of the due date.

The result shows that 45 percent of the borrowers, accounting for 266 of the total numbers of small farmers were in partial or total default. Total or partial default, however, is just one dimension of the loan repayment problem faced by the banks. Payment with arrears and the rescheduling of loans constitute another important, dimension of these problems. As reported, about 22 percent of the small farmers, accounting for 132 farmers paid at least 90 days after the due dates. Furthermore, 5 percent of the small farmers, accounting for 31 of the applicants had their credits rescheduled.

Considering not only unpaid installments and completely defaulted loans, but also rescheduled loans and loans paid with arrears, about 74 percent of the number of small farmers, accounting for 438 borrowers presented repayment problems. This striking result, obviously present a lending problem as only 26 percent of the credits are performing. Thus, it is clear that these loan repayment problems are not a minor or declining issue for the banks. Lack of repayment is of primary importance in explaining the increasing liquidity problems experienced by the banking institutions in recent years.

The geographical distribution of the respondents in the table shows that nearly two thirds of the non-borrowing farm households live in the northern senatorial region of the state. In addition, the proportion of the borrowing farm households who live within 10 Km from a nearest bank branch is higher than that of the non-borrowing farm households (62.5 versus 52.1) and the share of the borrowers living more than 20 km from a bank branch is lower compared to the non-borrowers (4.6 versus 15.6). This suggests that farm households who live physically closer to bank branches are more likely to access credit. Less than half of the respondents have saving accounts in banks. Compared to the borrowers, the non-borrowers appear to be more inclined to keep their money with banks (61.5% versus 42.4%). Approximately 14.6% of the non-borrowing farm households have family member(s) with official status, which is slightly higher than that of the borrowing households (13.1%).

The frequency distributions of Aversion to debt and Alternative credit source show that the non-borrower respondents are generally more averse to having debt and more able to access alternative credit sources when they need to borrow compared to the borrower respondents.

4.2.1 Credit characteristics of Small-scalefarmers in Nasarawa State

Table 4.2 provides some general information on the loans obtained by the respondents in the states. With regard to the maximum amount of a single loan, all loans acquired by the borrowers are in small amounts. The shares of the borrowers who could borrow less than ₦20,000, between ₦20,001 and ₦50,000, and between ₦50,001 and ₦100,000 are almost identical (about 29%).

Only a small portion (13.7%) of the borrowers obtained loans with a single amount above ₦100,000. In addition, the average total loan amount borrowed by the households is ₦44,012.

Table 4.2 also shows that few borrowers have received long term loans. More than half of the loans obtained by the borrowers are characterised as short term (within one year). In addition, the overwhelming majority (92.1%) of the loans do not require collateral. With regard to the loans issued with a collateral requirement, the collateral pledged to banks are mortgage property, Vehicles, Crops liens and guarantees.

In general, the bank loan processing time is long since 89.3% of the borrowers are granted loans in more than one month from the time their loan application was submitted. In addition, Table 4.2 shows that the main purpose of obtaining loans by the borrowing farm households is to finance their agricultural activities which are farm cropping, livestock raising, produce processing, and farming machinery purchases among others.

Table 4.2 Credit characteristics of Small Farmers in Nasarawa state

All Borrowers (N = 480)

Credit Rating	**Frequency**	**Percentage**
Excellent	53	9
Very Good	39	6.6
Good	84	14.2
Fair	40	6.8
New	338	57.1
Loan Debtor	23	4.0
No Rating	15	2.3
Total		100
Loan Repayment Status		
	Frequency	**Percentage**
Default	266	45.0
In Litigation	7	1.2
Rescheduled	31	5.3
Paid with Areas	132	22.3
Current	60	10.2
Paid without areas	96	16.0

Total	592	100.0	
		Sub-Total	% to N
Single Loan Amount (in ₦)			
		Frequency	**Percentage**
	< 10,000	141	29.3
	10,001 – 20,000	134	28.0
	20,001 – 30,000	139	29.0
	>30,000	66	13.7
	Total		100
Cumulative Loan Amount (mean value in ₦)			
Loan Term			
	Short term (1 Year or less)	241	50.3
	Medium term (1-3 years)	239	49.7
	Total		100
Collateral			
	Yes	38	7.9
	No	442	92.1
	Total		100
Collateral form			
	Land Mortgage	6	2
	Vehicles	5	1
	Guarantees	6	1
	Crops Lien Pledges	29	3.9
	Unsecured	442	92.1
	Total		100
Loan Processing Time			
	Within 1 month	51	10.7
	More than 1 month	429	89.3
	Total		100
Payment Frequency			
	Weekly	9	1.8
	Monthly	111	23.2
	Semi-annually	66	13.7
	Annually	294	61.3
	Total		100
Loan Purpose			
	Agricultural activities only	348	72.6
	Non-agricultural activities only	13	2.7
	Both	119	24.7
	Total		100

Source: Computed from field survey, 2018

The majority (72.6%) of the borrowers used their loans for non-agricultural purposes and 2.7% for agricultural purpose (such as financing self-run enterprises, household consumption, children's education, etc.). Approximately 25% of the borrowers invested the loans in both agricultural and non-agricultural activities.

Finally, most (61.3%) of the borrowers could not repay their previous loans as to when due and the loans are seldom repaid monthly (less than 2 percent). The repayment schedule of bank loans is established according to the type of the loan-funded activity, example ACGSF, CACS among others. Most of the loans in our research are invested in agricultural production and the repayment structure is closely linked to the production cycle. For the loans used to develop small-scale self-employed activities, the repayment period is relatively short (monthly or semi-annually) since these activities can generate income on a more flexible schedule. This finding is similar to Yehuala (2008) and Wu's (2001) studies which found that the payment period of production loans is one year or longer, while loans for non-agricultural activities such as self-run business and handicrafts are usually repaid within less than one year on an irregular basis.

Table 4.3 presents the number of small farmers that accessed credit and those that could not accessed credit in the credit markets in the study area. The analysisreveals that during the survey period, 81 percent of the sampled small farmers had borrowed from a credit source while 19 percent of the sampled small farmers applied to a credit source but were denied access. Inother words, 19 percent were not able to borrow.

Table 4.3: Small scale farmers' Credit Accessibility in Nasarawa State

Small farmers	Frequency	Percentage
with access to credit	480	81
Constrained	402	68
Unconstrained	78	13
With no access to credit	112	19
Constrained	112	19

Source: Computed from field survey, 2018

Some of the farmers that have no access to credit could provide some reasons why they were not granted credit. Some qualitative information gathered from the surveyed questionnaires shows

other factors that affect farm households' access to creditnot included in the empirical model. These are discussed in this section.

4.2.2 Knowledge of credit programmes

From the total of non-borrower respondents, 29.5% or 33 respondents reported that they had no knowledge about any credit programmes operated by Banks in the area. Three main reasons were found for such lack of knowledge. One of the most cited reasons was the lack of understanding of the concept of credit (60.7%). This was followed by the inadequate promotion of the credit programmes (21.4%) and the unawareness of the bank branches near them (17.9%).

4.2.3 Reasons for loan rejection

Table 4.4 exhibits the major reasons why the loan applications were rejected from the respondents' own perspective. Approximately 55.6% of the 18 non-borrower respondents who had been rejected from accessing credit reported that their loan applications were denied because the loan officers from the bank branches perceived them as risky in repaying loans because of their low household income. Similarly, 55.6% of the respondents attributed their loan denials to the inadequate

Table 4.4 Reasons for loan rejection

	Non-Borrower respondents (n = 112)	
Reasons	N	% to N
1. Insufficient income to repay the loans	63	55.6
2. Bad credit history due to previous defaults	25	22.2
3. Lack of collateral or co-guarantor	12	11.1
4. Difficulty in providing required documents	12	11.1
Total	112	-

Source: Computed from field survey, 2018
Note: Total responses do not tally with the number of respondents due to multiple answers.

collateral or the inability to find loan guarantors. On the other hand, creditworthiness potentially influences the households' access to credit since about 33% considered their failures in securing

loans to their adverse credit history due to previous loan defaults. Furthermore, approximately 28% report that the difficulty in meeting the required documents by the loan officers also prevented them from accessing credit.

4.2.4 Reasons for not applying for Credits

The non-borrower respondents were also asked to state whether they would need to borrow in the future and if they will, would they apply for loans. For non-borrower respondents (112), 87% or 97 signaled borrowing intentions in the future. In addition, 55% or 62 of the respondents expressed that they would give priority to loans if they had credit needs. The remaining 31% or 35 respondents indicated that they would not apply for loans when they need to borrow. Table 4.5 presents the major reasons for not applying for the loans.

Table 4.5 Reasons for not applying for loans

	Non-Borrower respondents (N = 112)	
Reasons	N	% to N
1. Insufficient household income	23	66.7
2. Bad credit record	13	26.7
3. Lack of collateral	12	33.3
4. Interest rate on bank's loan is too high	18	50.0
5. Difficulty in meeting the required documentations	15	43.3
6. The loan application process takes too much time	13	26.7
7. Much easier to access informal lenders	18	50.0

Source: Computed from field survey, 2018
Note: Total responses do not tally with the number of respondents due to multiple answers.

Household income is a determinant factor of the households' future borrowing from agricultural credit where 66.7% of the households would not borrow because their meagre income is not sufficient to repay loans. Interest rate is another crucial factor that restrains the households from applying for loans since 50% said that the interest rate from banks is too high. Similarly, 18 non-borrower respondents prefer informal loans over bank loans because the former can be easily obtained. In addition, the complicated application procedure adopted by banks in terms of

documentation requirements and processing time also makes the households shy away from applying for loans. It is worth nothing that 33.3% of non-borrower respondents would not apply for loans due to the lack of proper collateral. Approximately 26.7% non-borrower of the respondents would not apply for loans in view of their poor credit records.

We can conclude that the households' limited access to credit can be largely attributed to the low or zero credit needs of the households. Household income and available alternative credit sources (e.g., informal credit) are found to significantly influence households' borrowing decisions, and consequently, influence households' access to credit. This confirms the empirical findings in table 4.7 below. On the other hand, institutional-level factors such as interest rate, documentation requirements and loan processing time can potentially harm the households' access to credit which leads to either loan rejection or reluctance to apply. This is consistent with Umoh (2006) and Atieno's (2001) findings which note that the access problem is mainly created by the lending policies of financial institutions. Furthermore, our findings imply that there is the need for banks to enhance promotion of their credit operations among the rural households and make the households fully aware of the features of credit. This will help improve the access to credit by rural farm households.

In all, majority of the farmers sampled were credit constrained. Of the borrowed farmers, 68 percent were not able to borrow the amount they required from a credit source while only 13 percent of the sampled small farmers were able to borrow the amount they required.

4.2.5 Small scale farmers' Credit Sources in Nasarawa state

As shown in Table 4.6, with regard to the production season, the farmers sampled for the study sourced financing from agricultural credit guarantee scheme (ACGSF) arrangements, the BOA, CACS, the commercial bank owned fund (CBF), and MFBs. The highest proportion of farmers patronized the BOA, followed by CBF, CACS, and MFBs, while the lowest number is associated with ACGSF. Credit under ACGSF is applicable only to the Northern and West senatorial regions, while MFBs loans apply only to the Southern region, based on data availability. In general, the proportion of beneficiaries of nonbank loans was double (66 percent) than that of bank loans (33 percent), and the number of beneficiaries was higher in the central (75 percent) than west and north (58 percent). A higher proportion of males (69 percent) benefitted from nonbank loans than females (31 percent), whereas in the case of bank loans the proportion of female beneficiaries was lower (31 percent) than that of males (69 percent). Bank loans refer to loans from the Bank of Agriculture (BOA) and Commercial Banks (CBFs), while nonbank loans were from the Commercial Agriculture Credit Scheme (CACS) (on-lending programs), Microfinance banks credit supply scheme (MFBs), and agricultural credit guarantee scheme (ACGSF). The CACS provided the highest number of loans (346), followed by the BOA, with an average of 44; CBF (42); ACGS (40); and MFBs (8). Overall, the average number of loan application of 480 sampled farmers but there is regional and gender

Table 4.6: Borrowing status of farmers by gender, source of loan and Region

	BOA		**CBF**		**CACS**		**ACGS**		**MFB**		**Total**	
Borrower	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Gender												
Male	26	9	23	8	215	69	25	9	4	1	293	100
Female	18	10	19	10	131	70	15	8	4	2	187	100
Region												
North	12	9	11	8	98	71	10	8	2	2	133	100
Southern	15	8	14	7	151	76.5	13	7	1	0.5	194	100
West	14	9	13	9	112	71	12	8	2	1	153	100
Total	41	-	38	-	361	-	35	-	5	-	480	-

Source: Authors' Computation from 2018 survey

Note: BOA = Bank of Agriculture; CBF = Commercial Bank Fund; CACS = Commercial Agriculture Credit Scheme; MFB = Microfinance; ACGSF = Agricultural credit guarantee scheme fund.

variations. As shown in Table 4.6, the average number was higher in the Southern (194) than north and west (133 and 153) respectively. It was also higher for male farmers (293) than females (187). In what follows we highlight the characteristics of the various loan sources in terms of lending procedures and governance structures. The proportion of female beneficiaries was lower than the proportion of males for BOA and CBF loans, while the reverse is the case for CACS and ACGSF loans.

The Commercial Bank's funds come from a variety of sources which, for the purposes of thisstudy, have been classified into four categories. First are the bank's owned resources. The main characteristic of these funds is that they are not subject to any loan targeting criteria. Branch managers are free to choose their clientele. Second are ACGS funds. This is a special fund provided by the Central Bank for agricultural lending with the objective of financing predetermined group(s) of small rural producers. Third are the agricultural credit supply scheme sources, which comprise a variety of credit lines from government. One is a special credit line funded by the central Bank (₦50 billion) and the state Government (₦1.0 billion) for on-lending to small rural farmers. This fund is provided to finance investment projects selected by the bank and not subject to any loan targeting, criteria. Fourth is a commercial agriculture credit scheme line of credit, primarily for the financing of commercial agricultural crops. This credit line is funded by the government to provide small rural producers with fixed loans to finance the purchase of inputs to start a commercial production. This is a credit line created with Government resources to finance the agricultural and livestock activities of agrarian beneficiaries.

Table 4.6 clearly indicates that a majority of the loans granted were from the bank's own resources (45.9). Government-sponsored funds accounted for 32 percent of the total beneficiaries. It is interesting to observe that government funds accounted for about 50 percent of the total number of loans granted. This obviously reflects the interest of the Government in providing credit to small rural producers. This clearly reflects the declining participation of BOA's sources of funds.

An important contrast stands out in Table 4.6 between the average size for agrarian program loans and those granted with resources from the banks. Loans granted with resources from the agricultural program fund had an average size about eight times as large as loans provided with resources from the bank. This striking difference reflects the importance of loans to finance large agrarian groups which in turn retail these resources to individuals within the group. It also reflects the nature of the resources provided for agricultural development by the Government. This fund has been a classic case of social programs designed more to satisfy political objectives than to accomplish production goals, (Olomola and Nwafor, 2018). The large number of loans and the small average loan size of the ACGS have heavily impacted on the BOA's operation costs, thereby affecting its financial viability.

4.2.6 Econometric results offactors influencing small scale farmers' access to credit in Nasarawa State

To achieve the second objective, a logistic model was estimated to investigate farm household-level factors that influence farm households' access to credit using a maximum likelihood estimation technique. Table 4.8 presents the estimated results of the logistic model.

