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**Loan Demand and Rationing among Small-Scale  
Farmers in Nigeria**

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## **INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE**

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## ABSTRACT

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. To this end, this study seeks to (1) examine the nature of risks facing small-scale farmer-borrowers in Nigeria, (2) analyze the demand for agricultural credit by farmers and highlight the key determinants of this demand, (3) ascertain the extent to which farmers are credit rationed and the factors influencing the emerging rationing scenarios, and (4) suggest policy measures to address the problem of agricultural credit rationing and enhance the demand for credit. The study employs primary data obtained from 1,200 small-scale farmers through a survey conducted in 2013 across the six geopolitical zones of the country. 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 seemingly unrelated regression model is employed to ascertain the determinants of credit rationing. 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. We find that gender, geographical location, and marital status have no statistically significant effect on the probability that farmers will be quantity rationed. To address the credit rationing challenges and improve demand for loans by small-scale farmers, we urge banks to mobilize their resources to train potential borrowers and establish loan-monitoring committees at the grassroots level to serve as insurance against the risk of loan default.

**Keywords:** loan demand, credit policy, credit risks, credit rationing

## **ABBREVIATIONS AND ACRONYMS**

ACGSF	Agricultural Credit Guarantee Scheme Fund
ACSS	Agricultural Credit Support Scheme
ATA	Agricultural Transformation Agenda
BOA	Bank of Agriculture
CACS	Commercial Agriculture Credit Scheme
CBN	Central Bank of Nigeria
CF	contract farming
IDP	Interest Drawback Programme
MFB	microfinance bank
NGO	nongovernmental organization
NIRSAL	Nigeria Incentive-based Risk Sharing System for Agricultural Lending
NPFS	National Programme for Food Security
SACCOS	Savings and Credit Cooperative Society
TFM	trust fund model

# 1. INTRODUCTION

Despite recent advances in technology and policy incentives provided by the government, the financial sector in Nigeria 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 commercial banks to lend to small-scale farmers (Olomola 1996, 1999a). Adverse selection arises when 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.

Nonetheless, the dire need for financial services by the various subsectors of agriculture (crop, livestock, fisheries, and forestry) cannot be ignored. The services 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. Savings deposits can also assume the important function of serving as collateral support for borrowing. Although efforts are being made to increase agricultural investment, the sector remains grossly undercapitalized. Farmers and other stakeholders in the value chain need credit in order to address the issues of poor capitalization, low levels of use of modern inputs, and low productivity. Agricultural commodity value chain actors require short-term (seasonal) loans for periods of less than one year, medium-term loans for periods of up to five years, and long-term loans for periods of between six and ten years. Short-term loans are required to meet important financing needs in the agricultural production cycle, including the provision of advances for crop and livestock intakes, production requirements, and other related services that include the handling, manufacture, packing, processing, storage, transport, and marketing of agricultural products. Medium- and long-term loans are required for the support of investment in processing and farm machinery, in water supply and irrigation equipment, in livestock structures and fencing, in fish farming (ponds and cages), and in farm forestry development. In particular, long-term loans may be needed in the form of establishment loans for perennial crops (cocoa, rubber, oil palm, and others.) or for sugarcane plantations and citrus and deciduous fruit orchards. Long-term loans are also needed for acquiring farming equipment, implements, farming vehicles, and livestock, and for the improvement of structures and irrigation systems.

The recent developments in telecommunications and their extension to financial services have not been adapted to the rural sector, which is where agricultural activities take place. Agricultural financing should provide opportunities for money transfer within an economy and from any part of the world to improve production and trade. This transfer capability is particularly important given the fact that agricultural activities are time bound, and delays may have adverse effects on farm operations. Money transfers are crucial in meeting the financial needs of investors in rural areas. Many business partners with whom rural dwellers need to transact business live in urban areas. Transactions can take place at a reduced cost and in a more timely fashion if there are opportunities for money transfer. The advent of cell-phone banking, also known as mobile money, has changed money transfers in many countries, lowering the cost of making such transfers and greatly increasing the convenience of doing so. The financial system and the telecommunications sector, however, as well as the government, have not accorded the desired priority to providing the necessary infrastructure, incentives, and mechanisms that will enable the masses of rural producers and other business enterprises to benefit from such services.

Furthermore, agriculture involves a very high level of risk. Thus, risk mitigation measures are needed in order to encourage investment, both on-farm and further down agricultural value chains. Traditional farm management techniques for managing risk—for example, intercropping species with different moisture requirements, staggered planting (even in rainfed agriculture), interseasonal on-farm food storage, and maintenance of a contingency savings fund—are all important traditional techniques, but they are grossly inadequate to support the level of investment and financial services required for the successful implementation of Nigeria’s agricultural transformation agenda (ATA). The need for financial mechanisms for risk management is far more acute now than ever before, judging by the rising level of investment and the expected role of the financial sector. The insurance market, which is intended to assist with this, has been earmarked for reform under the ongoing agricultural transformation agenda but concrete measures are still being expected. Liberalization of the insurance market and increased availability of agricultural insurance services will help farmers cope with the risky nature of agricultural enterprises. Insurance can give poor farmers a sense of security that allows them to dare to pursue profit-oriented activities and hence to borrow, since an income shock will be minimized when insurance claims are settled.

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, as specified above. They have therefore continued to seek debt capital from various sources, both informal and formal. Although sustainable access to financial services—that is, savings, credit, payments, and insurance—contributes to economic growth and poverty reduction, such access is highly restricted. Access to financial services is the most limited in Africa south of the Sahara. Less than 1 percent of commercial lending goes to agriculture (Varangis 2010). Less than 1 percent of farmers in Zambia and less than 2 percent of the rural population in Nigeria have access to credit from formal financial institutions (Olomola 2011). Since the beginning of the 21st century, access to financial services in less-developed economies, including SSA, has been receiving increased policy attention, and the literature on the various initiatives on financial inclusion has been growing (UNCDF and UN-DESA 2006; Claessens 2005; Guha-Khasnobis and Mavrotas 2008). One major global initiative is the Bill and Melinda Gates Foundation–funded Alliance for Financial Inclusion, which was founded in 2008 to advance the development of smart financial inclusion policy in developing and emerging countries. However, the level of financial exclusion in Africa south of the Sahara continues to be quite high, and in the case of Nigeria it is well over 50 percent (Triki and Faye 2013).

Financial constraints are more pervasive in agriculture and related activities than in many other sectors, reflecting both the nature of agricultural activity and the average size of firms. Financial contracts in rural areas involve higher transaction costs and risks than those in urban settings because of the greater spatial dispersion of production, the lower population densities, the generally lower quality of infrastructure, and the seasonality and often high covariance of rural production activities. Thus, banks and other traditional for-profit financial intermediaries tend to limit their activities to urban areas and to more densely populated, more affluent, more commercial areas of the rural economy.

What sort of financial mechanisms are necessary to link farmers to formal credit institutions to enhance their access to credit directly? What are the limitations of these farmers? What rationing mechanisms exist in the financial system in which they operate? How can these mechanisms be addressed effectively? And what factors influence farmers’ demand for credit? These are the research questions to be unraveled in this study. These questions are important because the government’s commitment to agricultural financing over the years has not matched the contribution of agriculture to the economy and its critical importance in poverty reduction and food security. Government interventions, through a multiplicity of credit institutions established in recent years, have not resulted in significant improvement in financial intermediation. The liberalization of the economy since the introduction of the Structural Adjustment Program in the 1980s has tended to exacerbate the financial problems of the agricultural sector. Loanable funds from government sources have dwindled considerably. The cost of borrowing has escalated and the financial outlay for agricultural enterprises has multiplied several-fold irrespective of



the scale of operation, due to the ravages of inflation. Consequently, only a limited number of entrepreneurs are in a position to meet their financial requirements.

The difficulties faced by agricultural financing are not unrelated to the liberalization of the economy and reforms in the financial sector in particular. Unlike the situation during the pre-structural adjustment era, lending to agriculture has been decontrolled since the mid-1980s. Interest rates are now determined on the basis of market fundamentals. Usually, commercial banks set their lending rates based on the Central Bank of Nigeria (CBN) rates, the risk levels, the cost of doing business (which has been judged to be very high in the country), and profit markups and other considerations. This results in very high lending interest rates for the private sector in general and for agriculture in particular. Rates are sometimes in the double digits and appear very unattractive to any investor in the agricultural sector. This has accounted for commercial banks' low rate of participation in agricultural financing. Moreover, monetary policy provides a risk-free haven for commercial banks to invest in. The open market operations of the CBN, which involve mopping up excess liquidity through the issuance of government securities in an attempt to control inflation, have indirectly affected the flow of investment funds to the agricultural sector. More often than not, the biggest buyers of such securities are commercial banks. In such cases, funds that should have been loaned out to the private sector by banks are instead invested in risk-free government securities. This leads to the crowding out of bank lending to the private sector, making it even more difficult for highly risky sectors such as agriculture.

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 Nigerian financial sector has witnessed fundamental reforms since 2005, but the effects on agricultural financing have been lackluster. The traditional arguments that the agricultural sector is too risky, farmers are too dispersed and inaccessible in remote rural locations as well as the supply-side constraints continue to be relevant. It is still expensive to provide financial services in rural areas, which typically less-dense economic activity poorer infrastructure than urban areas 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. Financial sector operators often display limited understanding of the agriculture sector, and this greatly enhances their perception of the risks involved in financing the sector. Thus, 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.

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.

Thus, the broad goal of this study is to examine the constraints faced by small-scale farmers in securing credit for their operations and to stimulate policy attention to reduce them. This is with a view to ensuring that the role of the private sector, as envisaged in the government's ATA, is not undermined by inadequate financing. The specific objectives are fourfold: (1) to examine the nature of risks faced by small-scale farmer-borrowers in Nigeria, (2) to analyze the demand for agricultural credit by farmers and

highlight the key determinants of this demand, (3) to ascertain the extent to which farmers are credit rationed and identify the factors influencing the emerging rationing scenarios, and (4) to suggest policy measures to address the problem of agricultural credit rationing and enhance the demand for credit.

The study focuses on formal credit, unlike several others, which concentrate on the informal sector (Okorie and Miller 1976; Nwabughuogu 1984; Nweze 1991; Olomola 1999b), in view of the fact that the solution to the financial exclusion of the rural populace lies more in the formal financial system than the informal sector. The study makes a pioneering contribution by extending the empirical analysis of credit rationing beyond quantity rationing to include price and risk rationing. It also makes a contribution by modeling these three types of rationing using data obtained from the six geopolitical zones of Nigeria rather than employing data from only one state or one geopolitical zone.

## **Types and Sources of Data**

The survey of farmers was designed and supervised by the authors. It lasted from February to June 2013 (five months). The primary data were collected by enumerators who were recruited and trained by the authors during the survey exercise. Data collection was carried out using well-structured questionnaires, which were administered to a cross-section of small-scale farmers. The survey covered all the agroecological zones found in the six geopolitical zones of the country, with one state selected from each geopolitical zone as follows: northwest (Sokoto State), northeast (Bauchi State), north-central (Benue State), southwest (Ogun State), southeast (Ebonyi State), and south-south (Cross River State).

The questionnaire was designed to elicit information on the farmers' production activities, their demand for credit from various formal lending institutions, and their socioeconomic characteristics. Specifically, the types of data collected include age of borrower, gender, educational attainment, household size, household income, farm size, farming experience, farm income, nonfarm income, amount of farm loan, savings, value of assets, group or cooperative membership, types of collateral (land, for example), and sources of credit. The questionnaire was designed to easily distinguish farmers who applied for loans, those whose loan requests were granted or denied, and those who did not apply. Reasons for not applying for a loan and for being denied a loan were also obtained to assist in the characterization of the farmers' borrowing and rationing status. The lists of farmers were obtained from agricultural development projects in each state and from the lending institutions, namely, the Bank of Agriculture (BOA) branch in each state, microfinance banks (MFBs), and the Ministry of Agriculture and Ministry of Finance, which disbursed loans as part of the on-lending program of the Commercial Agriculture Credit Scheme (CACS). Random samples of 100 borrowers and 100 nonborrowers were selected from each state to give a total of 1,200 farmers included in the study across the six geopolitical zones. Borrower farmers were selected from the lists provided by the lending institutions, while the agricultural development programs provided information about the nonborrowers. The farmers were traced to their various locations by the enumerators for the purpose of administering the questionnaires. The proportion of each state's population in the total population of the six states was used for weighting in subsequent analysis to ensure the representativeness of the sample.

