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EFFICIENCY OF AGRICULTURAL LENDING SCHEMES IN NIGERIA

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ABSTRACT: *The broad objective of the study was to evaluate the efficiency of agricultural lending schemes in Nigeria with a view to determining their impact on output and income of beneficiaries. The study was carried out in Benue, Kwara, Kaduna, Abia, Anambra, Rivers, and Ogun states respectively. The method of proportionate random sampling was used in selecting 185 borrowers who are registered with their state Agricultural Development Programmes (ADP's). The sampling frame comprised all the registered ADP farmers in the surveyed states who took agricultural loan. Data collected were analyzed using frequencies, percentages, means, and multiple linear regression analysis. The results of the study showed that both small and medium scale farmers are efficient in the use of farm inputs, but small scale farmers are technically more efficient than medium scale farmers. Borrowers with secondary or tertiary education were efficient in inputs use, but borrowers with tertiary education were technically more efficient than borrowers with secondary education. The efficient lending schemes in Nigeria are ACGSF and CACS, but ACGSF was technically more efficient than CACS. It was recommended that the government should continue to fund farmers in Nigeria through ACGSF and CACS.*

KEYWORDS: Efficiency, Agriculture, Lending Schemes, Nigeria

INTRODUCTION

The provision of institutional credit to small holder farmers in Nigeria has been the policy thrust of successive governments in the country. In Nigeria, the first attempt at the injection of financial capital into the agricultural subsector was made by the Federal Government in the 1962 – 1968 development plan with the provision of six million naira (₦6m) for the development of that sector of the economy (FMED, 1981). Following this, bank credits to the agricultural sector in nominal terms over the years increased from ₦230 million (then about $233 million) in 1978 to over ₦262 billion ($2.23 billion) in 2005 (CBN, 2010 a). This is in realization of the fact that to sufficiently boost food production and adopt new agricultural technologies and innovations, there is the need for farmers to borrow money from lending institutions (Obasi et al, 1995). Moved by the desire to reduce import dependency, as well as by the need to relieve dependence on the oil sector for economic growth, Federal and state governments stepped up efforts to promote agricultural development through the establishment of a number of agricultural credit schemes. Some of these schemes include the Agricultural Credit Guarantee Scheme Fund (ACGSF), the Special Emergency Agricultural Loans Scheme (SEALS), the Supervised Agricultural Credit Scheme (SACS), the Small and Medium Enterprises Equity Investment Scheme (SMEEIS), the Agricultural Credit Support Scheme (ACSS), and the Commercial Agricultural Credit Scheme (CACS), and recently the Nigerian Incentive based Risk Sharing system for Agricultural Lending (NIRSAL) which encourages farmers to insure their farms against natural disaster, and to borrow from commercial banks guaranteeing the interest paid by the farmer up to 60%. According to Central Bank of Nigeria (CBN)(2010b), between 1978 and 1989 when the government

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stipulated lending quotas for banks under the Schemes, there was consistent increase in the lending portfolios of banks to the agricultural subsector. However, experience gained from the implementation of these schemes show that although they have succeeded in increasing the level of funding to the agricultural sector, the impact has not been as significant as anticipated, and moreover, the successes recorded have almost in all cases been constrained by among others, poor loan repayment performance, late disbursement of loans, loan diversion, low output, low productivity, and reluctance on the part of formal lending institutions to finance agricultural production (Njoku and Obasi, 1991). These therefore suggest that the schemes have been inefficient in fund delivery and recovery. As a result, there is the need therefore for research to investigate the contributions of the various credit schemes to agricultural production in Nigeria, and estimate the production efficiency of farmers' under the various lending schemes with a view to deriving policy for better performance of the agricultural lending schemes.