The hypothesis being tested in the logit analysis is that socioeconomic and Demographic factors including credit terms will significantly affect small farmers' access to credit from the formal credit market in the state. The determinants of credit access examined on the basis of the logit model shows that Farmers' credit access can be influenced by interest rate, wage rate, price of output, farm size, farming experience, household size, value of assets, nonfarm income, source of loan, and region. The results of the two-step Heckman sample selection correction procedure are presented in Table 4.7. The adjusted standard error for the access equation regression is given by sigma ($\hat{\sigma}$ = 1.2409), and the correlation coefficient between the (unobserved) factors that determine selection into the loan market and the (unobserved) factors that determine demand for loans is given by rho ($\hat{\rho}$ = -0.7434). The inverse Mills ratio (lambda = sigma x rho) has a negative coefficient (-0.8984) and is statistically significant. This suggests that the error terms in the selection (probit) and access (regression) equations are negatively correlated.

Table 4.7 Results of Heckman selection correction model of credit access

Dependent Variable	Coefficient	Standard Error	P>|t|
Interest rate (%)	0.647***	0.069	0.000
Wage rate (₦/kg)	0.330***	0.175	0.082
Cassava price (₦/kg)	-0.197 ***	0.170	0.067
Total assets (₦)	0.014***	0.015	0.030
Farm Income (₦)	-0.045***	0.033	0.000
Nonfarm income (₦)	0.158**	0.043	0.040
Farm/Land Ownership	-0.456***	0.447	0.008
Farm size (Ha)	0.039***	0.068	0.000
Household size (no)	-0.327***	0.101	0.009
Farming experience (years)	-0.013***	0.066	0.000
Loan source (bank/nonbank)	0.530***	0.091	0.000
Senatorial Region (North/South/West)	0.007	0.101	0.008
Constant	-3.643***	0.663	0.000
Estimated selection model			
Value of assets (₦)	0.104	0.150	0.372
Operating profit (₦)	-0.054	0.032	0.184
Nonfarm income (₦)	0.185***	0.034	0.000
Farm size (Ha)	0.093	0.086	0.585
Household size (no)	-0.372***	0.110	0.002

Farming experience (years)	-0.031	0.067	0.883
Age (years)	0.585***	0.167	0.000
Marital status	0.285**	0.138	0.014
Senatorial Region (North/South/West)	0.070	0.011	0.924
Constant	-2.013***	0.636	0.002
Mills			
Lambda	-0.8984	0.533	0.079
Rho	-0.7434		
Sigma	1.2409		
Wald $chi^2(10) = 183.33$ Prob> $chi^2 = 0.0000$			

Source: Author's Computation from field survey, 2018

****, **, ***, represent the 10%, 5%, and 1% significance level, respectively***

The significant correlation of the error terms with negative sign is an indication that the (unobserved) factors that make participation in the credit market more likely have a tendency to be strongly associated with lower credit access. Fitting the credit access model to the sample through a direct application of ordinary least squares would have meant that the selectivity bias was ignored and would have resulted in biased and inconsistent estimates. An empirical analysis of this nature will not always justify the application of the model and so much depends on the nature of the data and the relevance of the predictors. In a similar analysis by Wiboonpongse, Sriboonchitta, and Chaovanapoonphol (2006), the coefficient of the lambda statistic was not found to be significant and the null hypothesis that there is no correlation between the error terms in the selection and access equations could not be rejected. The significance of the lambda and other test statistics as well as the estimated coefficients are indication that the estimation of a Heckman selection model in this study is justified.

Table 4.8 Logit estimates of factors for farm households' accessibility to credit

Independent Variable	Coefficient	Standard Error	Wald Statistics	Marginal Effect
Interest rate (%)	0.674***	0.096	0.2874	0.023
Age	0.0103	0.0191	0.8428	0.0011
Gender dummy	0.4130	0.3288	1.2726	-0.047
Household size	-0.2262*	0.1356	2.7851	-0.026
Land/Farm Ownership dummy	-0.1050***	0.3046	13.169	-0.166
Farm size	0.7010	0.4375	2.5667	0.0548
Farm Income (in ₦'000)	0.0117**	0.0059	3.8842	0.0012
Non-Farm income	0.7000**	0.3605	3.7672	0.0547
Self-Employment	0.5353**	0.2255	5.6339	0.0558
Total Assets (in ₦'000)	-0.0617**	0.0303	4.1265	-0.064
Farming Experience (years)	-0.013	0.066	6.3767	0.838
Marital Status (Married = 1, 0 otherwise) dummy	0.284**	0.138	5.3693	0.041
Location (North = 1, Central = 2, and West = 3)	0.007	0.101	4.6758	0.942
Savings	-1.2124***	0.3624	11.158	-0.185
Alternatives	-2.1137***	0.4512	21.943	-0.102
Official Status	1.0596**	0.4707	5.068	0.0724
Dummy Variables				
Distance (1)				
Distance(2)	-0.2071	0.3162	0.4290	-0.0230
Distance(3)	-1.4804***	0.5525	7.1785	-0.2495
Education (1)				
Education(2)	1.1641*	0.6811	2.9214	0.1797
Education(3)	0.6809	0.8935	0.5808	0.0536
Constant	3.6876**	1.4357	6.5976	
R-squared				0.2878
Log likelihood				161.5214
Degree of Freedom				18
Total Observations				592

Classification			
No of correct	Dependent = 0	Dependent = 1	Overall
	26	454	480
% of correct	40.63	94.51	82.31
No of incorrect	86	26	112
% of incorrect	59.38	5.49	17.69

Source: Author's Computation from field survey, 2018
Note: 1/. Marginal effect is at the mean value. For binary variable, marginal effect is P\|1-P\|0; 2/. To avoid a multicollinearity problem, a dummy variable is dropped in each group.
****, **, ***, represent the 10%, 5%, and 1% significance level, respectively***

According to the results, the hypothesis that farmers' access to credit is significantly determined by socioeconomic and demographic factors specified in the model cannot be rejected in view of the statistically significant coefficients of these variables in the estimated access equation. The estimated regression coefficients present the estimated elasticities. However, not all the coefficients have the expected signs. Theoretically, the sign of the credit access elasticity with respect to output price is expected to be positive, implying that when the output price increases, it stimulates increased demand for credits and possible access. With an increased output price, farmers are inclined to expand production and are thus prompted to expand their capital base through increased demand for credits.

The specific variables considered are presented in Table 4.8, which contains the results of the analysis. As shown in the Table, some variables are significant while others are not. The significant variables are household size, income, assets, savings, attitude, alternatives, official status, distance 3, education 2, age, marital status, nonfarm income, and household size, whereas asset value, farm income, farm size, farming experience and location (region) are not significant. The results show that older farmers have a higher probability of accessing credit, compared to younger ones. Farmers who are married are also more likely to access credit than their unmarried counterparts. These results are consistent with the findings of Pastrapa (2011), which show that

the probability of receiving a loan is positively correlated with age and that married persons are more likely than unmarried persons to receive loans.

Gender has a positive sign and is significantly different from zero at the 5 percent confidence level. Being male increases the probability of access to credit. This result may suggest that females are being discriminated against in the credit markets in the study area. This result confirms Zeller *et al.* (1994), whose results indicated discrimination against women in the informal credit markets in Gambia. A possible explanation is that household resources are mainly controlled by men, thus lenders perceived men as more creditworthy. On the other hand, in the Nasarawa State culture men are seen as the head of the households, and it could therefore be argued that, there is no discrimination against women as they are being effectively represented by men.

Farm Households' monthly income is positively related to the probability of access to credit and is statistically significant at the 10 percent confidence level. Thus, implying that the higher the households' monthly income, the more likely that a credit agent will lend to it. A probable explanation for this could be that monthly income may serve as a measure of creditworthiness, household head with more income are more likely to have their credit demand met and could be a measure of repayment capability as they may be seen by the lenders as capable of repaying his loan as at when due.

The value of farm households' assets, however, has a positive sign and is statistically significant at the 10 percent confidence level. The greater the assets value, the higher the probability of

having access to credit. The rationale for this is that since lenders require repayment plus interest in cash, they could see the client's assets as the last resort to liquidate to recover the credit in case of loan default. Farm Households saving also had a positive and statistically significant influence on access to credit at the 10 percent confidence level. This could be as a result that savings could be substituted for collateral, especially if savings are deposited with the financial institution providing the credit. The inverse relationship between Savings and households' accessibility suggests that households who operate accounts with banks have better chances to access credit. This is possible because these households are able to use their savings in the banks when they need financial support, which can strengthen their likelihood of borrowing from Banks.

Loan repayment capacity, measured as debt-income ratio (Zeller, 1994), has a negative sign and is statistically related to households' accessibility to credit at the 1 percent confidence level. The possible explanation for this result is that the higher the debt-income ratio the higher the exposure to loan default risks which reduces the probability of credit access.

The results also show that a 1 percent increase in output price is associated with a reduction of 0.05 percent in loan demand and possible access, implying that farmers tend to plow back the additional earnings realized into farming to meet any intended expansion costs and so reduce access to credits. This finding is consistent with the work of Swain (2008), in which the coefficient of the output price is negative and significant. The access to credit depends positively on the wage rate, given the positive coefficient of the wage rate in the estimated equation. A rising wage is likely to lead to increased production costs, and thus farmers will need credit to finance these costs. A 1 percent increase in the wage rate is associated with a 0.15 percent

increase in loan demand and possible credit access. An explanation for this is that the need may arise directly from rising labor costs or from the fact that farmers may want to substitute mechanization for labor.

Although credit access is expected to depend negatively on the interest rate, we found a positive relationship. A 1 percent increase in the interest rate is associated with a 0.02 percent increase in loan access. This is not an entirely unique finding and may be due to the policy incentives aimed at lowering the cost of borrowing in the Nasarawa State agricultural sector. This result was also found in Sadikov et al. (2012) where He obtain such an unexpected relationship between credit access and the interest rate using a disequilibrium model of the credit market. Their results suggest that credit growth was basically supply driven, fueled by large deposit inflows and positive economic prospects.

From the table, the significant and positive sign on the income variable indicates that households with higher annual income have higher probability of accessing credit. One possible reason for this result is that high income households tend to have more investment opportunities, leading to stronger need for credit support. High-income farm households may also be more confident in repaying loans if they borrow.

As regards nonfarm income, the elasticity coefficient is also positive and significant. Whereas the result for nonfarm income contradicts the work of Motsoari, Cloete, and van Schalkwyk (2013), who found a significant and negative relationship between nonfarm income and access to credit in Lesotho, it is consistent with the work of Atieno (1997), who found a positive and

statistically insignificant relationship. Our finding here is indicative of the role of nonfarm income in addressing the covariate risk often faced by farmers, which lenders have always looked for ways to mitigate. A borrower-farmer who has a nonfarm income opportunity has a way of diversifying his source of income and can be in a better position to access more loans compared to his counterpart whose income source is less diversified. Farmers with higher nonfarm income can therefore expect to be granted more loans, while those with lower nonfarm income are likely to receive lower amounts of loans. The implication of this finding is that provision of nonfarm income opportunities in the rural sector may be an effective approach in mitigating the risk associated with agricultural credit operations in Nasarawa State.

The significant and positive sign on Education variable indicates that small farmers who have acquired secondary school education or less have higher probability to access credit than the uneducated small farmers, holding other factors constant. In contrast, a significant but negative relationship is found between household size and households' accessibility to credit suggesting that larger households are less likely to borrow. This is possibly because larger-size farm households tend to have low repayment capacity resulting from the smaller expected per capita income which lowers the probability of borrowing. This finding contradicts Ho (2004) and Vaessen (2001), who found that the probability of accessing formal credit increases with household size.

The estimated coefficients of Distance, Attitude, and Alternatives are all negative and significantly different from zero at the 1% level. Holding other factors constant, the households residing more than 20 km away from bank branches have significantly lower probability of

accessing credit compared to those who live within 10 km of bank branches mainly due to the perceived high borrowing costs arising from the travelling expenses and time opportunity costs. In addition, an adverse attitude towards having debt decreases the likelihood of accessing any type of credit by households. Furthermore, the availability of other credit sources (such as informal credit) also tends to reduce the probability of borrowing from credit programme. This finding is consistent with Vaessen (2001) who founds that many poor households are more willing to use informal credit owing to low transaction costs and flexible loan contracts.

The econometric results show that Self-employment and Official status variables are significant at the 95% confident level. As an apriori expectation, the probability of accessing credit increases when households become involved in self-employed businesses apart from agriculture production.

This can be explained by the higher capital requirement for investing in self-run enterprises. Official status is also a contributor to households' access to credit. One possible reason is that households with members working as village or township officials have greater need of credit for off-farm investment and thus have higher probability of accessing credit. Households with members working as local officials may also access credit easier due to their good relationship with the local people and the financial institutions.

Table 4.8 shows that the coefficients of the remaining explanatory variables: Gender, Location, Distance (2), Education (3), and Farm size, are not significantly different from zero, and they do not have significant effects on farm households' access to credit. In addition, the estimated sign

on Age contradicts the a priori expectation, while the others have the expected signs.Based on the estimated results, eleven variables are found to have significant influences on households' accessibility to credit. These include Distance (2), Household size, Education (1), Income, Self-employment, Assets, Savings, Attitude, Alternatives andOfficial status. Except for dependency ratio andSavings, most of the explanatory variables have signs as expected.

In the Nigerian and Nasarawa State case, the credit market in which farmers operate has considerable interest rate subsidy and credit-rationing features, such that farmers do not face market-clearing interest rates despite their continued preference for cheaper credit. The irrelevance of rising interest rates is discouraging farmers from borrowing. Our finding shows that it is statistically insignificant which supports Desai and Mellor 1993 on Kenya. Studies on credit access in rural areas of Kenya have shown that the interest rate or factors related to it are statistically insignificant or less significant as determinants of access for credit (Desai and Mellor 1993). In their study on demand for commercial bank loans in the rural areas of Kenya, David and Wyeth (1978) also found that farmers normally expressed insensitivity to the level of interest charged on their loans and would not be affected by an increase in the interest rate, in terms of the amount of loan they would like to obtain.

Our result is consistent with some studies in Nigeria that examines the determinants of demand formicrocredit among rural households, ((Balogun and Yusuf 2011; Aku, 2011). The study includes borrowers who sourced credit from commercial banks, NGOs and cooperatives. According to the study, the coefficients of interest rates in the estimated demand functions are positive and highly significant in the analysis for both commercial banks and

NGOs/cooperatives. The likelihood is that households' demand for credit from commercial banks and NGOs/cooperatives increases as the interest rate increases, by about 15 percent and 7 percent, respectively. The study concludes that irrespective of distance or interest rate, households will demand credit because of their need to increase capital supply.

The unfolding result in the case of our study is an indication that when credit operations are carried out in an incentivized system, (non-price rationing), availability is a much more critical issue than the interest rate. This is because lenders will not be encouraged to provide all the credit required by the borrower at less than a market-clearing interest rate. And as long as farmers are borrowing at a subsidized rate, they are likely to continue to be rationed by lenders and will continue to borrow even if the interest rate is rising but remains significantly below the optimum lending rate.