## **Literature Review**

Quantitative analyses of the factors influencing loan demand 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 demand 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, household size, number of working members per household, and number of children under six years (Pastrapa 2011).

A proper identification of the determinants of loan demand, 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 peri-urban 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. The Tobit type II model 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.

In a recent study, 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.

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).

Credit rationing or credit constraint manifests in the 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 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.

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; Guirking 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 emerge as key determinants of credit access, pointing to a need to further explore the implications for the effectiveness and targeting of public programs in this 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 recent 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 semistructured 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.

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, 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 recent and 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.

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. Moreover, the analysis of credit participation employs the Tobit type II model, which has not been previously applied in the Nigerian case. The scope is also extended beyond a single state to cover six states selected from all the geopolitical zones in the country.

## **Theoretical and Analytical Framework**

The theoretical framework for this study is based on the theoretical model of Iqbal (1983), which has been further modified by other works, especially in the treatment of interest rate as endogenous rather than exogenous (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, socioeconomic characteristics of the household, output price, and wage rate (Swain 2008). Essentially, this study is concerned with the behavior of a farmer-borrower 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, especially land.

### ***Econometric Model of Loan Demand by Small-Scale Farmers***

A major analytical issue in the estimation of a farmer-borrower demand model of this type in previous studies is the inherent bias due to data truncation resulting from the omission of nonborrowers from the analysis. This problem is addressed in this study by including nonborrowers among the farmers surveyed and employing the Tobit type II model to account for selection bias. The analysis of demand 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 (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  $D^* \geq D$ . 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 Tobit type II 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; Wiboonpongse, Sriboonchitta, and Chaovanapoonphol 2006). 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:

Regression equation: 
$$d_i^* = x_i\beta_i + \varepsilon_{1i} \quad (1)$$

Where  $x_i$  is a vector of exogenous variables and  $d_i^*$  the value of the loan obtained by the  $i^{\text{th}}$  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.

Selection model: 
$$b_i^* = z_i\gamma_i + \varepsilon_{2i}, \quad (2)$$

$$d_i = d_i^*, b_i = 1 \text{ if } b_i^* > 0, \text{ and} \quad (3)$$

$$d_i \text{ not observed, } b_i = 0 \text{ if } b_i^* \leq 0, \quad (4)$$

where  $b_i^*$  is a latent endogenous variable and  $z_i$  is a vector of exogenous variables determining whether an agro-dealer will borrow or not. If  $b_i^*$  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  $d_i$  (value of loan) only for  $b_i = 1$  (that is, for the borrowers). The distribution assumption for the unobserved errors ( $\varepsilon_{1i}, \varepsilon_{2i}$ ) is a bivariate normal with expectation 0, variances  $\sigma_1^2$  and  $\sigma_2^2$ , and covariance  $\sigma_{12}$ . The signs and magnitude of the estimated coefficients may differ across equations (1) and (2).

The model is estimated in accordance with the Heckman (1979) two-step procedure. The estimation is based on the following regression.

$$d_i = x_i\beta_i + \sigma_{12} \lambda_i(z_i\hat{\gamma}_i) + v_i, \quad (5)$$

where  $\lambda_i = \frac{\phi(z_i\hat{\gamma}_i)}{\Phi(z_i\hat{\gamma}_i)}$  is the Heckman's lambda, otherwise known as the inverse Mills ratio,  $\phi(\cdot)$  is the standard normal density function, and  $\Phi(\cdot)$  is the standard cumulative distribution function. The estimation task is to use the observed variables ( $d, x, b, z$ ) to estimate the regression coefficients  $\beta$  that are applicable to the sample of agro-dealers whose values of  $d$  equal both 1 and 0. The contents of the  $\lambda_i$  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.

$$b_i = \gamma_0 + \gamma_1\text{AGE} + \gamma_2\text{MSTATUS} + \gamma_3\text{ASSET} + \gamma_4\text{PROFIT} + \gamma_5\text{NFI} + \gamma_6\text{FSIZE} \\ + \gamma_7\text{HHSIZE} + \gamma_8\text{FEXP} + \gamma_9\text{REGION} + \varepsilon_{1i} \quad (6)$$

The estimating equation for loan demand has the following variables.

$$d_i = \beta_0 + \beta_1\text{IR} + \beta_2\text{WR} + \beta_3\text{PRICE} + \beta_4\text{ASSET} + \beta_5\text{NFI} + \beta_6\text{FSIZE} + \beta_7\text{HHSIZE} \\ + \beta_8\text{FEXP} + \beta_9\text{REGION} + \beta_{10}\text{LSOURCE} + \varepsilon_{2i}, \quad (7)$$

where  $d_i$  is the value of the loan and  $b_i$  is a dummy variable with a value of unity if the farmer is a borrower and 0 otherwise. AGE is the age of the farmer in years; MSTATUS is marital status of the farmer, with a value of unity if the farmer is married and 0 otherwise. ASSET is the value of key physical assets owned by the farmer, PROFIT is operating profit from the farming enterprises, NFI is nonfarm income, FSIZE is farm size, and FEXP is farming experience. The variable IR refers to interest rate, WR is the rural wage rate, and PRICE is the output price proxied by the price of maize (₦/kg). The use of the maize price is comparable to Swain's (2008) study of this nature in which the price of rice was used to represent the output price in the estimated demand model. REGION is a dummy variable for geographical location, with a value of unity if the farmer operates in the northern part of the country and 0 otherwise. 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.

A priori, it is expected that the interest rate will have a significantly negative effect on loan demand, while the effect of the output price will be positive and significant. The sociodemographic characteristics such as age, marital status, and household size are expected to have significantly positive effects on loan demand. Asset, profit, farm size, and farming experience are also expected to have a positive effect. Loan demand is expected to be a decreasing function of nonfarm income.

### ***Theoretical and Analytical Framework for Credit Rationing***

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 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 Guirking 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 Guirking (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 Guirking'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. 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.

### ***Econometric Model of Credit Rationing among Small-Scale Farmers***

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.

$$y_i^* = x_i' \beta_i + \varepsilon_i \quad (8)$$

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,  $\beta_i$  represents coefficients to be estimated in the model, and  $\varepsilon_i$  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.

$$y_{1i} = \alpha_i x_i + e_i, \quad (9)$$

$$y_{2i} = \beta_i x_i + \mu_i, \text{ and} \quad (10)$$

$$y_{3i} = \gamma_i x_i + v_i, \quad (11)$$

where  $y_{1i}$  is a dichotomous variable with a value of unity for a quantity-rationed farmer  $i$  and 0 otherwise. In the same vein,  $y_{2i}$  has a value of unity for a risk-rationed farmer  $i$  and 0 otherwise, while  $y_{3i}$  has a value of unity for a price-rationed farmer  $i$  and 0 otherwise.  $x_i$  represents a vector of explanatory variables;  $\alpha_i$ ,  $\beta_i$ , and  $\gamma_i$  are coefficients to be estimated; and  $e_i$ ,  $\mu_i$ , and  $v_i$  are 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 et al. 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 Guirking 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. The results of the econometric analysis are presented in Section 3 with regard to borrowing decisions and demand for loans and in Section 4 with regard to determinants of credit rationing.

## **2. CONSTRAINTS AND OPPORTUNITIES FOR INCREASED LENDING TO SMALL-SCALE FARMERS**

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.

### **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 bemoan 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.

#### ***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 taints their perception of the risks involved in financing the sector.

#### ***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.

### ***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 elsewhere (Olomola 2011).

### **Opportunities and Incentives for Credit Participation by Small-Scale Farmers**

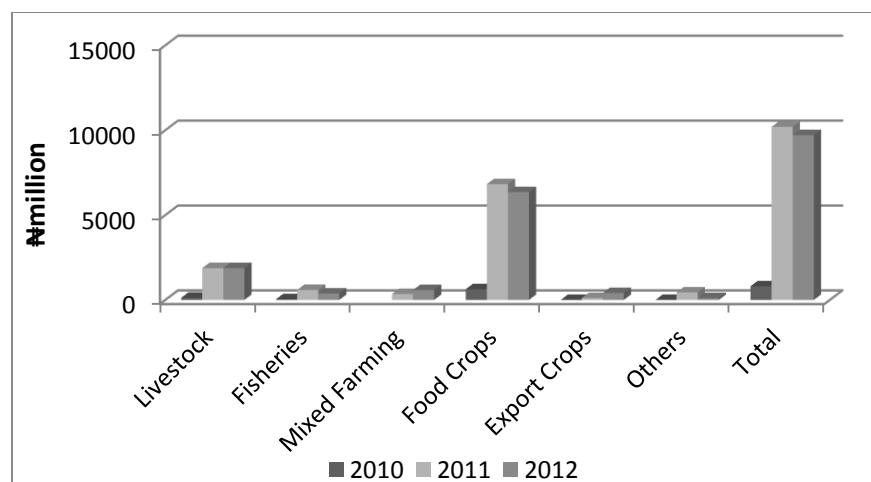
The agricultural financing reforms implemented since the early 2000s present opportunities for increased involvement by the banking sector in channeling funds to the agricultural sector. Opportunities exist in financial innovations introduced by the CBN from time to time to keep the credit market operating in tandem with the ongoing 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 constituted 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.

### ***Recent Performance of the ACGSF***

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 under the scheme, 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. Recently, 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 (Figure 2.1). The decline occurred in all subsectors of agriculture except for mixed farming and export commodities. As shown in Table 2.1, 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. Indeed, 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. This is consistent with the constraints identified above. 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.

**Figure 2.1 Loans guaranteed under the Agricultural Credit Guarantee Scheme Fund by size and purpose**



Source: Authors' graph using data from Central Bank of Nigeria (various years).

**Table 2.1 Loans guaranteed under the Agricultural Credit Guarantee Scheme Fund by size and purpose**

Loan purpose	₦50,000–100,000		>₦100,000		Total	
	Number.	Amount ₦'000	Number	Amount ₦'000	Number	Amount ₦'000
Livestock						
2010	25	1,955.0	242	125,179.8	267	127,134.8
2011	1,442	132,491.0	2,907	1,745,772.4	4,349	1,878,263.4
2012	981	66,372.0	3,563	1,811,670.2	4,544	1,878,042.9
Fisheries						
2010	2	140.0	64	43,045.0	66	43,185.0
2011	237	16,388.0	1,605	573,279.5	1,842	589,667.5
2012	149	10,585.0	662	367,726.9	811	378,311.9
Mixed farming						
2010	-	-	-	-	-	-
2011	1,187	127,345.0	896	223,880.0	2,083	351,225.0
2012	1,539	114,197.0	2,521	466,440.0	4,061	580,767.0
Food crops						
2010	3,981	207,232.3	1,154	424,752.3	5,135	631,984.5
2011	2,8952	1,670,604.0	16,939	5,151,177.1	45,941	6,822,015.7
2012	23,237	1,171,698.0	14,373	5,181,922.7	37,612	6,353,629.8
Export crops						
2010	6	410.0	2	600.0	7	910.0
2011	395	14,255.0	226	94,775.0	621	109,029.9
2012	126	7,113.5	834	399,461.6	960	408,654.1
Others						
2010	-	-	8	3,470.0	8	3,470.0
2011	489	31,417.5	907	412,228.3	1,396	443,645.8
2012	578	30,175.3	170	77,180.0	748	107,355.5
Total						
2010	3,996	209,737.3	1,470	597,047.0	5,484	806,784.3
2011	32,702	1,992,500.0	23,480	8,201,112.3	56,232	10,193,847.3
2012	26,610	1,402,221.0	22,123	8,304,401.3	48,763	9,706,761.2

Source: Underlying data from Central Bank of Nigeria Annual Report and Statement of Accounts (various years).

### ***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 (informal 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.