Objectives of the study

The broad objective of the study was to evaluate the efficiency of agricultural lending schemes in Nigeria with a view to determining their impact on output and income of beneficiaries. The specific objectives of the study are to:

(i) examine the socio-demographic characteristics of farmer borrowers in Nigeria
(ii) ascertain the various agricultural lending schemes in Nigeria and evaluate their efficiency
(iii) evaluate the efficiency of the different category of farmers (small, medium, or large scale) funded by the lending institutions in the country

Materials and Methods

The study was conducted in Nigeria. The country has an estimated 69.9 million hectares of agricultural land of which 39.2 million hectares are under permanent pasture, with 2.8 million hectares under permanent crops, and 27.9 million hectares under arable crops. Nigeria is divided into six agro-ecological zones namely; the humid rainforest found mainly in the south, the derived savannah, the southern guinea savannah found in parts of the south and the entire middle belt, the northern guinea savannah, the mid altitude savannah, and the dry Sudan or Sahel savannah all in the northern parts of the country. The guinea savannah is noted for the production of cotton, groundnuts, maize, millet, sorghum, soybeans, yam, cassava and vegetables. The humid rainforest, derived and coastal agro-ecological zones produce tree crops such as cocoa, oil palm, rubber and timber, and food crops such as cassava, yam, maize, pineapple, bananas, plantains, papaya, mango, oranges, beans and vegetables. The dry northern savannah is suitable for growing sorghum, millet, maize, groundnuts and cotton, and is also the principal livestock-raising area. In the middle belt and the south, the main food crops are cassava, yam, plantain, maize and sorghum. Rice is grown in the low-lying and seasonally flooded areas, and the main cash crops in the south are palm oil, cocoa and rubber. There are two major agricultural production systems: the traditional production system which is found in all parts of the country, and the improved irrigation production system which comprises of the improved Fadama (Hausa language meaning low lying land) farming. Fadama farming utilizes low lying land or water logged areas for crops and livestock production. The study covered five out of the six geopolitical zones in Nigeria. In the North-Central and North-West geopolitical zones, the states that were covered are Benue, Kwara and Kaduna, while in the South-Eastern, South-South and South-West geopolitical zones, the states that were studied are Abia, Anambra, Rivers, and Ogun

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respectively. The method of proportionate random sampling was used in selecting a sample of 185 borrowers from the seven states. The sampling frame (N) comprised all registered farmers with the states' Agricultural Development Programmes (ADP's) who took loan under any of the lending schemes. In addition, ten (10) commercial banks that advanced loan to farmers in each of the states were studied. These banks are Union Bank, First Bank, Access Bank, Unity Bank, Diamond Bank, United Bank for Africa, Zenith Bank, Eco-Bank, First City Monument Bank, and Bank of Agriculture. In addition to the ten (10) commercial banks, a Non-Governmental Organization (NGO) and a Micro-finance bank (MFB) were surveyed in Ogun state in particular. The reason for the inclusion of the Micro-finance bank (MFB) and the Non-Governmental Organization (NGO) in the list of lending institutions in the state was informed by the situation on the ground, whereby the Commercial banks do not lend directly to the farmers but through farmer associations and cooperative societies. Two sets of data were collected for the study. These are primary and secondary data. The primary data were collected directly from the field through questionnaire administration.

The period of data collection lasted between September 1st, 2013 and November 2nd, 2013. The variables on which data were collected are; farmers socio-economic characteristics (such as age, membership of cooperative society, years of farming experience, household size, farm size, expenditures on farm inputs (seeds, fertilizers, herbicides, insecticides, animal feeds), educational attainment, occupation etc), types of enterprises practiced, types and quantities of inputs used, quantities of outputs produced, annual income (farm and non-farm), main sources of income outside farming, interest rate charge, volume of loan applied for and the amount granted, amount of loan repaid to date and amount outstanding, time of application for loan and date of disbursement, loan transaction costs, repayment period, collateral pledged, awareness of the Nigerian Incentive based Risk Sharing system for Agricultural Lending (NIRSAL), use of insurance facilities by farmers, labour use (family and hired), wages paid, extension contact, problems faced by farmers. The secondary data needed were collected from publications of the Central Bank of Nigeria.