It has been argued that the estimated logistic coefficients obtained by maximum likelihood estimation do not generate a direct economic interpretation and the sign of an estimated coefficient only provides the direction of the effect of that explanatory variable on the probability of a success (Greene, 2003; Train, 1986). To address this limitation, marginal effects, that is, the change in the predicted probability associated with changes in the explanatory variables are calculated and used.

Table 4.8 also presents the marginal effects for the regressors of the logit model. For example, the marginal effect of Household size indicates that an additional member increase in the family will decrease the probability of accessing credit by 2.36 percent on average. In addition, the probability of borrowing from credit programmes would increase by 0.12 percent on average

with every ₦1,000 increase in Income. By contrast, an additional ₦1,000 increase in Assets would reduce households' probability of accessing credit by 0.64 percent. The marginal effects of both income and assets on the probability of accessing credit are minimal. Themarginal effect of dependency ratio shows that on average a one percent increase in the ratio would change the probability of borrowing from the bank by 0.0558 percent.

The results also show that the probability of accessing credit is decreased by 24.95 percent for households who live more than 20 km away from bank branches compared to those living within 10 km from bank branches. Conversely, households who have obtained secondary school education or less are 17.97 percent more likely to access from a credit source than uneducated households.

The marginal effects of the variables are shown in Table 4.9. Specifically, an additional year of age is likely to raise the probability of being in the loan market by 18.3 percentage points. Also, a marginal increase in nonfarm income is likely to increase the borrowing probability by 4.9 percentage points. If a farmer is married, the probability of participating in the loan market increases by about 9.5 percentage points. Moreover, an additional member in the household may reduce the borrowing probability by 10.3 percentage points. On the contrary, the significant and negative sign on the asset's variable implies that households' accessibility to credit decreases with increased asset values. This is because assets correspond to a household's initial capital. Farm Households with higher asset values may not be budget constrained and therefore less likely to demand credit and access it.

The marginal effect of non-farm incomeshows that the probability of accessing a credit will rise by 5.47 percent when the farm household is engaged in self-employment. Similarly, the probability of accessing credit for households with members working as local officials increases by 7.24 percent. However, the marginal effects of Attitude and Alternatives suggest that the probability of accessing credit would decrease by 16.76 percent when the household holds a negative attitude towards debt and by 10.02 percent when the household can find alternative credit sources other than bank credit.

Other important findings are related to the source of loans and the location of borrowers. The demand and access to loans is found to be higher in the central and western senatorial region of the state than the north, while accessto loans from commercial banks is found to be lower than for loans from nonbank sources. This finding corroborates the well-known fact that small-scale farmers in Nasarawa state are not well served by the banking sector as far as credit facilities are concerned. For example, there are no banks/branches in Keana, Kokona, Obi, Toto local government areas and something like representative banks in Awe and Wamba local government areas in the state. Farmers in these local government areas have to travel long distances to access credits.

The empirical results reveal that household income, non-farm income and official status are three contributors to households' accessibility to credit because they imply a higher credit demand resulting from the higher capital requirements (on/off farm), which in turn raises the likelihood of accessing credit by households. Conversely, household assets and savings can be used as

proxies for household initial capital and a higher value of either of them can potentially decrease the probability of accessing credit by the farm households.

4.3Characteristics of credit rationing among small scale farmers in Nasarawa State

The identification of the farmers' credit-rationing status is an integral part of the research instrument for this study. This is subject of the third objective which is to identify and evaluate the factors influencing small scale farmers' credit rationing in Nasarawa state. We start from the descriptive evaluation of the credit market experience of farm households. Table 4.9 gives an overview of the individual assessment of rationing outcomes. The table shows that by far the most important groups are the satisfied and the partially rationed applicants. 4 percent of respondents were not interested in borrowing at all, and only a small minority was completely rejected (10%) or discouraged (5%). It can be concluded that about 81 percent of farmers in the sample are borrowers, and that perceived excess demand is a relevant problem for almost half of the borrowers.

Table 4.9: Frequency of rationing experience of the small farmers

Rationing Experience	Observations	Percent
Satisfied applicants	78	13
Partially satisfied applicant	402	68
Completely rejected applicant	61	10
Not interested non-applicant	21	4
Discouraged non-applicant	30	5
Total	592	100

Source: Author's computations based on 2018 field data

Due to the relative unimportance of fully rejected and discouraged respondents, we consider these two groups together with the partially rationed group as the pool of credit-rationed respondents. In contrast, satisfied applicants and not interested non-applicants are regarded as not credit-rationed. Hence, we work with a dichotomous classification.

As we discussed in the literature review, there are three types of credit rationing. These are risk rationing, quantity rationing and price rationing. A typical household experiencing the first two types of credit rationing is said to be credit constrained. On the other hand, households who are price rationed are not constrained as they are able to obtain credit at the ongoing market interest rate.

Table 4. 10:Frequency of the type of credit rationing byhousehold Farms

Rationing Experience	Observations	Percent
Risk Rationed	95	16
Quantity Rationed	354	60
Price Rationed	65	11
Not Rationed	78	13
All respondents	592	100

Source: Author's calculations based on Nasarawa field survey 2018.

In table 4.10, from the entire households considered in the study, 60 percent of them are quantity rationed. This figure constitutes 71 percent of constrained households. Quantity rationed households include those who applied but were totally rejected, partially accepted, didn't apply because the institutions they want to apply to need collateral and those that didn't apply due to fear of rejection. The remaining types of rationing which are considered as credit constrained households is the risk rationing which accounts for about 16 percent of households. From the overall 592 credit constrained households, 27 percent of them are observed to be price and risk rationed householdssharing 11 and 16 percent of households in the group. Therefore, we can say that quantity rationing is the most prevalent cause of credit rationing and it compels policy stakeholders to prioritize in this regard. Finally, households in the not rationed accounts for 13 and are considered as unconstrained households.

In determining the factors that determine credit rationing in Nasarawa State, the survey asked questions that made it possible to infer respondents' credit-rationing status, following the

procedure employed by Khantachavana, Turvey, and Kong (2011) in defining various categories of rationed farmers. Typically, price-rationed farmers are those who borrowed and were happy with the amount they received. An applicant who was denied a loan is quantity rationed. The non-borrowers were also covered in the survey. An inquiry into the reasons for not borrowing reveals three basic reasons: first, some people did not apply due to the possibility and knowledge that their applications would be rejected (quantity rationed); second, some people did not apply due to the fear of losing collateral (risk rationed); and third, some people had enough money and no need to borrow (price rationed). On the basis of these definitions, the farmers are classified into three credit-rationed categories- namely, risk rationed, quantity rationed, and price rationed for the purpose of analyzing the determinants of credit rationing in small-scale agricultural financing in Nasarawa State. Of the 592 farmers included in the study, 326 are quantity rationed, 230 are price rationed, and 36 are risk rationed, representing 55, 39, and 6 percent of the total, respectively.

Credit rationing cuts across gender and regional divides, although in each region and gender group the distribution pattern tends to be similar in the sense that the largest proportion is quantity rationed while the smallest is risk rationed. In Table 4.11, however, the proportions of quantity-rationed and risk-rationed farmers are higher among males than females, whereas females have a higher proportion of price-rationed farmers than males. Similarly, farmers in the north and western senatorial regions are more quantity rationed and risk rationed than those in the central, whereas those in the central are more price rationed than their northern western counterparts. Overall, females seem to find their credit situation more satisfying than males, just

as farmers in the central appear to have a better credit-rationing status than those in the north and west.

To gain a better understanding of the nature of credit rationing among farmers, the disparity in credit-rationing status is examined across marital groups, sources of loans, occupational groups, educational levels, and types of available collateral. Both married and unmarried farmers face credit rationing, though it is more severe in the case of the latter than the former. Of the 539 married farmers, 55 percent are quantity rationed, 40 percent are price rationed, and only 5 percent are risk rationed. Of the remaining 53 who are single, 57 percent are quantity rationed, 36 percent are price rationed, and 7 percent are risk rationed. In other words, the proportions of quantity-rationed and risk-rationed farmers are higher among the single group than the married group.

All forms of rationing are associated with loans obtained from both commercial bank and the Bank of agriculture sources. The results show that farmers are treated differently by different types of lending institutions, irrespective of whether they are commercial banks or Bank of agricultural institutions. In the case of the BOA, the proportion of quantity-rationed farmers is the highest, followed by price-rationed farmers, while the lowest is risk-rationed farmers. The situation in commercial Banks is different, in the sense that the highest proportion of farmers is price rationed, followed by quantity-rationed farmers, while the lowest proportion is risk rationed. The proportion of quantity-rationed farmers is higher in the BOA than in Commercial Banks.

With regard to the CACS, the highest proportion of farmers is price rationed, followed by the proportion that is risk rationed, while the lowest proportion is quantity rationed. All the farmers participating in the ACGS scheme are price rationed. The scenario with the MFBs is that the highest proportion of farmers is quantity rationed, followed by the proportion that is risk rationed, while the lowest proportion is price rationed. This is the worst-case scenario compared to all the other sources of loans, in the sense that ratioing credit turns out to be most satisfactory in the case of ACGS, followed by CACS, CB, and the BOA, while the least satisfactory is the MFBs, and based on the observed credit-rationing status of farmers. By and large, each lending institution exhibits a different pattern of credit rationing. This is not surprising because the design of the small-scale agricultural credit programs varies from one institution to another. It implies, however, that the solution to the problem must be institution specific rather than generic. At best, a common approach may be applied to institutions having the same design in an attempt to tackle the problem.

Comparing the credit-rationing status of farmers across various secondary occupation groups, we find that the pattern in each group is consistent with the general pattern. The most quantity-rationed group is private-sector workers, followed by civil servants, artisans, and petty traders. However, the most price-rationed group is petty traders, followed by civil servants, artisans, and private-sector workers. This is the order in which farmers in these secondary occupation groups can be said to be satisfied with the prevailing lending conditions. The group with the highest proportion of risk-rationed farmers is artisans, followed by petty traders, private-sector workers, and civil servants.

The educational attainment of farmers seems to have quite a different pattern of influence on the credit rationing status than that of secondary occupation. First, the distribution of farmers is not consistent with the general pattern in all the groups-at least there is one exception. There are six education categories. Among farmers without any formal education, the proportion of price-rationed farmers is the highest, followed by quantity-rationed farmers, while the lowest proportion is risk rationed. This is contrary to the pattern in the remaining five categories, in which the highest proportion is quantity rationed, followed by price rationed, while the lowest is risk rationed. Secondly, the proportion of quantity-rationed farmers increases as the level of education increases. Third, there is an emerging pattern of relationship of risk rationing with different levels of education. The highest proportion of risk-rationed farmers is in the group without any formal education, while the lowest is in the group of farmers who completed secondary education. In general, farmers with primary school education or lower are more risk rationed than those with at least secondary education. Education appears to have a different influence on different types of credit-rationing status.

Another characteristic of the farmers that can help illuminate the nature of credit rationing in small-scale agriculture is the availability of potential collateral. Usually, access to loans under the various lending programs of the institutions that granted loans to the farmers included in this study does not depend on provision of collateral. Thus, in the absence of suitable collateral or a collateral substitute, credit rationing is likely to continue to thrive. The farmers were asked to indicate what they had to offer as collateral in case it became a necessary condition for granting them an adequate loan. The items indicated are vehicle, land and crops. Some farmers indicated that they could not offer any form of collateral. On the basis of their responses, four categories of

farmers emerge. A cross-tabulation of the farmers' available potential collateral and their credit-rationing status forms the basis of the comparison. The distribution of farmers based on their credit-rationing status varies among the potential collateral groups. In both the "land" and "no collateral" groups, the highest proportion of farmers is quantity rationed, followed by price rationed, while the lowest is risk rationed. In the "crop" group, the proportion of farmers that is quantity rationed is virtually the same as the proportion that is price rationed. In the "vehicle" group, the highest proportion is price rationed, followed by quantity rationed, while the lowest is risk rationed. As it turns out, the proportion of quantity-rationed farmers is highest in the group that potentially has nothing to offer as collateral, while it is lowest in the group of farmers that can provide vehicles as collateral.

Though all of the three sample senatorial regions are in Nasarawa State where they are administrated by similar state and federal rural development strategies including credit delivery programmes and schemes, there is a considerable difference in the concentration of credit rationing among the selected sample households within each Village area.Table 4.10 shows how this noticeable dispersion looks like.

Table 4.11: Credit rationing situations by sample senatorial Regions

Credit Rationing Status	Northern		Central		Western		Total	
	No	Percentage	No	Percentage	No	Percentage	No	Percentage
Unrationed	21	11	31	16	26	12	78	13
Rationed	164	89	162	84	188	88	514	87
Total	185	100	193	100	214	100	592	100

Source: Author's computations from Nasarawa state field survey 2018.

As presented in Table 4.11, 162 (84%) households are credit rationed in the credit market happens in the northern senatorial region followed by Western region with 188 representing

about 88 percent. On the other hand, households from the Southern region are 162 or 84 percent and it looks relatively less prone to credit rationed households. But the real question here is where did these variations come from? There might not be a universal compelling reason, but it can be argued that the highest percent of credit rationed households in Northern senatorial region may be explained by the relatively poor composition of the financial institutions and the low development of the agricultural sector in the area. This may affect credit suppliers from delivering credit to households and may be due to their risk aversion behavior caused by low level of agricultural yield in the area, even if there is a high demand for agricultural credit by farm households. On the other hand, the relatively low level of rationed households in Southern region can be explained by their high demand for agricultural credit due to their desired investments in the area. This region contends the highest number of financial institutions that are the source of credit for agricultural production when compared to other regions.

The relatively smaller magnitude of credit rationed households happened in Central region. This zone is the area's where we have the state capital and is more developed with larger available land which is conducive for agricultural production and investment. This may make credit suppliers to invest here through their credit delivery system believing households as productive and rate them with better expected repayment. Also, the existing relatively better agricultural condition may make households financially self-sufficient. The same can be argued for Western senatorial region.

4.3.1 Econometric results of the factors that determineCredit Rationing among small farmers in Nasarawa State

The probit model is employed to ascertain the determinants of credit rationing. It is broadly hypothesized that credit rationing is significantly influenced by the farmer's socio-economic characteristics which include farm size, household size, farming experience, share of farm income in total income, nonfarm income, savings, educational attainment, gender, marital status, borrowing status, and location (region) of the farmers. Specifically, it is hypothesized that quantity and risk rationing is decreasing in financial wealth and productive wealth. As noted earlier, financial wealth is represented by nonfarm income, share of farm income in total income, and savings, while productive wealth is represented mainly by farm size and other related variables such as household size, education, and farming experience.