### ***The Trust Fund Model***

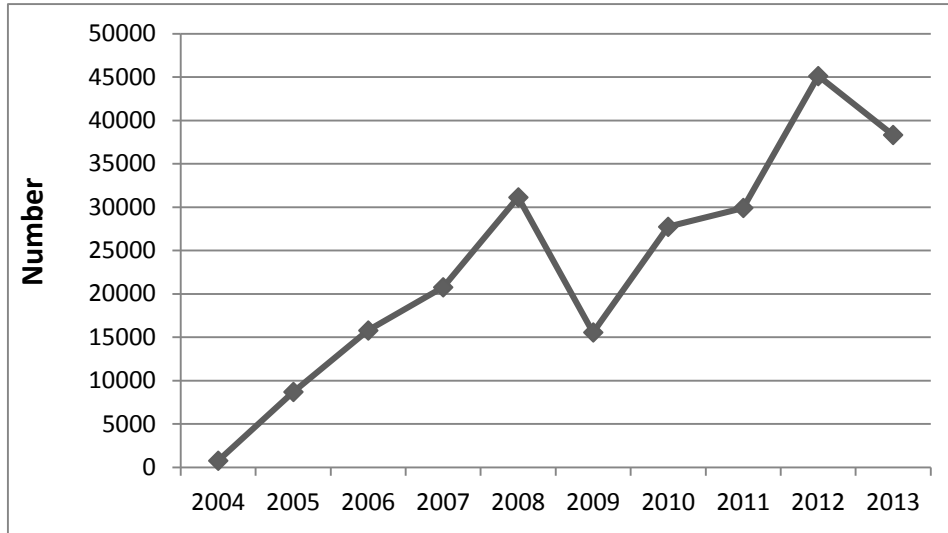
The TFM is a framework for enhancing credit supply to the agricultural and rural sectors of the economy. Under the TFM, oil companies, state and local governments, and nongovernmental organizations (NGOs) place funds in trust with lending banks to augment the small group savings of the farmers as security 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.

### ***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.

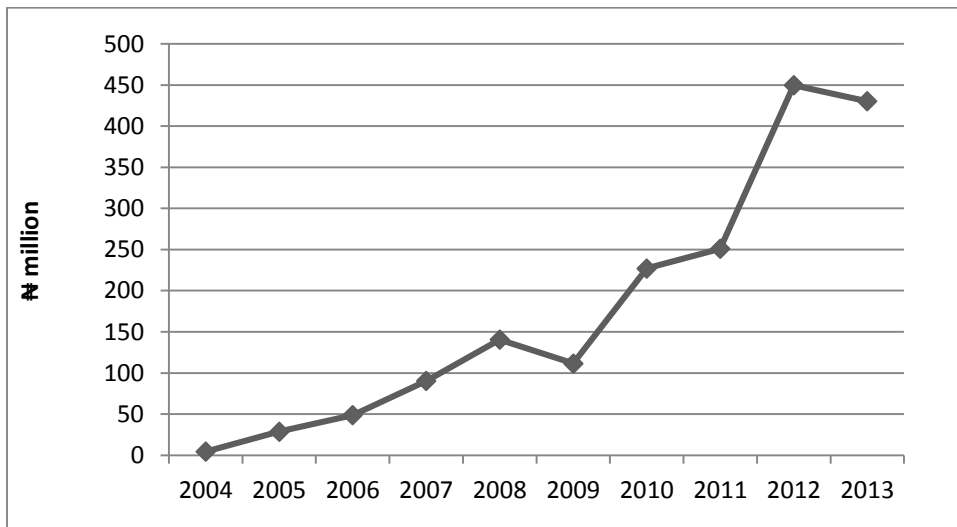
Available data show that lenders and borrowers have benefited from this incentive. Both the number and value of rebate claims under the program have been trending upward during the last decade (Figures 2.2 and 2.3). This implies that the program has induced borrowers to repay on time. Overall, this is likely to have a positive impact on loan repayment performance under the ACGSF.

**Figure 2.2 Number of claims settled under the Interest Drawback Programme of the Agricultural Credit Guarantee Scheme Fund**



Source: Authors' graph using data from Central Bank of Nigeria (various years).

**Figure 2.3 Value of claims settled under the Interest Drawback Programme of the Agricultural Credit Guarantee Scheme Fund**



Source: Authors' graph using data from Central Bank of Nigeria (various years).

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 recently launched Nigeria Incentive-based Risk Sharing System for Agricultural Lending (NIRSAL).

### ***Agricultural Credit Support Scheme***

The 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.

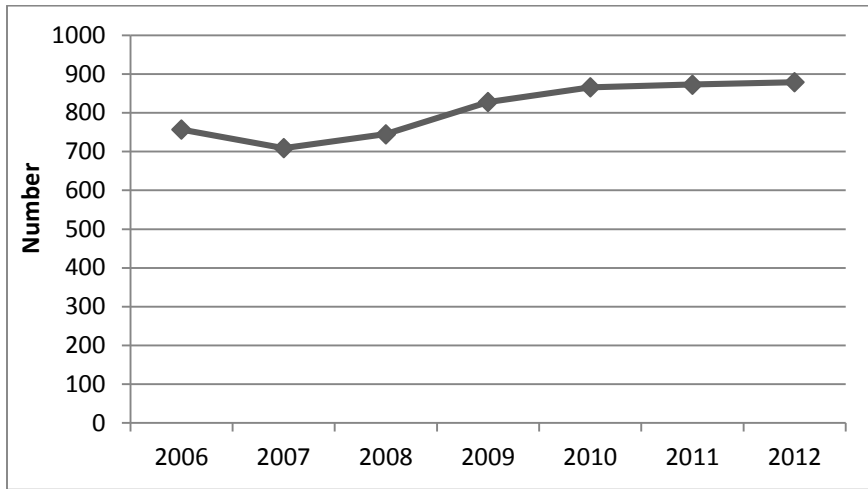
### ***Development of Microfinance Banks***

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. As shown in Figure 2.4, the number increased steadily from 757 in 2006 to 879 in 2012.



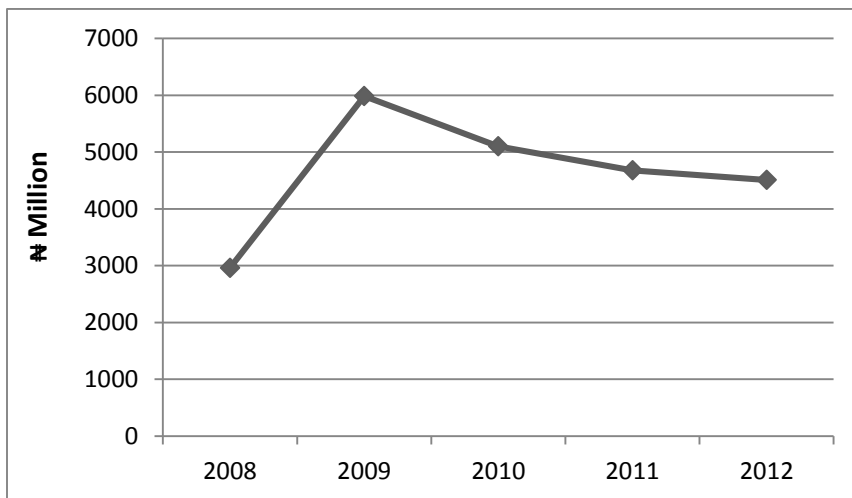
**Figure 2.4 Number of licensed community and microfinance banks**



Source: Authors' graph using data from Central Bank of Nigeria (various years).

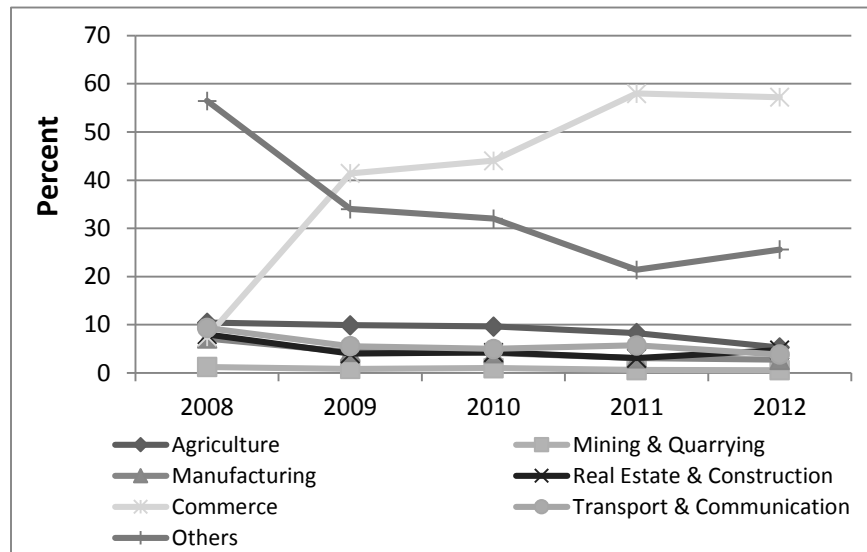
Despite the incentives for the MFBs to finance small-scale agriculture, there seems to be an inverse relation between the growth in the number of MFBs and their lending to agriculture, as shown in Figure 2.5. Like the commercial banks, the MFBs also disdain agricultural lending. The bulk of their lending 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 (Figure 2.6).

**Figure 2.5 Loans and advances disbursed to the agricultural sector by community banks and microfinance banks**



Source: Authors' graph using data from Central Bank of Nigeria (various years).

**Figure 2.6 Sectoral share of credit from community and microfinance banks**



Source: Authors' graph using data from Central Bank of Nigeria (various years).

### 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.

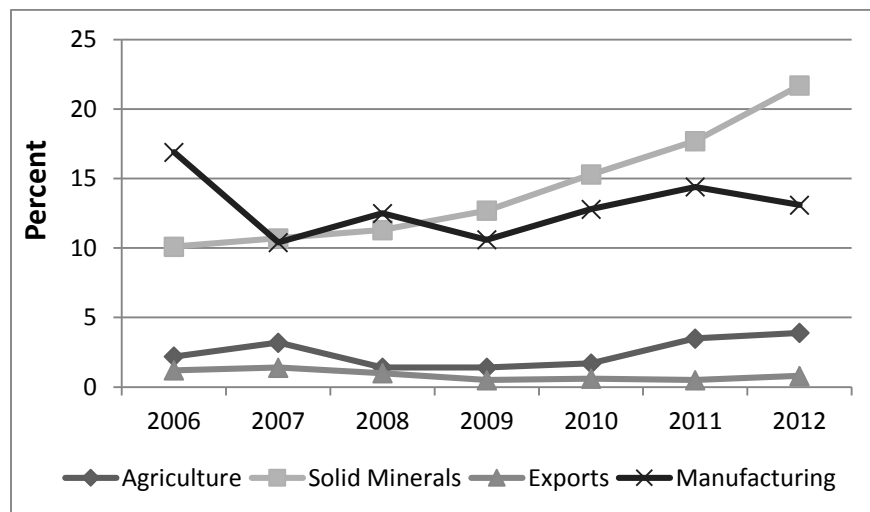
The CACS, which is a subcomponent of the federal government's Commercial Agriculture Development Programme, is financed through a ₦200 billion bond raised by the Debt Management Office. Loans to eligible entities under the scheme are disbursed at a maximum interest rate of 9 percent. The subsidy arising 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 has witnessed considerable lag, implying that repayment may 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. To date, however, not all the states have considered it necessary to take advantage of this provision of the CACS. Nonetheless, the overall impact of the scheme on the flow of credit from commercial banks to agriculture is likely to be positive, especially judging by the rising trend in the share of agriculture in commercial banks' total credit to key sectors of the economy (Figure 2.7). 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.

**Figure 2.7 Share of some key sectors in commercial banks' credit, 2006–2012**



Source: Authors' graph using data from Central Bank of Nigeria (various years).

### ***Nigeria Incentive-based Risk Sharing System for Agricultural Lending***

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.

### 3. FARMERS' CREDIT SOURCES, BORROWING DECISIONS, AND LOAN DEMAND

This section examines farmers' sources of credit, factors affecting farmers' participation in the credit market, and determinants of loan demand. With access to credit, the first priority of farmers (both crop and livestock farmers) is to cover production costs relating to inputs. Whereas farming enterprises yield income at specific periods, costs are incurred throughout the production season. Farmers acquire household assets and cover nonfarm expenses out of this income, with little or no savings to finance production activities in the following season. A reasonable level of profitability and regular access to credit will therefore be required for them to maintain or expand the level of operation of their businesses. Due to a number of factors, including a high incidence of poverty, low savings, and harsh economic conditions, it is difficult for farmers to rely on equity capital to meet production costs. They have therefore continued to seek debt capital from various formal sources.