In order to determine the category of farmers that are efficient in the use of scarce resources, the production function approach was adopted. Here production functions such as the Trans-log production function, the Cobb-Douglas production function and the stochastic frontier production function were considered. However, since each of these production functions has its own inherent advantage and disadvantage, these qualities were considered in tandem with the main objective of the study. The stochastic production function gives the efficiency of the individual farmer and not the entire system, while the trans-log and Cobb-Douglas production functions will give the efficiency of the lending scheme and the farmers as a whole. As a result, the Cobb-Douglas (C-D) production function was estimated. The estimating form of the Cobb-Douglas production function is specified in eqn. (1)

$$\ln Y_t = \ln A_0 + \sum_{i=1}^{n} (a_i \ln x_{it}) + U_t \quad \text{.....eqn. (1)}$$

Where Y_t = Gross farm income of the farmer (₦)
X_1 = Farm size (Ha)
X_2 = Expenditure on planting materials (₦)
X_3 = Expenditure on labour input (₦)
X_4 = Expenditure on fertilizer and agrochemicals (₦)
X_5 = Expenditure on other capital inputs (Dep.) (₦)

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U_t = Stochastic error term
A_0 = Constant term (efficiency index)
a_i = Parameter estimates, i =1, 2, …, 5
t = 1, 2, ..., T, is the number of observations

The Cobb-Douglas production function was estimated for ACGSF, CACS, category of farmers (small and medium scale), and borrowers with Primary, Secondary or Tertiary level of education. The study also estimated the technical efficiency of farmers since it gives an idea of the ability of farmers to produce maximum output from an optimal set of inputs as it will justify the extension of institutional loans to the farmers by the government. To determine the level of technical efficiency of farmers, two approaches may be employed. The first approach involves an examination of the value of the constant term associated with the two groups of farmers (Koutsoyiannis, 1979). According to Koutsoyiannis (1979), the more efficient farmers will have a larger constant term than the less efficient farmer. As a result, the multiplicative dummy approach is normally used to separate the two categories of farmers. In this approach, the empirical Cobb-Douglas production function is specified as:

$$\ln Y_t = \ln A_0 + \beta_0 D + A_1 \ln X_1 + \beta_1 D \ln X_1 + A_2 \ln X_2 + \beta_2 D \ln X_2 + A_3 \ln X_3 + \beta_3 D \ln X_3 + A_4 \ln X_4 + \beta_4 D \ln X_4 + A_5 \ln X_5 + \beta_5 D \ln X_5 + U_t \quad \text{.....eqn. (2)}$$

Where,

Variables X_1, X_2, X_3, X_4, and X_5 remain as defined in eqn. (1).
$(A_0 + \beta_0)$ is intercept for dummy = 1
$(A_i + \beta_i)$ are Slope coefficients for dummy = 1(i = 1, 2, . . , 5)
A_0 is intercept for dummy = 0
A_i are Slope coefficients for dummy = 0 (i = 1, 2, . . ., 5)
D = dummy (1= ACGSF, Small scale farmers, Tertiary education, Primary education), 0 = CACS, Medium scale farmers, Secondary education).
The empirical Cobb-Douglas production function as specified in (eqn.1) was estimated for ACGSF, CACS, category of farmers (small and medium), and level of education of farmers (Primary, Secondary or Tertiary).

Indices of Efficiency of Lending Schemes
In literature, not much is known about the efficiency of agricultural lending schemes. Scholars in the field of agricultural economics (Farrell, 1957; Heady and Dillon, 1972) talk of economic efficiency or resource use efficiency or the technical efficiency of farmers. In this regard, farmers are said to be either allocative or price efficient, or technically efficient. Therefore, to select a lending scheme as being efficient in this study implies that the scheme must have met certain efficiency criteria, while the operators of the lending schemes are efficient in the release of approved funds to farmers. In this vein, the following efficiency indices were used to judge a particular lending scheme as being efficient.

(i) Accessibility, affordability and availability i.e. the lending scheme must be easily accessed by farmers, loans can be obtained under the scheme with minimal cost, and funds readily available under the scheme.
(ii) Borrowing and repayment capacity i.e. the borrowers must borrow under the scheme without hindrance and repay borrowed funds as at when due.

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(iii) Technical efficiency i.e. the ability of farmers to produce maximum output from an optimal set of inputs at the given technology.