The estimated coefficients of the credit-rationing models and the marginal effects of the explanatory variables are presented in Tables 4.12 and 4.13, respectively. A Breusch-Pagan test of the independence of the error terms of each of the three seemingly unrelated regression equations shows that the credit-rationing models are not independent, as evidenced by the non-zero cross-correlation coefficients of the error terms of the estimated equations (Table 4.12), thus supporting the use of seemingly unrelated regression as a more appropriate estimation technique than estimating each of the equations independently. The results show that quantity rationing significantly depends on farm income, savings, farming experience, and educational attainment of the farmers. It depends negatively on farming experience and positively on farm income, savings, and education (Table 4.12). Thus, the hypothesis that quantity rationing is decreasing in financial wealth is rejected based on the positive coefficients of savings and farm income. We also reject the hypothesis that quantity rationing is decreasing in productive wealth on account of

the positive sign of the coefficient of land (farm size), and more importantly on account of its non-significance

Table 4.12: Probit regression estimates for credit rationed farmers

Variable	Estimated model		
	Quantity rationed	Risk rationed	Price rationed
Interest Rate (%)	0.192** (0.480)	0.292 (0.755)	0.244 (0.609)
Assets (₦)	2.160*** (6.036)	1.691*** (3.243)	2.827 (0.206)
Non-Farm income (₦)	2.610*** (3.038)	3.160*** (3.648)	-5.750* (3.080)
Farm income (₦)	0.013*** (0.003)	-0.0003 (0.001)	-0.013*** (0.003)
Land Ownership	0.005 (-0.762)	-0.012 (0.100)	-2.546 (0.459)
Liabilities to Formal Lenders	0.053 (3.920)	0.042 (0.110)	1.649 (1.263)
Liabilities (₦)	0.618*** (1.282)	0.957*** (2.115)	0.732 (1.655)
Relationship length (years)	0.714*** (1.038)	0.335** (0.669)	0.820 (0.385)
Land Collaterals	0.262*** (2.704)	0.590** (2.092)	0.298 (2.078)
Savings (₦)	1.357** (6.918)	2.950 (3.740)	-1.387** (7.018)
Farm size (ha)	0.029 (0.043)	-0.075*** (0.023)	0.046 (0.044)
Household size (no)	0.028 (0.021)	0.006 (0.011)	-0.035* (0.021)
Farming experience (years)	-0.020*** (0.008)	-0.0007 (0.004)	0.021*** (0.008)
Loan Source	-0.001 (-0.508)	-4.999 (1.516)	-0.917 (0.304)
Male Household Head	-0.157 (-1.547)	-0.553 (0.350)	-0.067 (0.066)
Female Household Head	0.267 (2.696)	-0.086 (0.065)	0.163 (0.125)
Group Collaterals	0.066*** (2.398)	-0.069 (0.421)	0.0852 (0.526)
Creditworthiness	-0.062** (2.260)	0.231*** (4.672)	0.025* (1.116)
Terms Loan	0.163* (1.953)	0.433 (0.931)	0.104*** (3.421)
OwnFund	-0.428	0.913***	0.133*

	(-0.248)	(2.861)	(1.163)
AgricFund	0.882 (0.561)	0.913** (2.122)	0.157** (2.520)
Loan Repayment Record	0.453** (2.086)	-2.035 (0.813)	0.628* (-1.320)
Education (years)	0.051*** (0.013)	-0.014** (0.007)	-0.037*** (0.013)
Gender	0.031 (0.030)	0.028* (0.017)	-0.058* (0.031)
Region (north/central/west)	0.009 (0.028)	0.087*** (0.015)	-0.096*** (0.029)
Marital Status	-0.013 (0.044)	-0.013 (0.024)	0.027 (0.045)
Borrower's Status	-0.586*** (0.027)	0.077*** (0.015)	0.509*** (0.028)
Constant	0.824*** (3.053)	-0.007 (0.029)	0.183*** (3.054)
No of observations	592	592	592
F-stat	49.43	7.47	39.32
R^2	0.435	0.364	0.293
Prob	0.000	0.000	0.000
Breusch-Pagan test of independence: chi^2 (3) = 1,074.56			
Pro > chi^2 = 0.000			

Source: Author's calculations based on the field survey 2018.

Note: Figures in parentheses are student t test; *** significant at 1 % level; ** significant at 5% level.

in a statistical sense. Farming experience turns out to be a significant variable that explains quantity rationing. Its coefficient is negative, implying that the higher the farming experience, the lower the probability that the farmer will be quantity rationed. This is plausible because an experienced farmer can more reasonably and realistically estimate the amount of credit required to support farm operations. If lenders realize that such an amount is not unduly inflated, they may be inclined to offer the loan in full. Moreover, an experienced farmer is also expected to have a good record (or

Table 4.13: Marginal effects of the variables in the estimated probit models

	Estimated models		
Variable	**Quantity rationed**	**Risk rationed**	**Price rationed**
Assets (₦)	0.441***	0.679***	0.146

	(6.793)	(4.423)	(0.017)
Liabilities (₦)	0.626***	0.727***	0.674
	(2.484)	(2.446)	(0.469)
Relationship (years)	0.390***	0.582**	0.043*
	(2.982)	(1.859)	(2.121)
Non-Farm income (₦)	2.61e-08	3.16e-08**	-5.75e-08*
	(0.86)	(1.92)	(1.87)
Farm income (%)	0.133***	-0.003	-0.013***
	(4.61)	(-0.25)	(-4.46)
Savings (₦)	1.35e-07**	2.99e-09	-1.38e-07**
	(1.95)	(0.08)	(-1.97)
Farm size (ha)	0.029	-0.075***	0.047
	(0.67)	(-3.19)	(1.06)
Collateral	0.906	0.909	0.901
	(0.292)	(0.288)	(0.299)
Household size (no)	0.029	0.006	-0.035
	(1.38)	(0.51)	(-1.67)
Farm experience (years)	-0.021***	-0.008	0.021***
	(-2.52)	(-0.19)	(2.56)
Education (years)	0,051***	-0.014**	-0.037***
	(3,92)	(-1.95)	(-2.81)
Gender	0.034	0.029*	-0.062**
	(1.11)	(1.72)	(-1.96)
Region (north/central/west)	0.009	0.087***	-0.-97***
	(0.33)	(5.61)	(-3.35)
Marital Status	-0.015	-0.014	0.029
	(-0.33)	(-0.57)	(0.64)
Borrowing Status	-0.585***	0.077***	0.509***
	(-21.00)	(5.08)	(18.00)

Source: Author's calculations based on the field survey 2018
Note: Figures in parentheses are z- statistics; ***; **; and * are significant at 1%, 5% and 10% levels respectively.

credible evidence) of operation, which can be shown to the lenders to demonstrate that the loan is genuinely required and the lenders may not want to reject his loan application outright.

We find that gender, geographical location, and marital status have no statistically significant effect on the probability that farmers will be quantity rationed, judging by the non-significance of the coefficients of these variables in the estimated equation. To ascertain whether quantity rationing is more severe in terms of shortfalls in the loan amounts received compared to the

amount requested than in terms of farmers being rejected outright, the borrowing status of the farmers is included as an independent variable in the model. Its coefficient is negative and significant. This implies that there is a higher probability of farmers being rejected than being given an amount of

loan that is lower than what was requested. With regard to risk rationing, we reject the hypothesis that risk rationing is decreasing in financial wealth, but we do not reject the hypothesis that risk rationing is decreasing in productive wealth. Regarding financial wealth, the coefficients of the key variables either have the wrong signs or are not statistically significant. The hypothesis with respect to productive wealth is accepted on account of the negative and statistically significant coefficients of land (farm size) and education. The result implies that farmers with larger farms are less likely to be risk rationed compared to their counterparts with smaller farms. Also, farmers with lower levels of education are more likely to be risk rationed than their counterparts with higher educational attainment.

Furthermore, the results show that male farmers have a higher probability than females of being risk rationed, and farmers in the north are more likely to be risk rationed than their southern counterparts. The positive and significant coefficient of borrowing status is more or less a definitional result indicating that having formal debt is positively associated with the likelihood that a farmer will be risk rationed.

As regards price rationing, 9 of the 11 variables included in the model turn out to be significant determinants. The two exceptions are marital status and farm size. Price rationing is found to be decreasing in financial wealth, judging by the negative and significant coefficients of nonfarm

income, farm income, and savings. The results show that the higher the level of education a farmer has, the lower the probability of being price rationed, whereas a farmer with more farming experience is more likely to be price rationed than one who has less experience. This implies that farming experience is far more important than educational qualification in determining whether a farmer will have unrestricted access to loans. Moreover, there is a negative relationship between household size and price rationing. A farmer with a larger household size is less likely to be price rationed than one with a smaller household size. The relationship between formal borrowing and price rationing is positive and significant, implying that the probability of price rationing is higher among the borrowers than non-borrowers. We find that male farmers have a lower probability of being price rationed than female farmers, just as the farmers in the north are less likely to be price rationed than their counterparts in the central region.

The analysis of credit rationing in three different categories brings out the effects of the explanatory variables in a way that provides a better understanding of the determinants of credit rationing among small-scale farmers than would have been the case if only one category had been examined. This analytical approach indicates that a particular variable may have different effects on different types of rationing. A generalization of the effects of such a variable can be misleading and is therefore inadvisable. For instance, seven variables that significantly affect at least two of the credit-rationing categories have marginal effects that are diametrically different from one category to the other. As shown in Table 4.13, a marginal increase in farm income will increase the probability of farmers being quantity rationed by 13.3 percentage points but reduce their probability of being price rationed by 1.3 percentage points. The marginal effect of nonfarm

income with respect to risk rationing and price rationing is similar, though infinitesimal. In the same vein, an increase in savings is associated with an increase in the probability of quantity rationing but a decrease in the probability of price rationing. An additional year of farming experience will decrease the probability of farmers being quantity rationed by 2.1 percentage points, whereas it will increase the probability of price rationing by the same percentage. Moreover, an additional year of education will increase the probability of quantity rationing by 5.1 percent, whereas it will lead to a reduction in the probability of risk rationing and price rationing by 1.4 and 3.7 percentage points, respectively. Finally, in terms of disparity in gender and geographical location, the results reveal that male farmers are more risk rationed but less price rationed than their female counterparts, while northern farmers are more risk rationed and less price rationed than those in the south. The implication is that financing mechanisms aimed at relaxing the constraints facing small-scale farmers need to be evaluated, taking into account gender and geographical location.

4.4Effects of Credit Rationing on productivity of small-scale farmers in the Nasarawa state

In chapter one, one of the leading objectives of the study is to show if there is any considerable impact of credit rationing on agricultural productivityand loan repayment in Nasarawa State. To this end, agricultural yield per hectare of land for selected crops is estimatedusing a criterion equation as bases of separation across the two groups of households and estimation is carried out using Full Information Maximum Likelihood (FIML) procedure. The result for determinants of agricultural yield for the two groups of households is presented in Table 4.14. Different farm specific, household demographic characteristics, location dummies, production inputs, shock and risk dummies and liquidity variables have been included among the factors that determine

Table 4.14: Determinants of agricultural productivity for each credit regime

Explanatory Variables	Un-rationed Households	Rationed Households
Liquidity	-0.0388	0.0254
	(0.0552)	(0.0183)
Value of Fertilizer per hectare	0.0517**	0.0603*
	(2.39E-05)	(0.0177)
Land size in hectares	-0.1704	-0.1662*
	(0.0727)	(0.0515)
Male household head dummy	0.0755	-0.0596
	(0.1293)	(0.0802)
Age of household head	0.0135	0.0977
	(0.0189)	(0.0102)
Household size	0.0107	0.0179
	(0.0230)	(0.0139)
No education	0.0351	-0.0057
	(0.0852)	(0.0546)
Primary Education dummy	-0.0132	0.0532
	(0.0934)	(0.0634)
Secondary Education dummy	0.1519	0.0108
	(0.2620)	(0.1949)
Post-secondary Education dummy	0.0512***	-0.0143**
	(0.0137)	(0.0075)
Dummy for household in North	-0.0109	-0.0887
	(0.1179)	(0.0682)
Dummy for household in Central	-0.2387	-0.4489*
	(0.1703)	(0.0708)
Dummy for household in Western	-0.1136	-0.1652**
	(0.1198)	(0.0775)
Risk averse household	0.0559	0.0653
	(0.0696)	(0.0431)
Number of oxen in the household	0.0410	0.07165*
	(0.0331)	(0.0224)
Hired Labour	0.1242***	0.0966**
	(0.0700)	(0.0486)
Constant	0.9784*	0.5018*
	(0.6932)	(0.5854)
Rho	0.7854	0.5437635

Source: Author's computations based on the field survey 2018.
Note: Figures in parentheses are t-value for each of the variables. * Significant at 1 % level; ** significant at 5% level; *** significant at 10% level.

productivity. A significant variation on the impacts has been revealed across the two groups of households. These variations accounted for credit ration statuses of households, keeping other

things constant. This implies that credit ration conditions distorted the effect of explanatory variables across the two groups of households.

In chapter 3, we argued that liquidity may have different marginal effects on productivity and loan repayment across the two groups of households. Its impact was expected to be positive and significant for credit rationed households and insignificant for un-rationed ones. However, the result revealed that the impact of marginal increases in liquidity is insignificant but positive for rationed farmers and insignificant and negative for un-rationed households. The interesting insight here is the variation in the sign of coefficients. Though insignificant, extra liquidity has a positive

impact in raising productivity and loan repayment of rationed and hurts productivity and loan repayment of not rationed farmers. The negative sign for not rationed farmers may reflect the fact that an improvement in the financial resources of not rationed farmers may increase their aspiration in none farm activities which will hurt their agricultural productivity and the repayment of their credits finally. The insignificant coefficient for rationed farmers may further reflect the presence of financial illiteracy. Financially illiterate households may have the demand for credit but the reward for credit may not sound great due to their poor financial utilization which is believed to be prevalent among households in many parts of the state. But still we can firmly argue that better financial deepening for creditrationed households will improve agricultural productivity conditions if we happen to apply themcomplementarily with other behavioral extension programs that improve the state of financial literacy of farm households.

In this study, there should be a clear understanding that liquidity is not the only variable which shows the effect of credit rationing on agricultural productivity across the two groups of

households. Because credit rationing conditions of households affect how other variables behave in the estimation of the agricultural productivity equation both the direction of the effect and level of significances. The variable for intensity of fertilizer consumption per hectare of land is positive and significant at 1% and 5% level of significances for rationed and not rationed households respectively. The marginal effect is greater for rationed farm households. If a typical household increases expenditure in fertilizer by ₦1000 per hectare, output will grow by 5.17 and 6.03 percent for not rationed and rationed households respectively. This implies that there is a room for better productivity in agriculture through intensive use of fertilizer which can be met through better access to credit for credit rationed households.

The prevalent of land size-productivity puzzle is evident for both groups of households as the negative sign indicates for the parcel of land in hectare owned by households. It is significant at 1% for rationed and at 5% for not rationed households. A 1 percent increase in the land holdings of a typical household reduces land productivity slightly, similar to 17 percent for both un-rationed and rationed households. It may be likely that if the adverse effect is worse for rationed farmers as expansion in land use under credit rations obliges households to engage in less technology intensive production procedures due to the binding financial problems. But the story may be similar across both rationed and not rationed households.

Location dummies are found to be insignificant for credit not rationed households compared to the Northern senatorial region. The implication is that as far as farmers are not credit rationed, they can raise their land's productivity by applying alternative procedures irrespective of agro-ecological settings. Though natural topography and climate variables matter in agricultural

production, farmers can still pursue alternative mechanizations that make them productive wherever they are as far as they are free from rationing in the credit market. But on the other way location dummies are found to be negative and significant at 1% and 5% for households in western senatorial region and Northern senatorial region respectively for credit rationed households. But for central region, though the coefficient is negative, there is no significant yield variation in relation to the other regions. The situation in North and central can be explained as, these Zones are characterized by lesser productive agriculture and markets due to their proximity with the federal capital of Nigeria. Compared to households in the North, the value of agricultural output is more by 44.9 percent and 16.5 percent in the western senatorial region. But as we saw earlier, these variables didn't significantly appear to determine location biases in productivity under credit not rationed conditions, though they assume negative coefficients. That is an indication for the possibility of better conducive productive agriculture to the existing agro-ecological conditions if farmers didn't happen to be credit rationed. But this didn't work if households are rationed. Our firm argument is that there is no incentive in investments for agriculture under financial market failures.