#### Sources of Credit

With regard to the 2012 production season, the farmers included in the study sourced financing from contract farming (CF) arrangements, the BOA, CACS, the National Programme for Food Security (NPFS), and MFBs. The highest proportion of farmers patronized the BOA, followed by NPFS, CACS, and MFBs, while the lowest number is associated with CF. Credit under CF is applicable only to the north, while MFB loans apply only to the south, based on data availability. In general, the proportion of beneficiaries of nonbank loans was double (66 percent) that of bank loans (33 percent), and the number of beneficiaries was higher in the north (75 percent) than south (58 percent). A higher proportion of males (69 percent) benefitted from nonbank loans than females (59 percent), whereas in the case of bank loans the proportion of female beneficiaries was higher (41 percent) than that of males (31 percent). Bank loans refer to loans from the Bank of Agriculture (BOA) and Microfinance Banks (MFBs), while nonbank loans were from the Commercial Agriculture Credit Scheme (CACS) (on-lending programs), National Program on Food Security (NPFS), and contract farming (CF). The CACS provided the highest loan amounts, which averaged ₦897,815, followed by the BOA, with an average of ₦108,137; NPFS (₦100,855); MFBs (₦101,350); and CF (₦14,872). Overall, the average loan size among the sampled farmers was ₦275,663, but there are regional and gender variations. As shown in Table 3.1, the average loan size was higher in the north (₦316,987) than south (₦176,411). It was also higher for male farmers (₦307,773) than females (₦176,411). 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 higher than the proportion of males for BOA and MFB loans, while the reverse is the case for CACS and CF loans (Figure 3.1).

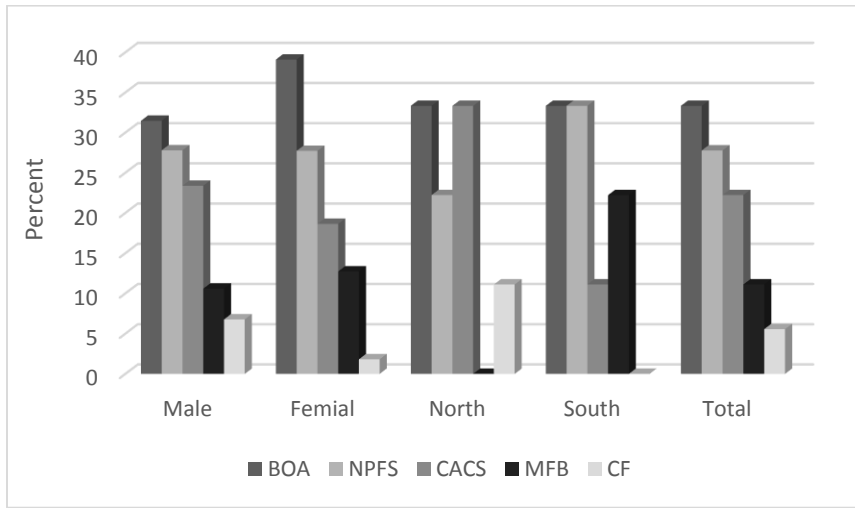
**Table 3.1 Comparison of average loan size by gender, source, and region**

Borrower	BOA (₦)	NPFS (₦)	CACS (₦)	MFBs (₦)	CF (₦)	Total (₦)
Gender						
-Male	118,205	105,496	975,497	114,931	14,613	307,773
-Female	83,081	86,475	596,561	66,429	17,850	176,411
Region						
-North	94,240	84,179	795,700	80,000	14,872	316,987
-South	122,033	111,607	1,204,160	101,786	-	234,338
All regions and genders	108,137	100,855	897,815	101,350	14,872	275,663

Source: Authors' computation using 2013 survey data.

Note: BOA = Bank of Agriculture; NPFS = National Programme for Food Security; CACS = Commercial Agriculture Credit Scheme; MFBs = microfinance banks; CF = contract farming.

**Figure 3.1 Agricultural credit sources by region and gender of farmers**



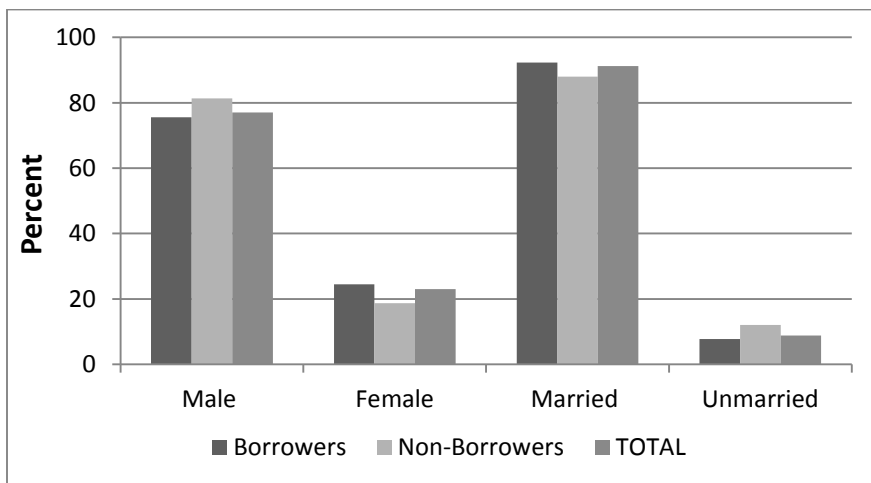
Source: Authors' graph using 2013 survey data.

Note: BOA = Bank of Agriculture; NPFS = National Programme for Food Security; CACS = Commercial Agriculture Credit Scheme; MFBs = microfinance banks; CF = contract farming.

### Factors Affecting Borrowers' Borrowing Decisions

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 nonborrowers with regard to some key variables. About 77 percent of the farmers are males and 23 percent are females. The borrowing status of the farmers reflects this gender disparity; while 76 percent of the borrowers are males, only 24 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 nonborrowers is higher than that of unmarried nonborrowers (Figure 3.2).

**Figure 3.2 Comparison of borrowing status of farmers by gender and marital status**

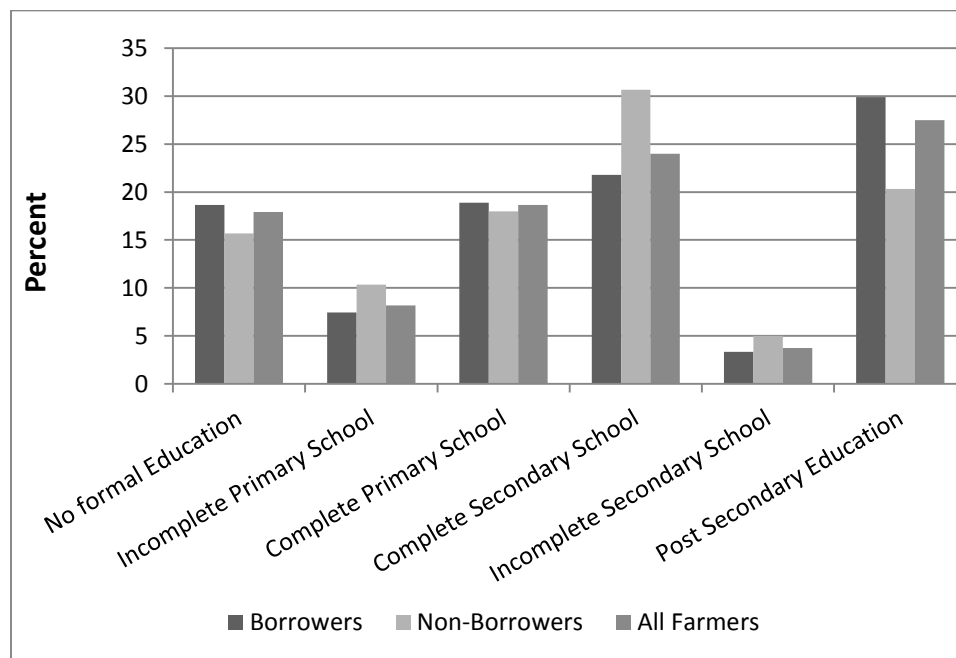


Source: Authors' graph using 2013 survey data.

Among females, 80 percent are borrowers and 20 percent are nonborrowers. In contrast, 74 percent of the males are borrowers while 26 percent are nonborrowers. Participation in the loan market thus seems to be relatively higher among females than among males. As regards marital status, 76 percent of married farmers are borrowers while 24 percent are nonborrowers, compared to 66 percent and 34 percent, respectively, in the case of unmarried farmers.

The farmers included in the study have varying levels of educational attainment, ranging from those without formal education to those with postsecondary education. Of the 1,200 farmers in the sample, those with postsecondary education represent the highest proportion (27.5 percent), followed by those who completed secondary education (24 percent), those who completed primary education (18.7 percent), those without any formal education (17.9 percent), and those who dropped out of primary school (8.2 percent), while the smallest is the group of farmers who did not complete secondary school (3.75 percent) (Figure 3.3).

**Figure 3.3 Comparison of borrowing status of farmers by level of education**



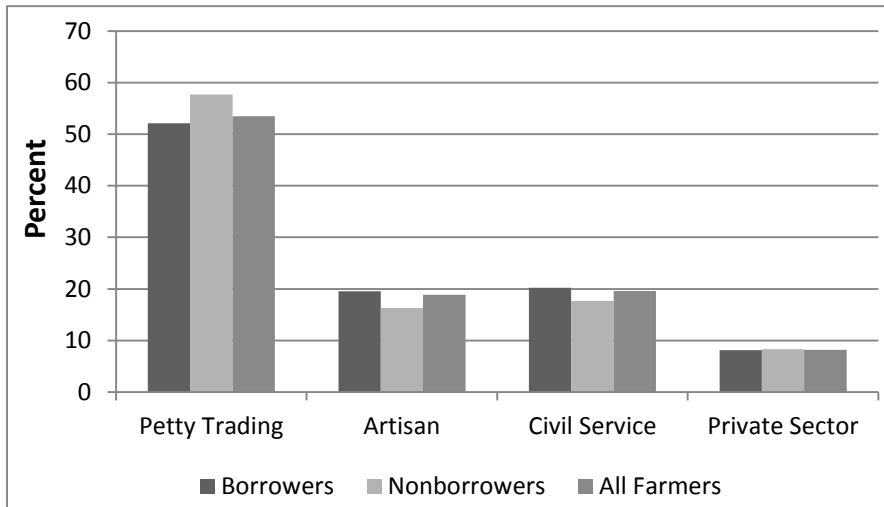
Source: Authors' graph using 2013 survey data.

Within each group, the proportion of borrowers is much higher than nonborrowers, although this varies considerably across the six educational groups. The results show that the most educated group has the highest proportion of borrowers (82 percent), while the lowest proportion (67 percent) is found within the group of farmers with incomplete secondary education. Of the farmers who have no formal education, 78 percent are borrowers while 22 percent are nonborrowers. This compares favorably with the situation in the group of farmers having postsecondary education. It is an indication that among the sample of small-scale farmers included in the study in 2012, 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.

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 proportion (53.5 percent) are petty traders, followed by 19.6 percent civil servants, 18.8 percent artisans, and 8.2 percent private-sector workers (Figure 3.4). The data reveal that petty trading is the dominant secondary occupational group, which also comprises the highest proportion of borrowers (52 percent) and nonborrowers (58 percent). Among the borrowers, petty traders are followed by civil servants (20

percent), artisans (19.5 percent), and private-sector workers (8.1 percent). The same pattern occurs among the nonborrowers, with slight changes in the proportions of civil servants (17.7 percent), artisans (16.3 percent), and private-sector workers (8.2 percent). Within each occupational group the proportion of borrowers is much higher than that of nonborrowers, and there seems not to be much variation across the groups. The highest proportion (77.9 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.