Number of oxen owned by the household significantly improved the value of agricultural productivity for credit rationed households, but insignificant for the not rationed counterparts. It is evident that an extra ox acquired by a typical credit rationed household improves yield by 7.2 percent. This result is consistent with the findings of Ali et.al (2012) on Pakistan. They argued that this is an indication of the existence of positive shadow price for oxen. Given that when households are credit constrained, it is difficult for them to acquire the extra oxen they may want

which shows the existence of unmet productivity potential for credit rationed households as a failure to get the optimal number of oxen.

Dummy for hired labor is positive and significant for both groups of households. The value of agricultural production for households that used hired labor is greater than those who are not by 12.4 and 9.6 percentage points for not rationed and rationed households respectively. The effect is lesser for credit rationed households may be due to the problem that credit rationed households face difficulties in acquiring other inputs which may raise labor productivity. If these inputs have labor productivity incentive effect, labor productivity for rationed households will be lower and that is what exactly happens in our result.

The remaining variables included in the productivity equation are insignificant for both rationed and not rationed households. It is surprising that none of the household demographic characteristics are significant.

4.5Effect of credit rationing on farm Investment by small farmers in Nasarawa state

To achieve the fifth objective, the investment model is used to estimate and investigate the effect of credit rationing on the investment behaviour of Nasarawa State farm households. Of particular interest is the relationship between governments promoted credit access and actual amounts spent for productive investment purposes. We start with an overview of the investment outcomes based on the survey data and proceed to present the estimation results, including the marginal effect of credit on investment.

Small Farmers were asked to indicate which investment activities attract their total investment volume. In Table 4.15, we present the mean shares of various investment purposes in the total investment portfolio of each farmer. The analysis is restricted to respondents who reported positive investment in their responses.

In Table 4.15, we marked (P) for those investment activities which are classified as productive investment, that is, items that are primarily regarded as enhancing the productive capacity of a farmer. The table shows that the major investment activities were related to the renovation of residential buildings and to automobile purchases which do not fall under this category of farming activities.

Only on items 3, 4, 6, 7, 8, 9, 14 and 15 positions are investments in productive assets, in particular buildings, machinery, land, and livestock. The results show that investment priorities of Nasarawa State farm households are such that growth in agriculture is ranked lower than what could be labeled agriculture aided goods. The Investments are not directly related to agricultural activities as they are rank lower. From the results Machinery/equipment for non-agricultural uses or establishment of building for personal use carry the highest amount of the credit accessed. Including not credit-rationed respondents in the analysis did not change anything.

Put in a more explicit way, the result of credit by rationed farm households (Table 4.14) shows that renovation of buildings is equally important as the purchase of agricultural machinery as they both carry the same weights. Also, an automobile purchase was next as it ranks relatively high as the second activity.

One of the major aims of our analysis is to find out how productive investment of Nasarawa State farm households is related to government promoted credit access. The pool of credit-rationed respondents as described in the table is used for the estimation of the investment equation. Note however that only 79.5 percent of these respondents reported positive investment, and 44.1 percent took long-term loans. The characteristics of the sample are illustrated by a number of descriptive statistics in Table 4.14.

Table 4.15: Mean shares of various investment activities of credit rationed farmers (in descending order)

Investment Purpose	Mean share (%)	Investment Purpose	Mean share (%)
1. Renovate or extend residential building	20.27	8. Buy land (P)	5.87
2. To add more wives	15.09	9. Buy animals (P)	5.42
3. Buy automobile	14.48	10. clear farmland for expansion (p)	2.74
4. Pay political expenses	13.98	11. Buy machinery/equipment for non-agricultural use	0.97
5. Renovate or extend farm buildings (p)	13.04	12. Buy mobile phone	0.89
6. Buy agricultural machinery (P)	13.01	13. Buy plants for farm use (P)	0.22
7. Buy Vehicle for private use	10.54	14. Other (P)	3.26

Source: Author's computations based on Nasarawa State survey 2018.

The results of the estimations are presented in Table 4.16. The coefficients of all the regressors have the expected signs and are significant, at least at the 10 percent level. The coefficient of land variable is significant at 5 percent, indicating that farmers with fewer assets invest more. A concern is the marginal effect of credit on investment. The effect is smaller than one, which

points to an underutilization of credit for productive investment purposes. This is in accordance with the farmers' use of credit funds. Only 50 percent of the borrowers have amounts of productive investment more than the credit volume. However, this means that this effect is constant over the entire range of observations. The coefficient of farmers with permanent bookkeeping and farm location variables are significant and have the expected sign. The implication is that farms with permanent bookkeeping and farmers in a region systematically invest more but with less credits.

Table 4.16: Description of variables used in the investment model (rationed sample)

All rationed respondents	**Mean**	**Std. Dev.**	**Min**	**Max**
Investment volume (₦'000)	24.8	42.4	0.0	322.5
Credit volume (₦'000)	20.6	43.2	0.0	400.0
Land owned Beginning (₦'000)	65.7	97.3	0.0	600.0
Farm has permanent book-keeping (dummy)	0.4	0.5	0.0	1.0
Farm is located in a region (dummy)	0.3	0.5	0.0	1.0
Respondents with positive investment				
Investment volume (₦'000)	31.2	45.5	0.0	322.5
Credit volume (₦'000)	24.8	47.4	0.0	400.0
Land owned Beginning (₦'000)	60.2	88.4	0.0	520.0
Farm has permanent book-keeping (dummy)	0.5	0.5	0.0	1.0
Farm is located in a region (dummy)	0.3	0.5	0.0	1.0

Source: Author's computations based on Nasarawa State survey 2018.

The marginal effect is the partial derivative of expected investment with respect to credit. The result shows that 1 percent increase in credit will improve investment by 0.782 though significant at 10 percent level. Land own initially has no effect in investment while permanent bookkeeping and location has marginal effect. The general result of a diversion of the marginal credit funds from investment is supported as expressed by the estimated coefficients.

The results reveal that, over the range of smaller credit volumes, the marginal effect slightly increases with increasing credit volume. If the land variable is taken to measure farm size, the following relationships can be traced empirically. There is a significant positive correlation of 0.22 between farm size and investment volume, which means that large farms invest more. The correlation between credit volume and land owned is 0.30. Accordingly, if non-borrowers are neglected, high farm-individual marginal credit effects are found in the group of relatively larger farms. However, net of the credit effect, farmers invest less, as can be seen from the regression results. The implication is that, out of a group of farmers with equal credit volume, smaller farms devote a higher amount of money to investment. Overall, it is therefore incorrect to say that large farms invest more, but if they use credit for investment, they obtain larger credit volumes and divert more to non-productive activities.

Table 4.17: Estimated investment equations/model

	Estimates	
Variables	Coefficient	Marginal Effect
Constant	-0.782	–
	(-.229)	
Credit volume (₦'000)	0.783	0.602
	(2.031)	
Land owned Beginning (₦'000)	-0.082	-0.063
	(-2.678)	
Farm with permanent book-keeping (dummy)	10.597	8.145
	(2.087)	
Farm is located in a region (dummy)	20.909	16.070
	(3.422)	
Inverse Mills Ratio	–	–
Log-Likelihood	-610.996	
Adjusted R^2	–	–
Number of Observations	156	156

Source: Author's computations based on Nasarawa State survey 2018.
Notes: t-values in parentheses. t-values of the linear model corrected for selectivity. Marginal effects calculated at sample means of selected observations.

However, the results support the structural problem of small farmers in Nasarawa state which is still at the subsistence level. Farming practice in the state is very much in the small holder'scategory as government and banks effort to fund the development of agriculture in the state has continued to be manned by the diversion of these funds to other uses.

Even the productivity in terms of yield per hectare is not good enough as it lags behind other states in the country. The use of credit to purchase agricultural inputs is low as shown in the results. This has adverse effect on the performance of the farmers as well as the loan repayment that should inform banks to lend more to the sector. Despite the willingness to repay the loan has no effect on the banks as most repayments seem to come from non-farm income.

4.6 Discussion on the findings

From a cursory look at the results in this chapter, some selected variables have significant regression coefficients. The factors that determine credit access and credit rationing are strong and consistent with theories but preferences are given to the evidence supplied by the access and rationing equations which is affected by the presence of small farmers performance. As predicted by the theoretical analysis of the two-period case with regulatory enforcement, changes in access and rationing are positively affected by changes in performance or productivity. The three parameters that is, borrowers, characteristics, loan terms and government incentives in the rationing regression is positive and strongly significant for the productivity and significant at 5 percent level. Both the risk rationing and quantity rationing grow at a slower pace for productivity and investment, the positive/negative and insignificant effect of price rationing. This

is consistent with the rational hypothesis that with more fund to small farmers, more will produce at optimal.

This reduction in management inefficiency and the bank stringent conditions together with increased investment through the purchase of agricultural input should increase performance across the small farmers. It might therefore be expected that accessing and rationing credit would increase investment by increasing performance and thereby develop the agricultural sector. If this is the case then regulation under the credit programs has been successful in achieving the desired objective of the government in developing and investing performance of small farmers which would have been efficient. Aside the credit programs of the government, banks often had quite different risk-return profiles. Even within them, considerable variations in risk exist. The ability of regulation to reduce search costs by providing 'labeled' risk information with regard to institution has implication for both bank efficiency and farmers performance.

According to responses of farmers made during the survey, about 81 percent of farm households took at least one loan in the reporting period. More than half of the borrowers obtained less credit than desired and are hence regarded as credit-rationed. Completely rejected applicants and discouraged non-applicants are of minor importance in the sample.

Central determinants of credit rationing as revealed by a Probit regression analysis are the reputation of the loan applicant as well as demographic household characteristics along with the terms of the loan and government incentives activities that affect the lending process. Over all loan types respondents with a good credit history have a87 percentage point's lower probability

of being rationed than borrowers who rescheduled a loan in the past. In addition, more adult males in the household decrease the probability of being credit-rationed, while more females increase it. This is assumed to be an effect of higher liquidity demand for consumption purposes by women or a signaling effect due to the higher share of male labour force. If only short-term borrowing is considered, collateral availability is an additional key factor of credit rationing, since more land owned and less land rented decrease the likelihood of becoming rationed. Furthermore, there is some evidence against the view that a depletion of subsidised funds is a major reason for rationing outcomes.

The econometric analysis of farmer's productivity and investment supports the finding that more than 81 percent of borrowers experienced credit rationing by rural banks in the state. For so rationed farms, credit plays a highly significant role in determining output and productivity. These farmers display a marginal willingness to pay for credit. The willingness to pay increases with increasing capital intensity with regard to land. It is significantly different from individual interest rates for credit that account for loan specific transaction costs. Measurable transaction costs were shown to be in the range of 30 percent of nominal interest rates faced by farmers with additional fees forming the major part of these transaction costs. These costs, however, do not rationalise a withdrawal of loan applications and therefore do not constrain borrowers. In the group of credit-rationed farmers, household characteristics have a significant effect on output supply. This is evidence in a violation of separating production from consumption decisions and which empirically support to the existence of market imperfection.

An evaluation of investment activities suggests that non-productive investment ranks high on the priority list of the small farmers. Residential buildings and automobile purchases are the two items with the largest share of farm-individual investment expenses in the reporting period, whereas machinery and land purchases followed on lower positions.

The econometric investment analysis leads to two major results. First, credit access turns out to be a significant factor of investment decisions of credit rationed farmers. This supports the theoretical prediction of a financial constraint model of investment behaviour and is consistent with the qualitative self-classification of respondents. Second, the analysis provides evidence that subsidised credit funds are partly diverted to non-productive purposes. In various specifications of the credit-investment relationship, the marginal effect of credit on productive investment is clearly smaller than one.

The results show that quantity rationing significantly depends on farm income, savings, farming experience, and educational attainment of the farmers. It depends negatively on farming experience and positively on farm income, savings, and education. Thus, the hypothesis that quantity rationing is decreasing in financial wealth is rejected based on the positive coefficients of savings, farm income, and nonfarm income. We also reject the hypothesis that quantity rationing is decreasing in productive wealth on account of the positive sign of the coefficient of land (farm size), and more importantly on account of its non-significance in a statistical sense. We find that gender, geographical location, and marital status have no statistically significant effect on the probability that farmers will be quantity rationed.

With regard to risk rationing, we reject the hypothesis that risk rationing is decreasing in financial wealth, but we accept the hypothesis that risk rationing is decreasing in productive wealth. The result implies that relatively land-poor farmers have a higher probability of being risk rationed. Also, farmers with lower levels of education are more likely to be risk rationed than their counterparts with higher educational attainment. Furthermore, the results show that male farmers have a higher probability than females of being risk rationed, while farmers in the north are more likely to be risk rationed than their other counterparts.

We find that price rationing is decreasing in financial wealth, judging by the negative and significant coefficients of nonfarm income, farm income, and savings. The results show that the higher the level of education of a farmer, the lower the probability of being price rationed, whereas a farmer with more farming experience is more likely to be price rationed than one who has less experience. This implies that farming experience is far more important than educational qualification in determining whether a farmer will have unrestricted access to loans. Moreover, there is a negative relationship between household size and price rationing. A farmer with a larger household size is less likely to be price rationed than one with a smaller household size. The results reveal that male farmers have a lower probability of being price rationed than female farmers, just as farmers in the north are less likely to be price rationed than their counterparts in the other regions.

In light of the foregoing, it is reasonable to argue that despite the policy incentives introduced in the country to increase the flow of credit into the agricultural sector, small-scale farmers in Nasarawa state are still confronted with significant levels of credit rationing in various forms.

There is considerable excess demand in the credit market, and under the various interest rate regimes associated with different categories of lenders (banks and nonbank institutions), credit availability is now a much more critical issue than interest rates. To ensure a win-win situation in which both borrowers and lenders can optimize their returns from participating in the credit market, there is a need for more channels of disbursement in terms of innovative financing mechanisms suited to the commodity value chains with which small-scale farmers are connected.

The analysis provides evidence that credit access and credit rationing are relevant phenomenon in rural Nasarawa State. A significant fraction of borrowers could substantially increase their productivity if access to working capital were improved. However, the examination of the loans revealed that farmers often prefer the investment in non-productive assets to grow investment. Credit rationing hence is unlikely to be the ultimate constraint for modernisation and structural change in the Nasarawa State farm sector. Government intervention in its current form has clearly failed to eliminate credit rationing and the targeting of state sponsored funds through Badakoshi agricultural pragramme establish in the state to assist small farmers access credit turns out to be rather dubious. An alternative government policy should aim to improve the general creditworthiness of prospective borrowers and address the causes of loan default in the past that led to a poor reputation of certain borrowers.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

This study sets out to examine access to credit, credit rationing and the performance of small-scale farmers in Nasarawa State as it affects the development of the agricultural sector. Basically, it sets out to examine the relationship between the borrower characteristics, lender's terms of the credit and government incentives as they affect the demand or access to credit and the supply of credit to the small farmers in the State. The study starts by examining the various efforts of the Nigerian government to make credit available to small farmers and their implication for the development of the agricultural sector in Nasarawa state in light of what factors influence small farmers' access to credit in the State and how does credit rationing affect productivity and investment outcomes of small farmers. Also, the factors that make credit rationing possible were examined. This was used to determine whether banks increase their lending to small farmers in response to the imposition of regulatory measures and pressure of the government.

Credit access and credit rationing can have an ambiguous impact on small farmers' performance and may even decrease performance (Petrick 2004) but where credits are properly utilized, however, performance may be expected to improve. Similarly, management inefficiency in the use of credit is reduced by the more stringent conditionality requirement of the banks. This reduction in management inefficiency and the bank stringent conditions together with increased

investment through the purchase of agricultural input should increase performance across the small farmers. It might therefore be expected that accessing and rationing credit would increase investment by increasing performance and thereby develop the agricultural sector. If this is the case then regulation under the credit programs has been successful in achieving the desired objective of the government Aside the credit programs of the government, banks often had quite different risk-return profiles. Even within them, considerable variations in risk exist. The ability of regulation to reduce search costs by providing 'labeled' risk information with regard to institution has implication for both bank efficiency and farmers performance.

In order to examine the theoretical relationship between the variables, these studies examine theories and models of credit access and credit rationing. This was in an attempt to find out the theory and model that is relevant for Nasarawa State for empirical analysis which can be used to fashion out policies and reforms that can improve the banking and agricultural sector in Nasarawa state. The traditional and modern theories of credit access and credit rationing are those theories discussed by Adams Smith, Vinner, Keynes, Roosa, Scott, Parker and Lindbeck, Keeton and later Modigliani and Miller, Stiglitz and Weiss among others. The traditional and modern theories support the view that credit access and credit rationing influence the intermediation behavior of banks. While the traditional theories of credit access stress the need for banks to lend on borrower characteristics and on short-term, self-liquidating and of good quality, the new institutional theory sees it as underinvestment or overinvestment of the farmers' activities. They are complete theories of access to bank credit and small farmer performance in that they are able to explain the causes, volume and composition of bank credits to small farmers. However, the modern theories are generally not complete theories of credit rationing. They seem

to have been advanced to take care of particular loopholes in the traditional neoclassical theories. Some of these theories have attempted to review and analyze a more realistic explanation of intermediation between borrowers and lenders. More important of the modern theories is the asymmetric information theory and new institutional theory which stresses the rational behavior of banks regarding lending to small scale Farmers. In addition to asymmetric information theories are theories of moral hazard and adverse selection, which sees credit access and credit rationing as a function of borrower characteristics, terms of the loans and regulatory actions of government in lending. The study upholds the modern school of thought that banks are the foremost transmitters of monetary policy and can influence the real sectors of the economy and it is important for the government to intervene in the credit market.

The theoretical investigation of credit markets sets out that credit rationing as a persistent private excess demand for loans is by definition excluded in the traditional neoclassical market model. The introduction of positive transaction costs is a first step to a more realistic depiction of credit market outcomes. However, the claim that empirically observable transaction costs could be regarded as a source or measure of credit rationing is shown to be unwarranted. Only models that explicitly account for asymmetric information between market participants can establish a situation of persistent credit rationing.

The further analysis suggests that credit rationing is a likely outcome on markets with asymmetric information. However, theory does not provide clear propositions regarding the welfare implications of credit rationing. Since the presence of asymmetric information cancels the functioning of the price mechanism, the traditional concepts of social efficiency are no longer

valid. As a consequence, credit rationing does not necessarily imply underinvestment, and it generally does not create a case for straightforward government policy. It seems therefore reasonable to analytically separate the analysis of credit rationing as a privately perceived excess demand and underinvestment as a socially undesirable situation.

The extent to which asymmetric information has harmful effects on investment outcomes depends on the availability of instruments or arrangements such as collateral, joint liability or reputation of borrowers. The study noted that the way in which governments can improve on these instruments and arrangements will play a vital role for successful policy action. Any intervention measures should consider the conditions and causes that are responsible for an undesirable market outcome.

In the framework of a two-period farm household model, the consequences of introducing a binding credit constraint are examined. The market interest rate loses its relevance for household internal allocation of funds and is replaced by an endogenous, unobservable shadow interest rate. Compared with a first-best world without credit rationing, the household will reduce output, which implies a loss of income. An increase in government transfers relaxes the liquidity constraint and thus has positive effects on farm output or productivity.

The model with endogenous equity formation, credit rationing results in a positive shadow price of equity, since equity (for example as collateral) has a value for financing production in the future. Investment cannot immediately attain its optimal level due to credit rationing. The household thus reduces current consumption in favour of equity formation. Since the ultimate goal of the household is current and future consumption, the study noted that possible liquidity

effects on production as a result of increased government incentives are only of a short-term nature. Additional funds are likely to be consumed in the long run. Similarly, we note that improvements in access to credit have conflicting short- and long-term effects on investment.

The presence of a perfect capital market allows the convenient separation of production or investment decisions on the one hand and consumption decisions on the other. Both farm household models suggest that this cannot be maintained under a binding credit constraint, which has two important consequences. First, there is no objective criterion anymore which allows assessing the efficiency of input use or investment activities. Both decision complexes can only be made simultaneously with the household's consumption plan and are thus affected by the household's preferences. Second, we noted that any empirical production or investment analysis has to take these interdependencies into account. Household preferences have to be made amenable to measurement and must not be neglected in the analysis.

After reviewing and analyzing the theories and models of credit access and credit rationing, the study upholds that, at the theoretical level, no theory so far reviewed can adequately explain the relationship between small farmers credit access and credit rationing in Nasarawa State. This study therefore, suggest that, for an underdeveloped agricultural sector like Nasarawa State, this relationship should be theoretically formulated taking into consideration the role of the government and the level of agricultural development.

Thus, in the model of the farmer's credit demand and supply were broken down into credit access, credit rationing and farmers productivity. As regards the theories and models, this study discovered that no theory or model could adequately explain the pattern in Nasarawa State.

Although most of the theories are relevant in the countries of their geo-political origin, however, few of them are relevant in explaining bank behavior to an extent in Nasarawa state. For example, the asymmetric information theory and the new institutional economic theories of bank lending are relevant and consistent in explaining banking business in Nasarawa State based on the level of the economic development of the state. However, the theories fail to mention the fact that, in developing countries banks are risk-averse and their customers do not mostly have the require securities that can be used to support loans demands. It also fails to show that banks are the major provider of credits to the economy. This suggests that a country's socioeconomic and political characteristics could determine its theoretical model and explains why most of the theories advanced are not applicable to other state. Thus, the study has adequately formulated the theoretical model of bank credit access and credit rationing for Nasarawa State to include their loans choice and investment growth. The components of the investment growth are necessary so that the farmers can be able to repay their loans and modernize their farming activities which shouldlead to development of the agricultural sector.

At the empirical level, this study has critically reviewed three categories of empirical literature. The rationale for this categorization is to examine how variables such as credit access and credit rationing affect the performance of small farmers and thus, policy decision and direction. This category includes a Cross sectional studies involving variables such as Quantity, Price and Risk rationing and Borrower's characteristics, bank's terms of loans and government's incentives to encourage lending to small scale farmers.

The variables and cross-sectional characteristics of the data and the technique of analysis vary from study to study. In their study of the determinants of credit participation in the rural areas of Vietnam, Doan, Gibson, and Holmes (2010) employ a probit model in which the gender, age, education, and marital status of the household head, as well as household size, pre-survey income per capita, pre-survey assets, phone ownership, location, and distance to the nearest bank branch, are included as explanatory variables and found that households that are larger and younger, have higher initial income, own a phone, and live in more rural countryside areas have a higher probability of borrowing while gender, education, and assets have no effect on the credit participation of rural poor households. Other empirical studies are discussed extensively in chapter two.

The third chapter starts with a reflection on the socio-economic and demographic profile of Nasarawa State and the methodological foundations of empirical economic analysis. It is assumed that econometrics cannot be the fundamental benchmark for the falsification of theories because there are no universal laws in economics and there are huge opportunities for data mining in the research process as there are no absolute standards for the statistical rejection of hypotheses. The methodological standpoint of critical rationalism should therefore be left behind and be replaced by a more pragmatic and instrumentalist position. In view of this, the study surveypossible methodological approaches to the empirical analysis of credit rationing and it revealed that there are a number of techniques available in the literature. The empirical results of the present study are primarily based on a descriptive statistic and a regression analysis of cross-sectional survey data which combines qualitative and quantitative indicators of credit access and credit rationing. The empirical strategy is discussed extensively in chapter three.

This study upholds that, no study has adequately captured the influence of access to credit and credit rationing of banks in Nasarawa State. This has been considered in the model estimation and the results have been interpreted and analyzed to conform to the prevailing situation in the state. It suggests that previous studies particularly for Nasarawa State and Nigeria may be spurious and might have led to misguided policy decision and direction, which explain why most of the agricultural credit programmes and policies have not yielded any appreciable impact as the sector remain underdeveloped.

Concerning policies on access to credits the study found that most of the policies regarding credit access have not been effective due to banks behavior. The supply of credits by the banks appears to be crucially dependent on the farmer characteristics and on the loans, terms already reached in the last period. This is an important conclusion in the context of the general acceptance of small farmers as an important variable in Nasarawa State development efforts. Most farmers and bankers in Nasarawa State often think that the best bank to loan money and the way to grant more loans is by meeting the needsof the big and influential farmers.

The international experience as discussed in chapter 1 of this study suggests that the type of policy intervention currently in place in Nigeria and Nasarawa State is usually difficult to be justified on economic grounds. Beneficiaries of similar programmes in other countries often did not increase the efficiency of their operations before accessing subsidised funds. Funds can rarely be targeted effectively as capital subsidies implied negative incentives for the development

of financial intermediaries as government investment promotion often turned out to be prone to political abuse. For these reasons, we are not interested in this type of market intervention.

The previous theoretical and empirical analysis discussed a number of these issues and it aim at scrutinising the role of government policy in addressing potential deficiencies of credit markets in general and the Nasarawa State rural loan market in particular. Although the current debate in the literature is not yet settled, it seems widely accepted that a theory of credit markets with pervasive agency relations concedes government activity as a potential role in improving market outcomes. The problem is that, although unfettered markets are likely to lead to suboptimal allocation of funds, it is almost impossible to predict from a theoretical analysis alone which type of government intervention is optimal. A major result of the analysis is that any policy measure should tackle the causes of undesired market outcomes. Although theory suggests potential causes, their ultimate identification has to be made on empirical grounds.

With regard to credit markets, it was shown that credit rationing does not necessarily imply underinvestment as compared with a real-World situation. However, the empirical detection of underinvestment was seen to be not straightforward, and was dropped from the research agenda of this study. Furthermore, the discussion in the previous chapter leads to doubts whether a purely hypothetical comparison with the real world is of any value for practical policy advice.

Policy recommendations therefore must focus on the role of government within a world of asymmetric information and opportunism. The problem is that governments are likely to face the same problems of, say, adverse selection or moral hazard as other economic agents do.

Frequently it is when government is eliminating certain agency problems that even create new ones. An example is the granting of public loan guarantees in order to mitigate the problems of loan collateralisation. Depending on the precise design of the programme, banks' incentives to properly screen and monitor borrowers might be diluted because the government effectively takes over the risk of loan default. The agency relation between the bank and the borrower is then simply transformed into an agency relation between the government and the bank. For these reasons, we are skeptical with regard to direct market intervention by governments. Although the government has no advantage of its own in assessing risks and premiums, it should foster the adequate use of screening and monitoring procedures, for example by an appropriate regulation and supervision. It can assign property rights in such a way that collateral problems are reduced, which should overcome existing agency relations.

5.2 Conclusion

The theoretical analysis of agricultural household models shows that credit rationing has a number of undesired consequences for the performance of the small farmers. In particular, the more severe the credit restriction, the higher are the reductions in farm output and farm income and the slower is farm growth especially where there are profitable investment opportunities available. Any government should therefore be interested in removing binding credit constraints in their farm sectors.

The empirical analysis of credit rationing in the Nasarawa State agricultural sector provides a host of valuable information for policy advice. It may be useful to sum the major findings that are relevant as:

(i) 81 percent of surveyed farmers took some type of loan between 2014 and 2016, though the survey does not include pure subsistence farms.

(ii)About 87 percent of borrowers are rationed by rural banks in the sense that they would have liked to borrow more at the same interest rate than they obtained.

(iii)Credit rationing was shown to be due inter alia to a poor reputation of borrowers and to depend on the number of male and female household members. The availability of collateral plays a role in short-term lending, while reputation effects are particularly pronounced if all types of loans are considered.

(iv)Credit rationing restricts farm productivity to a substantial extent. With regard to working capital loans, farmers' call for more credit is hence legitimized ex-post.

(v)The existing governmental subsidy scheme does not eliminate credit rationing. On the other hand, there is evidence that it is not the ultimate source of rationing.

(vi)With regard to investment loans, funds are frequently diverted to nonproductive uses, particularly if loan sizes are small.

The results show that the rural credit market provides resources for most farmers in the state. However, credit rationing is a relevant phenomenon. The analysis highlights the role of devices to overcome problems of asymmetric information (collateral, reputation), which could be a first hint for policy advice. In addition, other factors (demographic characteristics) come into play as well. The empirical investigation also suggests that there are several critical points of current government intervention. It is clearly not successful in removing credit rationing, which is no surprise if a lack of collateral or reputation are at the core of the problem. With regard to medium-term loans, the targeting of credit is rather dubious. On the other hand, it might be seen

as a virtue that lending apparently does not discriminate against small farms, since land owned has no significant effect on the probability of being credit-rationed. If only short-term borrowers are considered, there is a weakly significant, negative effect of land owned on the probability of being rationed.Below we recommend a number of policy measures to begin moving the country and the state in a better direction.

5.3 Recommendations of the Study

Based on the above considerations, the following policy recommendations can be given:

(i)The Nigeria and Nasarawa State government should reconsider the objectives of its agricultural credit policy. The current policy of subsidising interest rates is not successful in eliminating credit rationing. In addition, it is neither well targeted to improve farm productivity nor does it effectively foster investment in farm growth and productive assets. The government should therefore consider phasing out the current subsidisation scheme, since the dubious benefits are unlikely to justify the costs of funding and administering this programme.

(ii)Adequate policy measures should address the problems of lacking collateral and poor borrowers' reputation. It should be checked to what extent government policy can improve this. Since mortgaging land is widely practised in Nasarawa State, there seem to be a decisive bottleneck in the legal basis for this. However, it should be examined how far macroeconomic factors or a widespread policy uncertainty are relevant for the defaults of borrowers.

(iii) The government needs to create a regulatory environment that supports the modern contractual obligations that are characteristic of well-functioning agricultural financing and in which agricultural commodities and movable property can be accommodated as collateral. This

will be a necessary addition to the assistance already being provided under NIRSAL in the form of loan guarantees and other risk-sharing incentives.