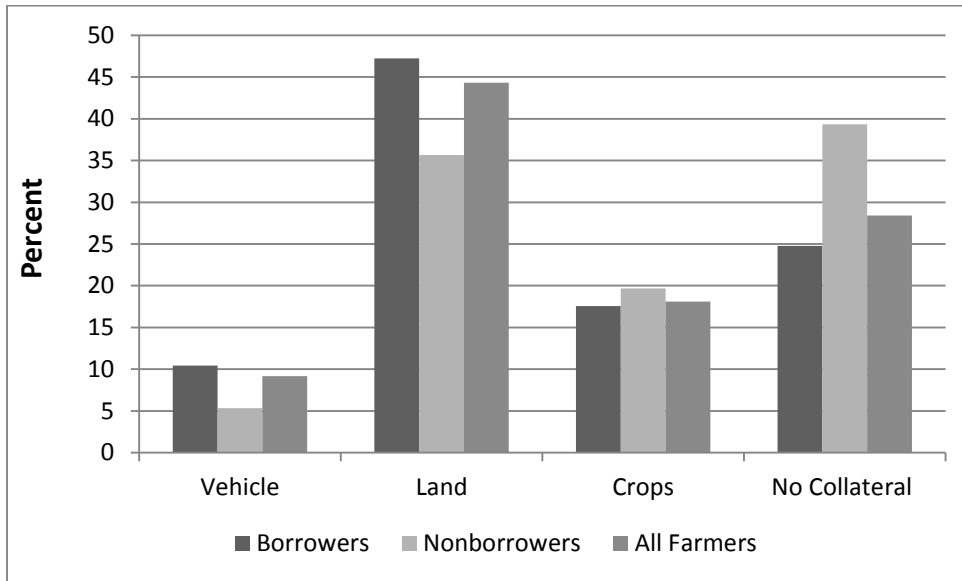
**Figure 3.4 Comparison of borrowing status of farmers by type of secondary occupation**



Source: Authors' graph using 2013 survey data.

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. As shown in Figure 3.5, farmers who have land to offer as collateral represent the highest proportion (44.3 percent), followed by those who have nothing to offer (28.4 percent), those who agree to offer their crops (18.1), and those who have vehicles to offer (9.2 percent).

**Figure 3.5 Comparison of farmers' borrowing status by availability of potential collateral**



Source: Authors' graph using 2013 survey data.

The data show that there is a tendency for collateral status and borrowing status to be positively related. For instance, the highest proportion (39.3 percent) of nonborrowers is found among farmers who have no collateral to offer. Moreover, the highest proportion (47.2 percent) of borrowers is found among farmers who can offer land as collateral. However, the proportion of borrowers without collateral is lower than the proportion of nonborrowers without collateral. A consideration of the borrowing status within each group of farmers with different types of collateral reveals that the highest proportion (85.5 percent) of borrowers is found among those with vehicles, followed by those with land (79.8 percent), those with crops (72.8 percent), and those with no collateral (65.4 percent). The highest proportion of nonborrowers is in the no-collateral group (34.6 percent) and the lowest in the vehicle group (14.5 percent).

### **Probit Analysis of Factors Affecting Farmers' Borrowing Decisions**

The hypothesis being tested in the probit analysis is that social, demographic, and economic factors will significantly affect farmers' decisions to borrow from the formal credit market. The specific variables considered are presented in Table 3.2, which contains the results of the analysis. As shown in Table 3.2, four of the nine specified variables are significant, while five are not. The significant variables are age, marital status, nonfarm income, and household size, whereas asset value, operating profit, farm size, farming experience, and location (region) are not significant. The results show that older farmers have a higher probability of deciding to borrow, compared to younger ones. Farmers who are married are also more likely than their unmarried counterparts to decide to borrow. 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.



**Table 3.2 Probit model of farmers' participation in the loan market**

Variable	Coefficient	S.E.	P[ Z >z]
<i>Dependent variable: Farmers' borrowing status (dummy)</i>			
Asset value (₦)	0.015	0.015	0.327
Operating profit (₦)	-0.045	0.034	0.182
Nonfarm income (₦)	0.158***	0.043	0.000
Farm size (ha)	0.039	0.068	0.558
Household size	-0.327***	0.101	0.001
Farming experience (years)	-0.013	0.066	0.838
Age (years)	0.586***	0.167	0.000
Marital status (married=1; otherwise=0)	0.284**	0.138	0.041
Region (north=1; south=0)	0.007	0.101	0.942
Constant	-2.031***	0.663	0.002
Log likelihood = -656.83			
LR $\chi^2(9) = 35.94$			
Prob > $\chi^2 = 0.000$			
Pseudo R <sup>2</sup> = 0.03			
Number of observations = 1,200			

Source: Authors' computation.

Note: \*\*\*significant at 1% level; \*\*significant at 5% level.

There is also a higher probability that farmers whose nonfarm income is high will decide to borrow. However, the probability is lower for farmers with a large household size. The marginal effects of the variables are shown in Table 3.3. 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.

**Table 3.3 Marginal effects of the variables in the probit model**

Variable	Coefficient	S.E.	P[ Z >z]
Asset value (₦)	0.004	0.004	0.327
Operating profit (₦)	-0.014	0.010	0.181
Nonfarm income (₦)	0.049***	0.014	0.000
Farm size (ha)	0.012	0.021	0.558
Household size	-0.103***	0.031	0.001
Farming experience (years)	-0.004	0.021	0.838
Age (years)	0.183***	0.052	0.000
Marital status (married=1; otherwise=0)	0.095**	0.049	0.054
Region (north=1; south=0)	0.002	0.032	0.942

Source: Authors' computation.

Note: \*\*\*significant at 1% level; \*\*significant at 5% level.

## Determinants of Loan Demand

The determinants of demand for loans are examined on the basis of the Tobit type II model specified above. Farmers' demand for loans is hypothesized to be a function of interest rate, wage rate, price of maize, 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 3.4. The adjusted standard error for the demand equation regression is given by sigma ( $\hat{\sigma} = 1.2049$ ), 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 ( $\hat{\rho} = -0.7344$ ). The

inverse Mills ratio ( $\lambda = \sigma \times \rho$ ) has a negative coefficient (-0.8849) and is statistically significant. This suggests that the error terms in the selection (probit) and demand (regression) equations are negatively correlated.

**Table 3.4 Results of Heckman selection correction model of loan demand**

<i>Estimated demand model</i>	Coefficient	S.E.	P> t
<b><i>Dependent variable: Amount of formal loan obtained (log-linear)</i></b>			
Interest rate (%)	0.674***	0.096	0.000
Wage rate (₹/day)	0.303***	0.173	0.081
Maize price (₹/kg)	-0.199***	0.107	0.065
Value of assets (₹)	0.044***	0.014	0.003
Nonfarm income (₹)	0.253***	0.052	0.000
Farm size (Ha)	0.213**	0.071	0.003
Household size (no.)	0.273***	0.102	0.007
Farming experience (years)	-0.244***	0.064	0.000
Region (north/south)	-0.277***	0.104	0.008
Loan source (bank/nonbank)	-0.503***	0.090	0.000
Constant	6.314***	1.295	0.000
<b><i>Estimated selection model</i></b>			
Value of assets (₹)	0.014	0.015	0.327
Operating profit (₹)	-0.045	0.033	0.182
Nonfarm income (₹)	0.158***	0.043	0.000
Farm size (Ha)	0.039	0.068	0.558
Household size (no.)	-0.327***	0.101	0.001
Farming experience (years)	-0.013	0.066	0.838
Age (years)	0.585***	0.167	0.000
Marital status	0.283**	0.138	0.041
Region (north/south)	0.007	0.101	0.942
Constant	-2.031***	0.663	0.002
<b><i>Mills</i></b>			
<i>Lambda</i>	-0.8849*	0.533	0.097
<i>Rho</i>	-0.7344		
<i>Sigma</i>	1.2049		
Wald $\chi^2(10) = 183.33$ Prob > $\chi^2 = 0.0000$			

Source: Authors' computation.

Note: \*\*\*significant at 1% level; \*\*significant at 5% level; \*significant at 10% level.

The significant correlation of the error terms (with negative sign) is an indication that the (unobserved) factors that make participation in the loan market more likely have a tendency to be strongly associated with lower loan demand. Fitting the loan demand 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 type II Tobit model; 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 probit and demand equations could not be rejected. The significance of the lambda and other test statistics, as well as the estimated coefficients as shown in Table 3.4, is an indication that the estimation of a Heckman selection model in this study is justified.

According to the results, the hypothesis that farmers' demand for loans 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 demand equation. The estimated regression coefficients are presented in Table 3.4, while Table 3.5 presents the estimated elasticities. However, not all the coefficients have the expected signs. Theoretically, the sign of the loan

demand elasticity with respect to output price is expected to be positive, implying that when the output price increases, it stimulates increased demand for loans. With an increased output price, farmers are inclined to expand production and are thus prompted to expand their capital base through increased demand for loans.

**Table 3.5 Elasticity coefficients of the estimated loan demand model**

<i>Estimated demand model</i>	<b>Elasticity coefficient</b>	<b>Standard error</b>	<b>P&gt; t </b>
Interest rate (%)	0.023***	0.003	0.000
Wage rate (₦/day)	0.147	0.085	0.085
Price of maize (₦/kg)	-0.049	0.026	0.065
Value of assets (₦)	0.039***	0.014	0.004
Nonfarm income (₦)	0.276***	0.061	0.000
Farm size (Ha)	0.023***	0.007	0.003
Household size (no.)	0.005**	0.002	0.006
Farming experience (years)	-0.023***	0.006	0.000
Region (north/south)	-0.013***	0.005	0.008
Loan source (bank/nonbank)	-0.017***	0.003	0.000

Source: Authors' computation.

Note: \*\*\*significant at 1% level; \*\*significant at 5% level.

The results, however, show that a 1 percent increase in output price is associated with a reduction of 0.05 percent in loan demand, implying that farmers tend to plow back the additional earnings realized into farming to meet any intended expansion costs and so reduce demand for loans. This finding is consistent with the work of Swain (2008), in which the coefficient of the output price is negative and significant. The demand for 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. 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 demand 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 demand. This is not an entirely unique finding and may be due to the policy incentives aimed at lowering the cost of borrowing in the Nigerian agricultural sector. In a recent study, Sadikov et al. (2012) obtain such an unexpected relationship between credit demand and the interest rate. Using a disequilibrium model of the credit market, the authors investigate whether the surge in credit to the private sector in Lebanon during 2008–2010 was driven by supply or demand. Their results suggest that credit growth was basically supply driven, fueled by large deposit inflows and positive economic prospects. The demand for credit was modeled as a function of the real lending rate, future economic prospects, a dummy for economic and political uncertainty, advanced country GDP, and a time trend. The model was estimated for the local currency and foreign currency credit markets in addition to a joint estimation for the two markets. The coefficient of the real interest rate turned out to be positive but not statistically significant. This led the authors to conclude that the real interest rate had no effect on credit demand in Lebanon during the study period.

Dasgupta and Gupta (2005) find a positive and significant estimate of interest rate elasticity in their study of demand for money. The main objective of the study was to examine whether any behavioral changes in the money demand function did in fact take place due to the structural reforms in the Indian economy. Both short-run and long-run money demand functions were estimated. The coefficient of the interest rate in each of the models turned out to be positive. Whereas the positive coefficients are found to be insignificant for the long-run models, they are significant for the short-term models. One formulation of the short-run model expresses money demand as a function of last period money supply, permanent income, and the interest rate. Specifically, the result shows that the most decisive factors affecting

demand are the interest rate, the last period money supply, and permanent income. According to the authors, one plausible explanation for the positive and significant interest rate elasticity is the fact that interest rates were regulated and maintained well below the market rate as the government practiced priority-sector lending prior to the liberalization phase. Even after India adopted the liberalization program, interest rates were not allowed to be completely determined by the market. What followed as part of the financial sector liberalization was basically a phase-wise deregulation of the interest rate structure and a relaxation of the reserve requirements of the commercial banking system, which was intended to create more money through the multiplier system in the credit-starved economy. In another formulation of the model, the authors express money demand as a function of permanent income, savings, and the interest rate and observe that the impact of the interest rate is again positive and significant. The deviation in the sign of interest rate elasticity from the general expectation is explained by the same aforementioned factors. The study concludes that the positive interest elasticity in the estimated short-run demand functions and the error correction model confirms the fact that as interest rates were freed in a phase-wise motion, increases in money demand were actually witnessed.