(iv) The transformation of the agricultural finance system will also involve upgrading farmers' risk management capacity in terms of prevention, mitigation, and coping strategies. This is important because it will enhance their credit ratings as lenders begin to emphasize this factor in the assessment of farmers' creditworthiness. A change is therefore needed in their attitude to credit participation. Their orientation to formal credit must change from that of political participation to business facilitation. Farmers must refrain from seeing credit as another government money that is being shared for political participation and purge themselves completely of this misperception, which has been popularized by the political class over the years. They should be encouraged to cultivate a culture of precautionary savings and enterprise diversification to strengthen their credit ratings and financial capacity in general. The incentives under NIRSAL, as well as other credit policies being pursued by the Central Bank of Nigeria are likely to lead to improvements in farmers' savings. The extent to which this will affect their demand for loans, however, remains unknown. Also unknown is the extent to which NIRSAL has encouraged increased lending to small-scale farmers.

(v)The appropriateness of banking technology and screening and monitoring practices should be checked by the baks. The econometric analysis provides a number of hints for this task. It should be examined what is behind the fact that household characteristics play a role in the probability of credit rationing. Are these characteristics taken into account by the banks' decision to grant a loan, and, if yes, why is this the case? Does this point to some sort of discrimination? It was shown that transaction costs, and in particular fees, considerably mark up the effective interest rate farmers have to pay. Although careful screening of borrowers is an important task of banks,

it should be looked at whether banking practices can be streamlined to reduce these costs. Whereas the overall transition of the Nigerian banking industry has been widely successful, there is evidence that the unfinished restructuring and reconsolidation process of the rural banking sector might be partly responsible for still inefficient banking practices. Government policy should support this process. Other potential government activities should include the establishment of a private credit rating agency, financial support to assessing credit worthiness of borrowers and the general support of market information systems.

(vi) There is the need to improve the collateral requirement of banks by Legislation in Support of use of alternative collateral other than landed properties. From our results, the need and use of collateral other than land is increasing in the context of agricultural financing. In some develop countries like Romania and Kosovo, and even developing countries like Rwanda in Africa, agricultural-finance providers have accepted assets such as cars, tractors, animals, or crops from the fields as collateral. Though some banks have started doing this but the legal environment and banking regulations do not encourage or embrace the pledging of movable assets as collateral for bank lending, making it difficult for banks to contemplate accepting them or understand how they could foreclose on such items, even for short-term loans, in the case of default. The expansion of bank lending to agriculture has been constrained partly because of the inability of potential borrowers to offer acceptable collateral. One way of resolving the issue would be the design of collateral substitutes backed up with appropriate legislation.

(vii) Insurance system should be liberalized and refocused the Agricultural Insurance services. Farmers (crops and livestock producers) are to be insured against risks occasioned by damage or loss caused by fire, lightning, windstorms, floods, drought, accidents, diseases, pests, or invasion of farms by wild animals. On account of high operational costs, low farm incomes, low levels of

demand, misperception of the insurance concept by farmers, and poor administration, the scheme has not been popular among small-scale farmers and has not been able to allay the fears of lenders concerning the adverse effects of exogenous risks on farmers' repayment capacity.

To strengthen the role of insurance in risk mitigation and increase credit participation by small-scale farmers, Nasarawa state and Nigeria should begin to prepare the ground by de-monopolizing the provision of agricultural insurance and refocusing its operations in the direction of index insurance in the medium- to long-term horizon.

(viii) Warehouse receipts are documents issued by warehouse operators as evidence that specified commodities, of stated quantity and quality, have been deposited at particular locations by named depositors (Onumah 2003). Typically, producers deposit their goods in a certified storage facility in exchange for a receipt documenting their value, which can then be leveraged for a loan to finance inputs. The farmer hands the warehouse receipt to the bank as collateral for credit-often a proportion of the value of the commodity in storage. Upon selling the product, the farmer notifies the bank, which obtains repayment from the buyer in return for the warehouse receipt. The application of warehouse receipt finance to address the pricing, marketing, and financing challenges in agriculture has been a tradition in the developed world, especially in the grain-producing countries of North America and the former Soviet Union. According to AFD (2012), this mechanism was rediscovered some 23 years ago in Eastern Europe (Kazakhstan, Poland, Russia, and Ukraine) and has also been practiced in other parts of the world, including Thailand, Brazil, and Mexico. It has started to gain ground in some African countries, including South Africa, Zambia, Tanzania, Mali, and Ghana, with varying degrees of success and failure. Generally, it is a promising collateral alternative but relatively complex to implement given the

infrastructure requirements and the legal and regulatory environment. Government should provide incentives or environment to encourage its use in Nasarawa state and Nigeria.

In order to increase the flow of credit to the agricultural sector in Nasarawa state and Nigeria, warehouse receipt finance is highly recommended. This form of commodity collateralization can be a substitute for land and other immovable assets that are often required as collateral by banks but that small-scale farmers are not in any position to provide.

(ix) The repeated pronouncements of the government concerning the recapitalization of the BOA should be of concern to the agribusiness sector, and indeed all stakeholders in agricultural development in the country. The recapitalization is long overdue. At the moment, however, what is required to transform the BOA is far beyond recapitalization. No amount of recapitalization will create the necessary turnaround unless urgent actions are taken to ensure that the ownership, management, and operational patterns are altered. If the BOA is to contribute meaningfully to agricultural financing, it must be licensed to operate as a commercial agricultural bank and not as a parastatal of any ministry. Thereafter, it should be depoliticized, restructured, and recapitalized. Part of the restructuring will involve the creation of savings functions and the inclusion of other financial services in the bank's operations. For instance, since its establishment, the agricultural bank in Nasarawa state and Nigeria has focused only on credit disbursement without any provision for commercial-bank-type savings or other financial services for its clients. It has also relied largely on the government as the source of its loanable funds. Apart from diversification of its services, the BOA should also diversify its clients so that it can provide services to various actors along the agricultural commodity value chains. If the transformation is properly undertaken it will lead to considerable value added in terms of increased wealth creation and employment generation. In its fully transformed status, the BOA should be able to provide

commercial, retail, corporate, and international banking services that are commensurate with the vision of a modern Nigerian economy that is driven by its agricultural potential and agribusiness opportunities. As argued elsewhere, this holistic approach to financial service delivery is required for the transformation of agriculture not only in Nasarawa state but in Nigeria as whole. Agricultural entrepreneurs, irrespective of their scale of operation, need more than just credit from providers of financial services. They need money transfer and payment services as well as savings facilities. No amount of government funds injected into the institution by way of recapitalization will solve the problem; the bank will remain unviable and unsuccessful unless the pattern of ownership is liberalized, sources of capital are diversified, and meaningful savings functions are introduced. As farmers embrace the savings culture, it is essential that the financial institutions serving them offer safe, convenient, and accessible savings facilities. A BOA that is totally transformed into a bank in the true sense of the word, especially in the manner recommended above, should be in the best position to offer such services in the state and Nigeria as a whole.

5.4 Recommendations for future research

The aim of this final section is to look at the implications of the analysis for potential future research activities. Since only a fraction of open questions raised in the course of the study could be addressed explicitly within this study and because many of the proposed answers might be regarded as tentative or unsatisfactory, it seems useful to identify a number of key research areas for the time to come. We restrict the considerations to the narrow range of issues that formed the core of this research. The recommendations can be grouped as follows:

(i) The analysis has demonstrated that the theoretical understanding of many relevant real-world phenomena isnot met in the standard neoclassical models has progressed, as there are still many unresolved problems. The theoretical landscape has evolved neither in a uniform nor in a consistent way. This is of course natural and only to be expected in a rapidly growing research field. However, it seems particularly desirable to develop more robust theoretical models for predicting the implications of asymmetric information, or the consequences of dropping other assumptions of the neoclassical tradition. One question to be raised is whether the highly abstract and mathematically oriented way of analysis can and should be retained. Communication processes with proponents of more verbally oriented theoretical approaches such as Transaction Cost Economics should be sought.

(ii) This should go hand in hand with a further exploration of the empirical applicability of NIE concepts in general. Although the consequences of agency theoretic models for the empirical analysis of real-world events are increasingly understood, there is still a gap between the abstract and often highly simplifying theoretical models and the practical policy problems. Matthews (1986, p. 917, as cited in Eggertson 1990, pp. 31-32) is still right in arguing that because economic institutions are complex, they do not lend themselves easily to quantitative measurement. Even in respect to what they do, the data often are not routinely collected by national statistical offices. As a result, the statistical approach which has become the bread and butter of applied economics is not straightforwardly applicable.

The present study has provided an example of how the economic analysis of institutions can be undertaken by using econometric modelling techniques. However, the approach is still been carried out on a general level, for example in terms of specifying functional relationships. It

seems therefore desirable to further strengthen the link between theoretical concepts and representative empirical and policy-oriented analysis.

(iii) Future work on the Nigeria and Nasarawa State in particular could extend the current research in a number of directions. The first could be to investigate other sources of finance in Nasarawa State agriculture, in particular informal sources or trade credit. These have been largely neglected in this study because they are of less quantitative relevance as compared to formal credit. However, they may be important for small scale and subsistence farms. A second approach could be to carry out a more comprehensive cost-benefit analysis of Nasarawa State credit market intervention. This would be a challenging task, in particular with regard to a proper measurement of the programme's benefits. The third issue not investigated in this work concerns the political aspects of government intervention on credit markets in Nasarawa State. Future research could possibly draw on work by Wenzeler (1999), who provides an analysis of banking sector restructuring in Poland based on political economy considerations.

(iv)The final most important task for subsequent research concerns a further indepth analysis of the determinants of structural change in the Nasarawa State farm sector. The current study has failed to provide a comprehensive explanation based on credit rationing. In contrast, the empirical analysis demonstrates that credit access seems not to be the decisive bottleneck for farm investment and growth. Future work should investigate other reasons for slow structural change in Nasarawa State agriculture. A promising starting point for such an investigation will be the rural labour market, the current shape of which effectively blocks the outflow of agricultural labour force or even forces people into the sector to secure a most basic livelihood. Structural change and the development of labour and land relations in Nasarawa State agriculture are of high political interest for the years to come. As observed by Tangermann and Swinnen

(2000, p. 198), rural labour markets are among the least understood phenomena of transition economy.

Overall, there are fundamental research questions yet to be answered in the theoretical, empirical, and policy-oriented spheres of this field. Following Hanf (1997), it is to be hoped that agricultural economists with their rare blend of experience in all three dimensions of research accept the challenge.

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APPENDIX 1: QUESTIONNAIRES

Department of Economics,

Faculty of Social Sciences,

Ahmadu Bello University,

Zaria.

Kaduna State.

Dear sir/Madam,

LETTER OF INTRODUCTION

I am **Aku, Emmanuel Maganie**, a postgraduate student in the above Department and faculty, working for the award of Doctor of Philosophy in Economics with the Ahmadu Bello University, Zaria, Nigeria.

As part of the requirements for the award of the degree, I have to carry out a research dissertation. So, therefore I am approaching you to kindly assist me in the data gathering to enable me write up the thesis which is on **Effect of Credit Rationing onthe Performance of Small-Scale Farmers in Nasarawa State.**

The information provided will only be used for academic purposes and will be treated with utmost confidentiality. You are assured that every assistance or information given to me will be most appreciated.

While thanking you very much for everything, I count on your best co-operation.

Yours sincerely

Aku, Emmanuel Maganie

QUESTIONNAIRES TO SMALL SCALE FARMERS

1 SMALL SCALE FARMERS CHARACTERISTICS

1 Where is your farm based?

Senatorial Zone	Local Government Area	District/Village

2 Are you

Male ( )

Female ( )

3 Age of Household Head

25-34 ( )

35-44 ( )

45-54 ( )

55-64 ( )

65 and above ( )

4 The number of members of the household

Less than 5 ( )

Between 6 and 10 ( )

11 and above ( )

5 The number of labourers over 16 years old

Less than 10 ( )

Between 11 and 50 ( )

51 and above ( )

6 Which Education Level have you reached?

Never attended ( )

Primary Certificate ( )

Secondary Certificate ( )

College degrees and above ( )

7 The farming activities that household are engaged in (multiple responses possible)

Cultivation ( )

Livestock farming ( )

Aquaculture ( )

Teachers or civil service ( )

Transportation or farm ( )

Products processing ( )

Others ( )

8 For how long have you been in the farming business?

Less than 2 years ( )

2 - 5 Years ( )

6 - 10 Years ( )

More than 10 Years ( )

9 Major source of income

From cultivation ( )

From Livestock farming ( )

From doing business ( )

From wages as teacher or civil servants ( )

From migrant workers ( )

10 How many permanent employees does your farm employ in total? If non or prefer not to say, please put 0.

From 1 employee to 9 employees ( )

From 10 employees to 49 employees ( )

From 50 employees to 249 employees ( )

250 employees or more ( )

11 How many seasonal employees does your farm employ in total? If non or prefer not to say, please put 0.

From 1 employee to 9 employees ( )

From 10 employees to 49 employees ( )

From 50 employees to 249 employees ( )

250 employees or more ( )

12 How many of your permanent employees are members of your family (apart from yourself)? If non or prefer not to say, please put 0.

From 1 employee to 9 employees ( )

From 10 employees to 49 employees ( )

13 How many of your seasonal employees are members of your family (apart from yourself)? If non or prefer not to say, please put 0.

From 1 employee to 9 employees ( )

From 10 employees to 49 employees ( )

14 How much land do you

Own in hectares----------

Lease in hectares----------

Rent in hectares----------

15 What is the range of your Asset size in terms of machinery, equipment and working capital but excluding lands and buildings?

Less than ₦1million ( )

₦2million - ₦5million ( )

₦6million – ₦10million ( )

Over ₦10million ( )

16 What is the total land area at the end of 2017?

Less than 3hectares ( )

4 to 10 hectares ( )

Over 10 hectares ( )

17 What is the value of your Residential housing area at the end of 2017?

Less than ₦1million ( )

₦2million - ₦5million ( )

₦6million – ₦10million ( )

Over ₦10million ( )

18 Self-estimation of the level of housing property relative to others in the village

Upper ( )

Middle ( )

Lower ( )

19 Self-estimation of the level of household income in the village

Upper ( )

Middle ( )

Lower ( )

20 Total cash income in 2017

₦10,000 and below ( )

₦11,000 and ₦50,000 ( )

₦51,000 and ₦100,000 ( )

₦100,000 and above ( )

21 Total expenses in 2017

₦50,000 and below ( )

₦51,000 and ₦100,000 ( )

₦101,000 and ₦300,000 ( )

₦300,000 and above ( )

22 What shares of your production do you and your family sell (and not consume yourselves)?

We sell nearly everything ( )

We sell most ( )

We sell about half ( )

We sell less than half ( )

23 Out of the crops produced, which one did you sell, what amount and what price in the last two years?

Crop	2016 bags/kilo	Price per kg/bag	2017 bags/kilo	Price per/bag

24 Out of the livestock raised, which one (product) did you sell, what amount and at what price in the last two years?

Livestock	Product	Amount Sold			
		2016		2017	
		Quantity	Price/Unit	Quantity	Price/Unit
Dairy Cattle					

Beef Cattle					
Sheep					
Goats					
Pigs					
Broilers					
Layers					
Fish					
Others					

25 Is your farming business profitable during the whole year?

Yes ()

No ()

26 Consumer durables that the family has (multiple responses possible)

Television ( )

Motorbike ( )

Haulage vehicle ( )

Hand set/Television ( )

Others: specify……..

27 Apart from farming activities, do you have other activities that bring income into your household? If yes, which source and how much in the last two years?