In the Nigerian 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 in discouraging farmers from borrowing in a situation in which the government has implemented various forms of interest rate subsidy has also been substantiated in previous studies in other developing countries. Studies on credit demand in rural areas of Kenya, for instance, have shown that the interest rate or factors related to it are statistically insignificant or less significant as determinants of demand 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 that of a recent study in Nigeria that examines the determinants of demand for microcredit among rural households. 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 dire need and the shortage in supply (Balogun and Yusuf 2011).

The unfolding result in the case of our study is an indication that when credit operations are carried out in an incentivized system, 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 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.

With regard to farm size, the elasticity is positive and significant. A 1 percent increase in farm size is associated with an increase of 0.02 percent in loan demand. This shows that farmers with a larger farm size will demand more loans than those with a smaller farm size, and this is consistent with many findings in the literature (Ferede 2012; Motsoari, Cloete, and van Schalkwyk 2013; Atieno 1997; Swain 2008). A similar result is also obtained with respect to household size. A 1 percent increase in household size is associated with an increase of 0.01 percent in loan demand. The finding that a large family size increases agricultural credit demand has been reported in another study in Nigeria (Oluwasola and Alimi 2008). In Ghana it has also been found that larger households are more exposed to shock (for example, illness) because the higher number of household members ultimately causes them to demand more credit (Steiner, Giesbert, and Bendig 2009). In an exceptional study in India, the relationship is found to be negative, in the sense that family size actually decreases the demand for loans. The possible explanation

given by the author is that increased family size might be a reflection of an increased number of earning members in the household (Swain 2008).

As regards nonfarm income, the elasticity coefficient is also positive and significant. A 1 percent increase in nonfarm income is associated with an increase of 0.28 percent in loan demand. Whereas the result for nonfarm income contradicts the work of Motsoari, Cloete, and van Schalkwyk (2013), who found a significant negative relationship between nonfarm income and access to credit in Lesotho, it is consistent with the work of Atieno (1997), who found a positive though 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 therefore appear to be in a better position to attract 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 to mitigating the risk associated with agricultural credit operations in Nigeria.

The elasticity of farming experience is negative and statistically significant. A 1 percent increase in farming experience is associated with a 0.02 percent reduction in loan demand. This result is consistent with the findings of Atieno (1997) in her study of the determinants of credit demand in Kenya. The result implies that more experienced farmers are likely to demand less credit. The managerial ability of the farmer may be an important factor that can explain the situation, as farmers with more farming experience may be better managers and hence less likely to need credit.

Other important findings are related to the source of loans and the location of borrowers. The demand for loans is found to be higher in the southern part of the country than the north, while demand for 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 Nigeria are not well served by the banking sector as far as credit facilities are concerned. Thus, in the next section the issues surrounding credit rationing for small-scale farmers are subjected to a more elaborate analysis.

#### **4. NATURE AND DETERMINANTS OF CREDIT RATIONING AMONG SMALL-SCALE FARMERS**

Although efforts are being made to increase agricultural investment in Nigeria, the 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. However, needs turn into demand only when there is a willingness and ability to pay for the service and when farmers actively seek loan facilities. The range of loans for which an effective demand exists includes short-term (seasonal) loans for periods of less than one year, medium-term loans for periods of up to five years, and long-term loans for periods of between six and ten years. Short-term loans are designed to meet important financing needs in the agricultural production cycle, including the provision of advances for crop and livestock intakes, production requirements, production credit, and other services that include the handling, manufacturing, packing, processing, storage, transport, and marketing of agricultural products. Medium- and long-term loans are for the support of investment in processing and farm machinery, water supply and irrigation equipment, livestock structures and fencing, fish farming (ponds and cages), and farm forestry development. Long-term loans may be in the form of establishment loans to farmers for perennial crops. These loans are typically used for establishing sugarcane plantations, citrus and deciduous fruit orchards, timber plantations, and vineyards for table and wine grapes. They can be designed specifically for acquiring farming equipment, implements, farming vehicles, and livestock, and for the improvement of structures and irrigation systems.

Agricultural financing should also provide opportunities for money transfer within an economy or internationally, whether for production activities or international trade. Such transfer capability is particularly important given the fact that agricultural activities are time bound, and delays may have adverse effects on farm operations. Money transfers are crucial in meeting the financial needs of investors in rural areas, which is where farming is carried out in many African countries. Many business partners with whom rural dwellers must transact business live in urban areas. Transactions can take place at a reduced cost and in a more timely fashion if there are opportunities for money transfer. The advent of cell-phone banking has changed money transfers in many countries, lowering the cost of such transfers and greatly increasing the convenience of doing so.

Agriculture involves a very high level of risk. Thus, risk mitigation measures are needed in order to further encourage investment, both on-farm and further down agricultural value chains. Conventional farm management practices—for example, intercropping species with different moisture requirements, staggered planting (even in rainfed agriculture), interseasonal on-farm food storage, and maintenance of a contingency savings fund—are all important traditional techniques for managing risk. The need for financial mechanisms for risk management is being increasingly felt, however, judging by the rising level of investment and involvement of the financial sector. The insurance market, which is supposed to assist with this, is still not properly developed. Availability of agricultural insurance services will help farmers cope with the risky nature of agricultural enterprises. Insurance gives the poor a sense of security that allows them to pursue profit-oriented activities and hence to borrow, because an income shock will be minimized when insurance claims are settled. A strategy of linking insurance with credit provision will ensure that lenders have better loan recovery performance and thus guarantee the viability of the credit institution (Olomola 2011).

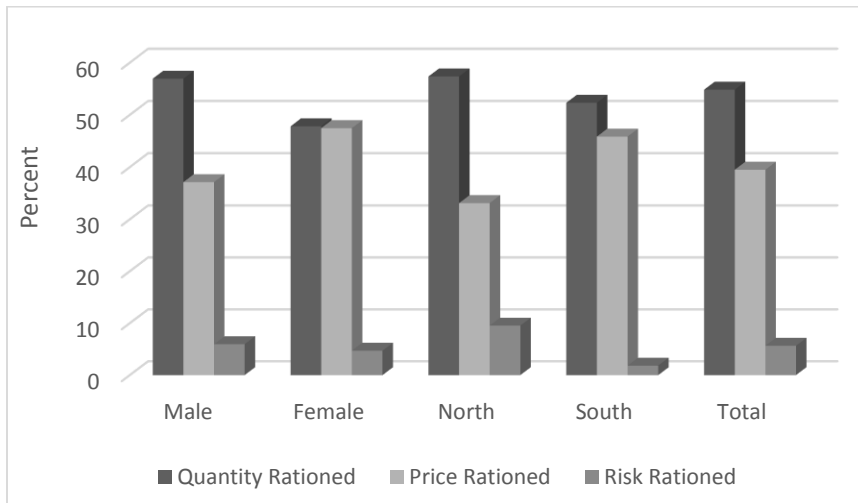
##### **Nature of Credit Rationing among Small-Scale Farmers**

Despite the various attempts being made to capitalize the agricultural sector, it has proved difficult to bridge the gap between formal lenders and small-scale farmers. There are arguments on both sides of the divide. Lenders often argue that farmers do not repay loans on time, the administrative cost of loan processing is prohibitive, and loan supervision is cumbersome. In the case of default, the CBN does not respond promptly to loan guarantee payment requests. However, the farmers are of the opinion that it

takes too long for formal lenders to process a loan, disbursement is often late (about three months delay), and information about loan conditions is released in a piecemeal fashion. Many farmers do not apply for credit because they assume they will be denied it on account of the stringent conditions that are often stipulated. And there are situations in which all these conditions are met and yet farmers are denied loans. Farmers are also of the opinion that the loan processing is not transparent.

The identification of the farmers' credit-rationing status is an integral part of the research instrument for this study. 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 nonborrowers 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 Nigeria. Of the 1,200 farmers included in the study, 658 are quantity rationed, 474 are price rationed, and 68 are risk rationed, representing 55, 39, and 6 percent of the total, respectively (Figure 4.1).

**Figure 4.1 Credit-rationing status of farmers by region and gender**



Source: Authors' graph using 2013 survey data.

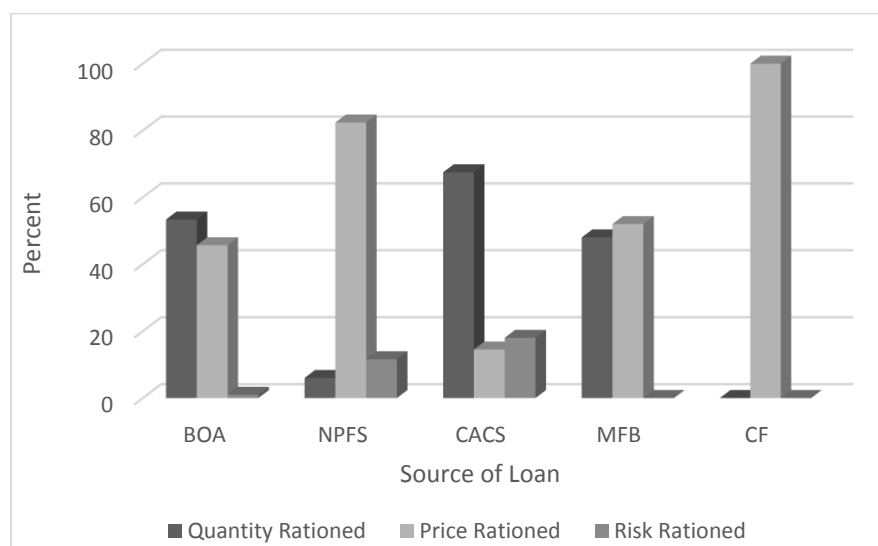
Credit rationing cuts across gender and regional divides, although in each region and gender group the distribution pattern tends to be similar in the sense that the largest proportion is quantity rationed while the smallest is risk rationed. As shown in Figure 4.1, however, the proportions of quantity-rationed 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 are more quantity rationed and risk rationed than those in the south, whereas those in the south are more price rationed than their northern counterparts. Overall, females seem to find their credit situation more satisfying than males, just as farmers in the south appear to have a better credit-rationing status than those in the north.

## Some Socioeconomic Characteristics of Credit-Rationed Farmers

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 1,095 married farmers, 55 percent are quantity rationed, 40 percent are price rationed, and only 5 percent are risk rationed. Of the remaining 105 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 bank and nonbank sources. The results show that farmers are treated differently by different types of lending institutions, irrespective of whether they are banks or nonbank 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 MFBs 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 MFBs (Figure 4.2).

**Figure 4.2 Comparison of farmers' loan-rationing status by source of loans**



Source: Authors' graph using 2013 survey data.

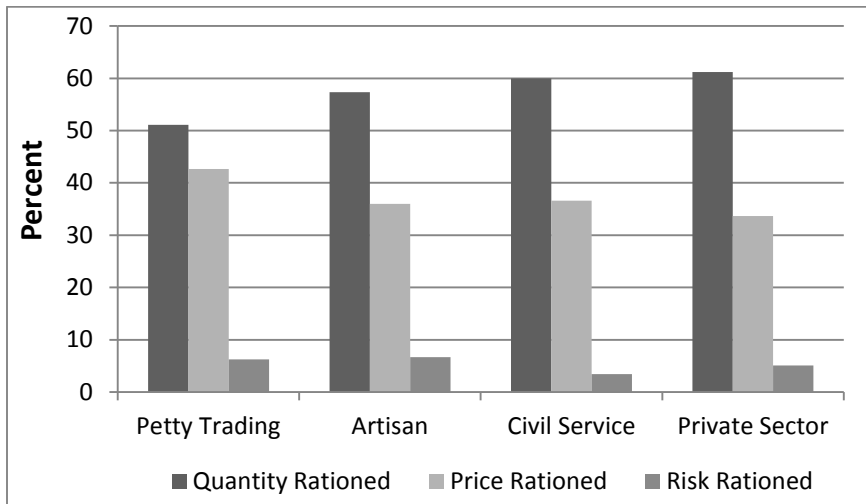
Note: BOA = Bank of Agriculture; NPFS = National Programme for Food Security; CACS = Commercial Agriculture Credit Scheme; MFB = microfinance bank; CF = contract farming

With regard to the NPFS, 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 CF scheme are price rationed. The scenario with the CACS 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 access to credit turns out to be most satisfactory in the case of CF, followed by NPFS, MFB, and the BOA, while the least satisfactory is the CACS, 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 (Figure 4.3). 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.

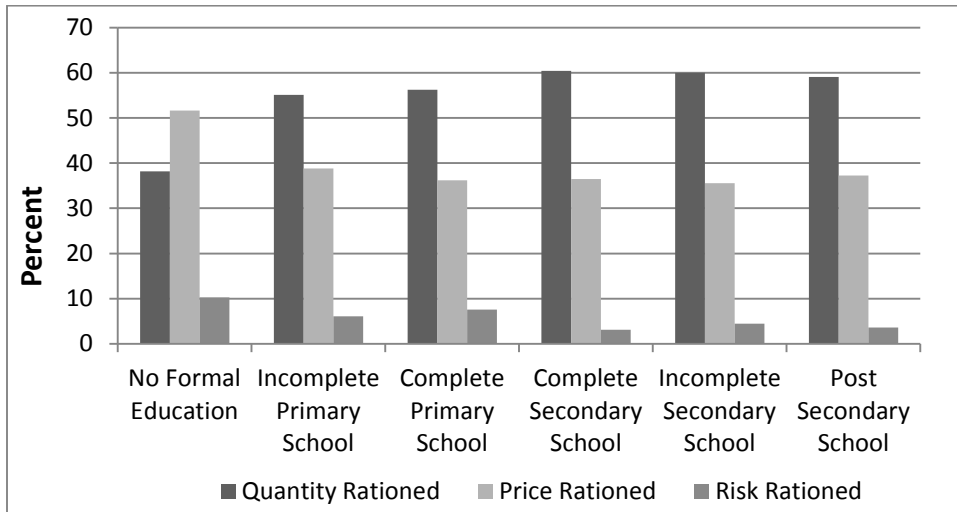
**Figure 4.3 Credit-rationing status of farmers by type of secondary occupation**



Source: Authors' graph using 2013 survey data.

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. As shown in Figure 4.4, 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. Second, the graph shows that 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.

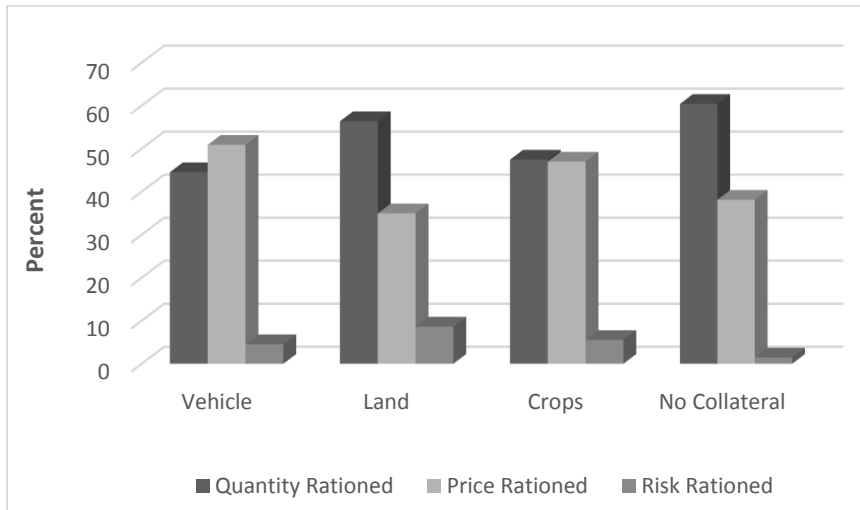
**Figure 4.4 Credit-rationing status of farmers by level of education**



Source: Authors' graph using 2013 survey data.

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 illustrated in Figure 4.5. The distribution of farmers based on their credit-rationing status varies among the potential collateral groups. In the 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.

**Figure 4.5 Credit-rationing status of farmers by availability of potential collateral**



Source: Authors' graph using 2013 survey data.

### Determinants of Credit Rationing

The seemingly unrelated regression model is employed to ascertain the determinants of credit rationing. It is broadly hypothesized that credit rationing is significantly influenced by 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 rationing is decreasing in financial wealth and productive wealth and that 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 4.1 and 4.2, 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 4.3), 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 4.1). 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 nonsignificance 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 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.

**Table 4.1 Seemingly unrelated regression estimates for credit-rationed farmers**

Variable	Estimated model		
	Quantity rationed	Risk rationed	Price rationed
Nonfarm income (₦)	2.61e-08 (3.03e-08)	3.16e-08** (1.64e-08)	-5.75e-08* (3.08e-08)
Percent farm income (%)	0.013*** (0.003)	-0.0003 (0.001)	-0.013*** (0.003)
Savings (₦/kg)	1.35e-07** (6.91e-08)	2.95e-09 (3.74e-08)	-1.38e-07** (7.01e-08)
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)
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/south)	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)
Borrowing status	-0.586*** (0.027)	0.077*** (0.015)	0.509*** (0.028)
Constant	0.824*** (0.053)	-0.007 (0.029)	0.183*** (0.054)
No. of observations	1,200	1,200	1,200
F-stat	49.34	7.44	39.23
R <sup>2</sup>	0.31	0.06	0.26
Prob	0.000	0.000	0.000
Breusch-Pagan test of independence: Chi <sup>2</sup> (3) = 1,047.65 Prob > chi <sup>2</sup> = 0.000			

Source: Authors' computation.

Note: Figures in parentheses are standard errors; \*\*\*significant at 1% level; \*\*significant at 5% level.

**Table 4.2 Marginal effects of the variables in the estimated seemingly unrelated regression models**

Variable	Estimated models		
	Quantity rationed	Risk rationed	Price rationed
Nonfarm income (₦)	2.61e-08 (0.86)	3.16e-08** (1.92)	-5.75e-08* (-1.87)
Percent farm income (%)	0.133*** (4.61)	-0.0003 (-0.25)	-0.013*** (-4.46)
Savings (₦)	1.35e-07** (1.95)	2.99e-09 (0.08)	-1.38e-07** (-1.97)
Farm size (ha)	0.029 (0.67)	-0.075*** (-3.19)	0.047 (1.06)
Household size (no.)	0.029 (1.38)	0.006 (0.51)	-0.035 (-1.67)
Farming experience (years)	-0.021*** (-2.52)	-0.0008 (-0.19)	0.021*** (2.56)
Education (years)	0.051*** (3.92)	-0.014** (-1.95)	-0.037*** (-2.81)
Gender	0.034 (1.11)	0.029* (1.72)	-0.062** (-1.96)
Region (north/south)	0.009 (0.33)	0.087*** (5.61)	-0.097*** (-3.35)
Marital status	-0.015 (-0.33)	-0.014 (-0.57)	0.029 (0.64)
Borrowing status	-0.585*** (-21.00)	0.077*** (5.08)	0.509*** (18.00)

Source: Authors' computation.

Note: Figures in parentheses are z-statistics; \*\*\*significant at 1% level; \*\*significant at 5% level; \*significant at 10% level.

**Table 4.3 Correlation matrix of residuals**

Variable	Quantity rationed	Risk rationed	Price rationed
Quantity rationed	1.0000		
Risk rationed	-0.2415	1.0000	
Price rationed	-0.8529	-0.2962	1.0000

Source: Authors' computation.

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 nonsignificance 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 nonborrowers. 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 south.

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 4.2, 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 nuanced, taking into account gender and geographical location.

## 5. SUMMARY, POLICY RECOMMENDATIONS, AND CONCLUSIONS

This study has sought to examine the factors influencing the borrowing decisions of small-scale farmers in Nigeria, analyze the demand for agricultural credit by these farmers, ascertain the extent to which they are credit constrained, and determine the factors influencing their credit-rationing status with a view to recommending policy measures to address the problem of agricultural credit rationing and enhance the demand for credit by small-scale farmers in the country. The analysis of the farmers' participation in the credit market involves the estimation of a Tobit type II model in which determinants of farmers' borrowing decisions and their demand for credit are analyzed following the Heckman two-step approach. With regard to credit rationing, we cover three dimensions—quantity rationing, risk rationing, and price rationing—and hypothesize that quantity rationing is decreasing in financial wealth and productive wealth and that risk rationing is also 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. In the econometric analysis we employ the seemingly unrelated regression model to ascertain the determinants of credit rationing among the small-scale farmers included in the study. Below we present the summary of our main findings, followed by policy recommendations and concluding remarks.

### **Main Findings**

#### ***Factors Influencing Farmers' Borrowing Decisions***

With regard to the borrowing decisions of farmers, the results show that older farmers have a higher probability of deciding to borrow compared to younger ones. Farmers who are married are also more likely to decide to borrow 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. Farmers whose nonfarm income is rising have a higher probability of deciding to borrow. However, the probability is lower for farmers with rising household size.

#### ***Determinants of Loan Demand***

The hypothesis that farmers' demand for loans is significantly determined by the socioeconomic and demographic factors specified in the model cannot be rejected. We found that demand for credit depends positively on the wage rate. A rising wage is likely to lead to increased production costs, and thus farmers will need credit to finance these costs. The need may arise directly from rising labor costs or from the fact that farmers may want to substitute mechanization for labor. Either way, funds will be required to pay for relevant services or to acquire necessary equipment. The relationship between output price and loan demand shows that farmers tend to plow back the additional earnings realized into farming to meet any intended expansion needs and so reduce demand for loans, possibly in the face of heightening borrowing constraints. Although credit demand is expected to depend negatively on the interest rate, we found a positive relationship. This is not an entirely unique finding (David and Wyeth 1978; Sadikov et al. 2012) and may be due to the policy incentives aimed at lowering the cost of borrowing in the Nigerian agricultural sector. The results show that more experienced farmers are likely to request lower loan amounts, while less experienced farmers tend to request more. Here the managerial ability of the farmer is a crucial factor that can explain the situation. Farmers with more farming experience tend to be better managers of funds and are likely to be able to more accurately determine the amount of loan they need or how much they expect to receive from the lending institutions, compared to their inexperienced counterparts.

Farmers with higher nonfarm income can expect to be granted more loans, while those with lower nonfarm income are likely to receive lower loan amounts. We found that farmers with larger farms request more loans (ostensibly to provide the necessary working capital to acquire additional productive inputs) than those with smaller farms. The fact that loan demand increases as household size increases suggests that the proportion of nonearning members may be higher than that of the earning members of the household, and this implies more expenditure on consumption and less income to finance farm operations, thus exacerbating the need for credit. Moreover, the demand for loans is found to be higher in the southern part of the country than in the north, while the demand for loans from commercial banks is found to be lower than demand for loans from nonbank sources. This finding corroborates the well-known fact that small-scale farmers in Nigeria are not well served by the banking sector as far as credit facilities are concerned.

### ***Determinants of Credit Rationing***

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 nonsignificance 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 southern 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 south.

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 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. Below we recommend a number of policy measures to begin moving the country in this direction.



## **Policy Recommendations**

### ***Legislation in Support of Use of Alternative Collateral***

The use of collateral other than land is increasing in the context of agricultural financing in the developing world. In some countries (for example, Kosovo, Rwanda, and Romania), agricultural-finance providers have accepted assets such as cars, tractors, animals, or crops from the fields as collateral. In Nigeria the legal environment and banking regulations do not 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. This is one of the main reasons why financial services such as equipment leasing, inventory financing, invoice discounting, and factoring (which are entirely normal in developed markets) are rarely applied to agricultural financing. The expansion of commercial 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. Essentially, the legislation needs to broaden the array of financial services provided to the agricultural sector by legalizing the use of movable assets such as large animal species, tractors, and other agricultural equipment in addition to land as collateral for securing agricultural loans from the banking sector.

### ***Liberalization and Refocusing of Agricultural Insurance***

Agricultural insurance schemes were introduced in Nigeria in the late 1980s and legally came under the implementation, management, and administration of the Nigerian Agricultural Insurance Corporation established by Decree 37 of 1993. 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. Linking insurance with the provision of credit is not out of place. Indeed, it has been recognized as one of the mechanisms for improving the financial system's response to the development of the real sector (Dercon 2004). Nonetheless, to generate the desired response in Nigeria, a rethink of the agricultural insurance policy is needed.