Other Sources of Income	2016 Amount in Naira	2017 Amount in Naira
Formal employment		
Selling Charcoal/Firewood		
Carpentry		
Small Business		
Brick Making		
Masonry		
Other (specify)		
Total		

28 If hired labour was used in your farm in the last two years, indicate cost per operation per acre.

Operation/activities	C_1	C_2	C_3	C_4
Land Preparation				
Cultivation				

Planting				
Weeding				
Harvesting				
Transportation				
Marketing				
Where C_1 to C_4 are $Crop_1$ to $Crop_4$ respectively				

29 Do you and you keep written financial records of the farm revenue and expenses?

Yes ( )

No ( )

30 On average, what are your monthly sales in Nigerian naira?

10, 000 - 50, 000 ( )

50,100 - 100, 000 ( )

Over 100, 000 ( )

31 How much do you spend on the farm monthly basis?

10, 000 - 50, 000 ( )

50,100 - 100, 000 ( )

Over 100, 000 ( )

32 What is the approximate monthly profit margin of your farm sales?

10, 000 - 50, 000 ( )

50,100 - 100, 000 ( )

Over 100, 000 ( )

33 What was the balance of your deposit account at the end of 2017:

Less than N10,000

Between N11,000 and N50,000

Between N51,000 and N100,000

Between N1101,000 and N500,000

Over N500,000

34 Please fill in the values in the following table about your Farming business (in thousands of Naira)

One growing cycle (season)		
Value of sales (revenues)		
Costs	Land preparation (Machinery/Labour cost)	
	Seeds and Plants	
	Fertilizers	
	Pesticides/Herbicides	
	Harvest (Machinery/Labour cost)	
	Transportation	
	Energy (Electricity, Gas etc)	
	Rent	
	Licences, fees	
	Other	
	Total	
Value of Profits		

35 Please fill in values in the following table about your farming business

Value of building/land	
Values of equipment and Vehicles owned	
Value of livestock	
Value of inventories (raw materials, semi-finished, goods, finished goods)	
Value of Debt	
Value of personal and family expenses	

36 How much does each of these sources contribute to the revenue of you family

Total annual revenue from other sources	In thousands of Naira
Foreign Remittances	
Government service or Pension	
Profits from other crops	
Profit from livestock	
Profit from non-farming business	
Outside job of other family members	
Other sources	
Total Revenues	

Please specify the kind of other sources

37 Please evaluate the development of your farming business over the last 24 months

Declined significantly ( )

Declined somewhat ( )

Remained the same ( )

Improved somewhat ( )

Improved significantly ( )

38 In the last 12 months, what proportion of your farm's working capital and new investment has been financed from each of the followings?

	Working Capital	New investments
	Proportion (%)	Proportion (%)
Farm's internal funds/Retained earnings		
Debt		
Check that Total are	100%	100%

39 Do you have a savings account with a financial institution?

Yes ( )

No ( )

40 How much do you have in savings?.....

41 Have you had a time when you needed a loan from a bank or Bank of Agriculture?

Yes ()

No ()

42 If you urgently need funds, which institution or individual would you prefer to borrow from:

Bank of Agriculture Limited ()

Commercial Bank ()

Other bank ()

43 If you need funds to start or develop your farm, which would you prefer:

Own savings ()

Borrow from a bank ()

Borrow from Bank of Agriculture limited ()

44 Have you ever received a loan from a bank or Bank of Agriculture?

Yes ()

No ()

45 If you have not received a loan from a bank or Bank of Agriculture, what was the reason?

Did not apply ()

Renounced after application ()

Rejected ()

46 If you did not apply, what was the reason? (multiple responses possible)

No need of credit ()

The amount was not sufficient ()

Could not provide collateral ()

Did not have the ability to repay ()

Unaware that farmers could apply for loans ()

Ignorant of lending procedures ()

Private loans were more convenient ()

Other ()

47 What was the reason that your loan application was rejected? (multiple responses possible)

No profitable project ()

Unable to repay ()

No collateral ()

Shortage of funds in the bank ()

No networking in the bank ()

Other ()

48 What was the reason that you withdrew your loan application? (multiple responses possible)

Complicated procedures ()

Bad service (of the institution) ()

The credit line given was not sufficient ()

Short duration ()

Long distance (between the institution and you) ()

High interest rate ()

Other ()

49 What is the approximate distance you have to travel and approximate time it takes to travel to the nearest lending financial institution?.....in kms……in minutes.

50 In your opinion, if you want to get a loan from a financial institution, how important are the following factors? (Rate from 1 to 5, with 1 being least important and 5 very important):

Convenient location of financial institution (1)(2)(3)(4)(5)

Quick disbursement of loan (Quick processing of loan application) (1)(2)(3)(4)(5)

Quality of service of financial institution's staff (1)(2)(3)(4)(5)

Low interest rate/cost of borrowing (1)(2)(3)(4)(5)

Convenient repayment period (1)(2)(3)(4)(5)

Absence of requirement for immovable property as collateral (1)(2)(3)(4)(5)

Availability of other financial services from same financial institution (1)(2)(3)(4)(5)

51 Do you have assets you are willing to offer so as to get the loan?

Yes ( )

No ( )

52 If yes, would you mention the assets that you have (own) which can be regarded as the security (collateral) for the loan? (For example, Land, Machinery, House, Farm, TV, Radio etc)

Assets	Number of assets owned	Value

53 Have you applied for a loan from a financial institution in the last three years?

Yes ( )

No ( )

54 If yes, you

got everything ( )

got most of it (between 75% and 99%) ( )

only got a limited part of it (between 1% and 74%) ( )

refused because cost too high ( )

were rejected ( )

55 If you applied and tried to negotiate it, did you;

receive all the amount you requested; ( )

receive only part of the loan you requested; ( )

refuse to proceed because of unacceptable costs or terms and conditions; ( )

or have you not received anything at all? ( )

56 What were the reasons you have not applied for a loan with a financial institution?

primary reason (mentioned first)…….

Secondary reason (mentioned after primary reason)…(0 if only one reason was given)

High interest rates ( )

Short loan term (maturity) ( )

Excessive collateral requirements ( )

Lengthy application process ( )

High costs associated with borrowing ( )

No lending financial institution in convenient proximity to my farm/residence ( )

High risks – uncertain of own ability to pay interest and repay principal ( )

Did not know could receive credit from a financial institution ( )

Did not apply because was denied credit earlier ( )

Don't need a loan ( )

Other (please specify)……

57 Have you received a loan in the previous three years (2014 to 2017)?

Yes ( )

No ( )

48 Please provide information about loans you received in 2014 to 2017

No		Bank	Non-Bank Institution
1	No of loans		
2	Total amount received (N)		
3	Average annual interest rate (%)		
4	Application time (No of days)		
5	Maturity of loan (months)		
6	Percentage of loan demanded as collateral		

	(security)		
7	Individual		
8	Group		

59 For what purposes did you use the loan money? Estimate the proportion (%) of total loan money used for the following purposes

1	Purchase inventories/goods for sale	%
2	Purchase fixed assets (buildings, equipment, Livestock)	
3	Purchase agricultural products (seeds, fertilizer, pesticides, animal feeds, etc)	
4	Personal/Household expenses	
5	Pay off other debts	
6	Start new business	
7	Other (specify)	

Check that total percentage equals 100%

60 How many times have you applied for credit in the past two years? .....

and how many times were successful in securing credit?.....

61 What was the loan size you received?

Full amount ( )

Part of the amount ( )

62 Do you have other loan from other financial institution?

Yes ( )

No ( )

63 If yes, can you tell how much is still unpaid? ……..

64 If yes, state the repayment arrangement of the loan…….

65 Indicate the amount repaid and the one in areas

Seasons	Amount repaid (N)	Arrears (N)

66 If you are in arrears, give reasons……..

67 What sort of penalty(ies) are imposed by the financial institutions for the late repayment or loan default?.....

68 Were the loan disbursement made on time before the beginning of the cropping season?

Yes ( )

No ( )

69 Was there a gestation period for the loan to commence repayment?

Yes ( )

No ( )

70 If yes, was it adequate?

Yes ( )

No ( )

71 In your opinion, how likely will you apply for a new loan from a financial institution within next 12 months?

I will not apply ( )

It is unlikely that I will apply ( )

It is likely that I will apply ( )

I will definitely apply ( )

72 If you do apply for a loan in the next 12 months, what amount and term will you most likely request?

1	Amount of loan in Naira	
2	Terms (months)	

73 If you are approved for a loan of the amount and term you indicated in question 44 above, at an annual interest rate of 24%, will you accept this loan?

What if the annual interest rate is 20%?

What if the annual interest rate is 16%?

What if the annual interest rate is 12%?

74 What would be the acceptable interest rate for you?

		Yes	Likely	Unlikely	No
1	24% interest				
2	20% interest				
3	16% interest				
4	12% interest				
5	Acceptable interest %				

75 If you do apply for a loan in the next 12 months, what is the maximum monthly payment that you can afford to pay for the loan?

……..…….

76 Since when have you heard/informed about Government credit scheme for agriculture?.....

76 How many times have you applied for credit under these schemes in the last two years?.....and how many times were you successful in securing the credit?.....

77 What banks or other institutions such as NGOs, would you prefer to apply for a loan from?

Banks	Other Institutions

78 Do you provide adequate information for credit/ loan assessment?

Yes ( )

No ( )

79 Do you always get full explanation about the bank loans before applying for it?

Yes ( )

No ( )

80 Do the bank always make you aware of any change on its lending policies?

Yes ( )

No ( )

81 Do you always easily understand the credit terms and policy of the bank?

Yes ( )

No ( )

82 Do you present to the bank the financial statements of your business when applying for a loan?

Yes ( )

No ( )

83 What is the distance of the nearest bank in your area?

1 to 5 kilometres ( )

6 to 10 kilometres ( )

11 to 15 kilometres ( )

16 to 20 kilometres ( )

More than 20 kilometres ( )

Don’t know ( )

84 What is your perception about Banks?.....

85 How much do you wish to borrow per loan (when you need a large amount of money)?

N50,000 or less ()

N50,000-N100,000 ()

N100,1000-N300,000 ()

N310,000-500000 ()

500,000 and over ()

86 What is the optimal loan duration for you (when you need a large amount of money)?

6 months ()

1 year ()

2 years ()

3 years ()

5 years or above ()

87 What is the optimal repayment period for you (when you need a large amount of money)?

6 months ()

1 year ()

Lump-sum repayment at maturity ()

88 What is the maximum interest rate acceptable to you (when you need a large amount of money)? ……..(%)

89 With the current interest rate, are you willing to borrow from banks?

Yes ()

No ()

90 Which loan requirements is acceptable to you?

Collateral ()

Guarantee by a third party ()

Guarantee with own credibility ()

Group Collateral ()

91 What are you willing to provide as collateral? (Multiple responses possible)

Consumer durables ()

The using right of the land ()

Animals ()

Certificate of deposit ()

Houses ()

Securities ()

Other ()

92 In a few years, what would be the costly project that you need to invest in?

Do business ()

Planting or breeding ()

Purchase of agricultural machinery ()

House building ()

Repayment of loans ()

Tuition ()

Marriage or funeral ()

Other ()

93 Would your own savings be able to meet the need for this project?

Yes ()

No ()

94 Source of the loan:

Bank of Agriculture limited	()
Commercial Bank	()
Agricultural Credit Guarantee Scheme	()
Commercial Agriculture Credit Scheme	()
MicroFinance Bank	()
Other	()

95 How many times did you go to the lender for this loan?.....

96 On average, how long was your travel time each time you went to the lender?.....

97 Total cost of transportation for the loan……

98 Amount of other costs, e.g. gift for the lender…….

99 Amount of the loan that was not repaid at maturity……..

100 What was the reason for not repaying on time?

Failure of the project	()
Lack of funds to repay	()
Unexpected expenses	()
Others defaulted	()

101 Source of funds for repayment

Income from the project	()
Income from cultivation	()
Income from salary from teaching or civil service	()
Others	()

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While thanking you very much for everything, I count on your best co-operation.

Yours sincerely

Aku, Emmanuel Maganie

QUESTIONNAIRES FOR BANK STAFF

1 Name of institution (optional)…….

(a) Senatorial Zone ……..

(b) Local Government Area …….

(c) District/Village Area……

2 Are you

Male ( )

Female ( )

3 Which Education Level have you reached?

Secondary Certificate ( )

Diploma ( )

Degree ( )

High Degree ( )

4 For how long have you worked in that financial institution?

Less than 2 years ( )

2 - 5 Years ( )

6 - 10 Years ( )

More than 10 Years ( )

5 What is your position in the bank?.....

6 Nature/Type of fund for lending

Own fund ( )

Government fund ( )

Donor Agency fund ( )

Other (please specify) ( )

7 Who do you offer credit?

Individual ( )

Group ( )

Corporate ( )

All of these ( )

8 What kind of credit do you offer?

Short time ( )

Long time ( )

All of the above ( )

9 Does the bank gives out loans to finance farming activities?

Yes ( )

No ( )

10 What are the requirements for a farmer to be eligible for a credit/loan?

Purpose of the loan ( )

Amount of the loan ( )

Period/terms of the loan ( )

Earnings from the loan to the Bank ( )

Repayment arrangement of the loan ( )

Security for the loan ( )

All these conditions ( )

11 How is the repayment of the loan arranged?

Weekly ( )

Monthly ( )

After harvest ( )

Others (specify) ( )

12 What factors do you consider in scheduling repayment of the credit?

Farmers' business cash flow ( )

Farmers' other incomes ( )

Both of these ( )

13 Do you assess the small farmers business before extending loan to them?

Yes ( )

No ( )

14 What parameters do you consider when screening the small farmers?

Character of the farmer ( )

Capacity/Cash Flow of the farmer to repay the loan ( )

Capital of the farmer in the business ( )

Conditions refer to the totality of the environment which the banker and the farmer operate ( )

Collateral is the acceptable security that the bank can fall back to when the farmer default ( )

All these factors are considered ( )

15 What other factors do you evaluate before extending loan to small farmers?

People Factor Analysis: The people that will coordinate the business ( )

Purpose Analysis: The loan should be in line with the funding needs of the farmer ( )

Payment Analysis is the repayment source ( )

Protection Analysis is concern with the conditions/ownership of the security offered ( )

Perspective Analysis is the future outlook of the transaction ( )

All of these Analyses ( )

16 Do you discuss the interest rate charged on loans with the farmers before extending the loan?

Yes ( )

No ( )

17 Is the interest rate charged by the bank always favourable to farmers?

Yes ( )

No ( )

Don't know ( )

18 Do the Farmers take the loans at any interest rate you propose to charge?

Yes ( )

No ( )

19 Do the bank always offer farmers better interest rate?

Yes ( )

No ( )

20 Does the loan repayment period that the bank gives enables farmers to accumulate assets?

Yes ( )

No ( )

21 Does loan repayment period affect borrowers' repayment arrangement?

Yes ( )

No ( )

22 Does the bank always deny loans to borrowers who ever defaulted?

Yes ( )

No ( )

23 Does Farmers provide all the needed information to enable the bank screen out the bad borrowers?

Yes ( )

No ( )

24 Does the bank know all the background information about borrowers when they are applying for a loan?

Yes ( )

No ( )

25 Does the bank always alert borrowers of any change on its lending policies?

Yes ( )

No ( )

26 Do Farmers easily understand the credit terms and policy of the bank?

Yes ( )

No ( )

27 What is your perception about small farmers? .....