To strengthen the role of insurance in risk mitigation and increase credit participation by small-scale farmers, 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. The point must be stressed, however, that liberalization will not generate the required demand unless the requisite infrastructure and skills are provided to facilitate the smooth operation of the insurance market and purge it of the traditional problems of moral hazard and adverse selection. This is all the more reason why index insurance could be an appropriate policy option. Under index-based insurance, the payout to farmers is triggered when the threshold value for an underlying risk indicator is breached. The index (risk indicator) can be based on the amount of rainfall (lack of or excess), humidity levels, arrival of locusts, water levels in a river, crop yield, and so on. Unlike in traditional crop insurance products, asymmetric information problems play a much smaller role in index-based insurance schemes. First, a farmer generally has little more information than the insurer regarding the index value, and second, the index value cannot be influenced by individual farmers. Thus, less asymmetric information leads to less adverse selection and reduced moral hazard problems. This is likely to result in lower transaction costs, especially in view of the fact that verification of individual loss claims may be unnecessary, thus making it more affordable for small and marginal farmers. A medium- to long-term perspective is recommended for an effective adoption of index insurance, given the high level of sophistication required for the technical design and implementation procedures. Success will depend on the availability of highly proficient and dependable measurement tools, including weather stations,

remote-sensing techniques, and satellites, and competent staff, as well as a high level of transparency and credibility in risk management, data gathering, and analysis.

### ***Value Chain Finance***

Value chain finance is not a new concept in the agricultural finance literature, but its application to agricultural financing in Nigeria remains at an embryonic stage. The flow of funds to and among the various links within a value chain comprises what is known as value chain finance. Value chain finance makes use of the business relationships among the value chain partners (who are interdependent but share business information) and in this way reduces performance, market, and credit risks (Miller 2011). Thus, the partners that farmers regularly do business with, such as input suppliers and buyers, provide or facilitate credit to these farmers.

This study finds that asymmetric information is at the root of the credit-rationing phenomenon experienced by small-scale farmers in the country. Adopting a value chain approach to credit transactions in the agricultural sector is likely to reduce the information asymmetries that banks and other formal lenders are confronted with and lead to more optimal credit participation by smallholder farmers. The approach has the following potential advantages: (1) the mere fact of being in the value chain is a tremendous boost to the farmers' creditworthiness, as the assurance of a close marketing relationship between farmers and buyers in the value chain is an element of loan surety cherished by lenders; (2) technical advice provided to farmers in CF tends to reduce farmers' performance risk (harvest failure or substandard yield); and (3) loan transaction costs, in terms of lower costs for loan appraisal, loan disbursement, and recovery, are reduced. The various mechanisms through which value chain financing can be used to enhance farmers' access to finance are shown in Table 5.1. Although some of these mechanisms, such as CF, outgrower schemes, and loan guarantees, are being practiced in Nigeria, others, such as warehouse receipt systems and trade credit, have yet to be implemented. These financing approaches will therefore receive further elaboration below. It is important to emphasize, however, that fairness and transparency must prevail in the pricing and credit conditions to ensure that farmers derive the desired benefits from their participation in this type of financing framework. Otherwise, farmers will resort to defending themselves against abuses by credit providers by engaging in side-selling of their commodities to redress any unfair treatment and recoup the perceived revenue loss. The framework should therefore be backed up by appropriate legislation that will guarantee ownership rights, transferability of title documents, and timely resolution of disputes.

**Table 5.1 Types of value chain finance instruments**

<b>Type of value chain financing</b>	<b>Description</b>
Trade credit (credit from input suppliers or buyers, such as traders or processors)	Farmers receive credit from input suppliers, intermediary traders and shops, or agro-processors, pledging to repay from future harvest income. Typically, this does not directly involve a bank, and the agreement is usually informal and based on trust. Trade credit is often provided in kind (seeds, fertilizer, consumption goods), and payment is made in kind as well (final produce). Such arrangements nearly always concern seasonal credit only. The cost of credit (interest) is embedded in the agreed prices for inputs and outputs, and may be quite high.
Contract farming	A trader, exporter, or agro-processor establishes preharvest purchase contracts with selected farmers or their representatives (an association or cooperative). This involves forward contracting of the crop (the price or pricing formula is fixed). The main motivation is to secure a supply of produce of a certain quality and at a specified time. Technical support to ensure quality may be part of the contract. Product standards are agreed to beforehand. As part of the forward contract, farmers receive partial prepayment. A bank can also be involved through a triangular arrangement (the sales contract becomes the surety). This arrangement nearly always concerns seasonal credit only. A special case is preharvest credit provided to cooperatives, enabling them to buy goods from their members. Prefinance usually has a maturity of only several weeks.
Outgrower scheme	An outgrower scheme is an elaborate contract-farming arrangement emanating from a nucleus—a lead farm or processor (also called a technical operator)—that gives outgrowers access to its marketing, operational, and logistical capabilities. Technical support may be provided to the outgrowers. Loans may include investment financing (for example, in trees and equipment). Outgrower schemes are most common in high-value specialty crops with niche markets.
Warehouse receipt finance	Products stored in a certified and secured warehouse serve to guarantee credit, to be used for the next harvest or other purposes (postharvest finance). This gives the farmer more flexibility in timing the sale of products, thus benefitting from interseasonal price increases. Also, if products are tested and graded, their value may increase. This arrangement concerns seasonal credit because the farmer will probably want to sell the crop and repay the debt before the next harvest.
Loan guarantees	Agricultural loan guarantees are offered by third parties (especially entities in the public sector) to enhance the attractiveness of financing by reducing lending risks. Guarantees are normally used in conjunction with other financial instruments and can be offered by public-sector agencies to support increased lending to the agricultural sector.
Financial lease (lease-purchase)	A financial lease is a purchase on credit that is designed as a lease with an agreement of sale and ownership transfer once full payment is made (usually in installments with interest). The financier maintains ownership of the goods until full payment is made, making it easy to recover the goods if payment is not made while allowing agribusinesses and farmers to use and purchase machinery, vehicles, and other large-ticket items without requiring the collateral otherwise needed for such a purchase.

Source: Adapted from AFD (2012) and Miller (2011).

## ***Warehouse Receipt Finance***

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 buyer presents the receipt to the warehouse to retrieve the product. The bank transfers the balance (minus the loan amount and interest) to the farmer. There are two possibilities in making the payment: (1) the buyer pays the full amount to the bank, which pays the balance to the farmer, or (2) the buyer pays the bank the loan amount plus interest due, and the rest to the farmer. Default rates in warehouse receipt finance tend to be low partly because the borrower (producer) repays the loan with earnings from the sale of the product. 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 17 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.

Warehouse receipt finance is a self-liquidating loan product. The form of the receipt depends on local regulations and consists in some legal systems of two documents: a certificate of title and a certificate of pledge. In Latin America, the documents used are (1) the warehouse receipt itself, confirming that the produce was received in storage, and (2) a warrant or chattel bond that represents ownership of the crop. Warehouse operators store all the produce received from all farmers in one silo, thereby losing track of the products' origin. However, since farmers offer products of varying quality, products must first be tested and graded upon receipt and stored accordingly.

In order to increase the flow of credit to the agricultural sector in Nigeria, warehouse receipt finance as explained above 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. As a financing mechanism, therefore, the warehouse receipt finance system is likely to expand and formalize credit participation by a large number of small-scale farmers in the country, especially those who produce crops such as rice, maize, millet, ginger, cashew, cocoa, cotton, and other nonperishable commodities. The introduction of this system should proceed gradually and in phases so as to allow sufficient time for the technical, regulatory, and infrastructural components to be well established. Policy actions are required in terms of proper regulation and enforcement of compliance with stipulated standards regarding physical facilities, capital adequacy, liquidity, managerial qualities, and insurance. There should also be continuous training of technical staff (weighers, samplers, and graders) to ensure effective performance of their duties so that the relevant commodities conform to national and international standards. The key innovation in warehouse receipt finance is that it solves a financing and collateral problem. It offers the bank a safe and liquid collateral asset that is easy to monitor. However, warehouse receipt finance is a postharvest financial product, applicable only when the farmer has already completed a harvest cycle. Therefore, the initial harvest cycle and subsequent preharvest operations will continue to require funding from other credit resources.

### ***Increased Agricultural Financing through Trade Credit***

Trade credit is an important financing mechanism through which the private sector can be more involved in agricultural financing in a manner that is devoid of the conventional lender-creditor relationships, terms, and conditions. Farmers need not source formal production credit solely from the banking sector. There are nonbank and even nonfinancial institutions that can participate in agricultural financing in the form of trade credit. This is a form of credit transaction via which beneficiaries receive credit through layers of traders in which some actors in particular layers (not necessarily the farmers) within the system may or may not have access to bank loans. Trade credit can flow into both upstream and downstream activities. Nonfinancial institutions such as hotels, supermarkets, restaurants, agricultural input dealers, agribusiness firms, importers, and exporters are suitable actors in trade credit arrangements. Credit can flow upstream to farmers in situations in which input dealers advance seeds, fertilizer, and chemicals to farmers at the planting season while expecting to be repaid after the harvest. In the dairy sector, dairy farmers can be paid at agreed periods, an indication that farmers are prefinancing the dairy factory. In the same vein, agricultural products can be sold on consignment through supermarkets, with delayed payment implying that farmers carry the shops' inventory cost. Similarly, fish farmers and vegetable producers can secure ready markets with hotels and restaurants that can take up the supplies with a promise of payment at a later date. As the nation's agricultural sector is being given a business orientation under the ATA, we strongly recommend that trade credit be viewed as an important component of the value chain financing framework to enhance private-sector investment in agriculture and boost the supply of credit to smallholder farmers.

### ***Transformation of the Bank of Agriculture***

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 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 Nigeria but in Africa as whole (Olomola 2012). 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.

## Conclusions

Although some incentives have recently been introduced to ensure improved agricultural financing in Nigeria, banks still subject farmers to various forms of rationing. The agricultural credit constraints confronting small-scale farmers in Nigeria are myriad and age-old, but they are not insurmountable. As the agricultural sector is being transformed, there is need for innovative approaches to agricultural financing that will address not only the sector-specific risks but also the agricultural finance risks in all their ramifications. In this regard, the financial sector, the government, and farmers themselves have significant roles to play.

The banking sector must invest in capacity building in terms of staff training and retraining in agricultural financing. This will enable commercial banks to come to grips with the financing requirements of the agricultural sector. According to Olomola (2011), the critical areas in which banks need to intensify the development of capacity include (1) risk assessment and identification of strategic opportunities to strengthen value chains, (2) determining how cohesive value chains can be used to reduce risks and facilitate access to finance, (3) determining how to apply value chain financial products to meet the needs of various actors in the chain, and (4) designing appropriate financial products to meet the needs of small-scale farmers. The banks can also assist in mobilizing financial and human resources to organize training for potential borrowers in the areas of (1) farm accounting and business management, (2) understanding financial risks, (3) identifying opportunities and managing risks, and (4) loan application writing for bankable agricultural projects, with emphasis on cash flows and project costs. Greater portfolio diversification by banks is required, with an emphasis on a variety of agricultural enterprises (especially along the value chains of the various commodities), geographical locations, and borrowers' risk-based socioeconomic characteristics such as gender, collateral substitutes, and social insurance. A social mechanism involving lenders setting up loan-monitoring committees at the grassroots level may work as insurance against the risk of loan default. The committees, which may include officials of agricultural agencies and community leaders, could work with lenders to identify true farmers and monitor the use of loans from the beginning of farm operations to the end of the loan period. This will ensure that loans are effectively utilized and repayment obligations are complied with conscientiously.

The government needs to create a regulatory environment that supports the modern contractual obligations that are characteristic of well-functioning agricultural value chain 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.

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 a quid pro quo for political participation and purge themselves completely of this misperception, which has been popularized by the political class over the years. Moreover, they must 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 CBN, 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. These issues, as well as the risk management capacity of small-scale farmers, constitute important areas for further research. An investigation into the extent of the benefits being derived by farmers since the inception of NIRSAL in 2011 is desirable in order to further substantiate the gains of the recent agricultural finance policies under the ATA being implemented in the country.

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