RESULTS AND DISCUSSION

The results of the analysis of the socio-demographic characteristics of the borrowers show that 78% are males while 22% are females. Further analysis of the data based on gender distribution across the lending schemes show that 17% of those that obtained loan under ACGSF are females while 83% are males, under CACS, 23% are females while 77% are males. Similarly, 29% females and 71% males obtained loan under SMEEIS, 46% females and 54% males obtained loan under SACS, 8% females and 92% males obtained loan under ACSS and NGO's/MFB's respectively. Highlighting the socio-demographic characteristics of borrowers in a study of this nature is very necessary because studies (Kuhn et al, 2000; Akinbode, 2013) have linked loan repayment performance to borrower personal and employment characteristics, previous loan histories or micro lender traits. The results also show that 78% of the borrowers belong to co-operative societies while 22% do not. Farmers associations are informal groups usually formed by farmers involved in a given line of production. They are formed more often than not to serve as plat forms for members to benefit from government financial assistance to such associations. Similarly, membership of co-operative society enhances members' access to institutional credit through group lending with or without collateral.

The study showed that 61% of the borrowers were visited by extension agents while 39% had no extension contact. A vibrant extension service system is necessary for the delivery of improved agricultural inputs and for the communication of vital information to the farmers. For instance, some of the farmers that are aware of NISAL knew about it through the activities of their state ADP's. The few farmers that are aware of the package knew about it either by radio or television programs or the training programs of state ADP's sponsored by the Growth Enhancement Support (GES) activities of the Agricultural Transformation Agenda (ATA) of the government. This suggests that greater awareness is needed to adequately inform the farmers of the benefits of the NIRSAL program. The results further show that 29% of the farmers obtained loan through ACGSF, 26% got loan through CACS, 12% obtained loan through ACSS and SACS respectively, while 7% got loan through SMEEIS. This may imply that loans are more easily accessible, affordable, and available to farmers under ACGSF and CACS. For instance, the interest drawback program of the CBN under ACGSF which offers a rebate of 40% on the amount paid as interest on the loan by the borrower provided full repayment was made as and when due, with a grace period of three months for delayed repayments after which a farmer is ineligible for the rebate is a very big incentive to farmers to borrow and repay on time under the scheme, while the requirement that Loans to eligible entities under CACS should be disbursed at a maximum interest rate of 9% is a great incentive to farmers to borrow money from CACS. These guidelines appear to be responsible for the greater number of beneficiaries under ACGSF and CACS lending schemes.

The policy implication of this is that government may continue to encourage the disbursement of funds to farmers through the ACGSF and CACS lending schemes. However 14% of the borrowers obtained loans from Non Governmental Organizations (NGO's) and Micro Finance Banks (MFB's). The Non Governmental Organizations and Micro Finance

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Banks serve as plat forms through which Farmers' Multipurpose Cooperative Societies obtained loan and disbursed to their members under loan schemes such as Fadama, National Programme on Food Security (NPFS), Rural Finance Institution (RUFIN), and National Poverty Eradication Programme. This information is very vital for policy formulation as it calls for the strengthening of the NGO's and MFB's that grant loan facility to farmers especially in states like Ogun and Abia. The results also show that majority of the farmers are within the age brackets of 51 to 60 years and 41 to 50 years respectively. The figure further shows that only 10% of the borrowers are farmers who are within the ages of 31 to 40 years. This suggests that only a small fraction of Nigerian youths are engaged in food production. The mean age of the farmers is 50.4 years. However, 98% of the farmers have secondary occupation.

The figure shows that 52% of the borrowers have household sizes that range between 6 to 10 persons. The mean household size of borrowers is 9 persons. Although large household sizes are needed to boost food production, it exacerbates poverty level among families. The figure shows that 43% of the borrowers had secondary education, 22% had primary education, and 31% had tertiary education, while 4% had no basic education. The policy implication of this is that agricultural mechanization in Nigeria is possible if the 96% with basic education are supported by government with tractors, planters, harvesters and high yielding seeds and breeds of animals. The mean year of education of borrowers is 11years. Access to basic education is vital for the adoption of improved farm technologies. According to Henri-Ukoha et al (2011), the age of the farmers, level of education, farming experience, farm size and marital status significantly affected the amount of loan acquired by small scale farmers in Ohafia Agricultural zone of Abia State, South-east Nigeria because formal credit providers evaluate borrowers using these socio-economic characteristics. The analysis further shows that 60% of the borrowers have farm sizes that range from 1.1 to 2hectares, 16% from 2.1 to 3hectares, 9% from 3.1 to 4 hectares, 8% from 4.1 to 5hectares, while 7% cultivated 5.1 hectares and above. The mean farm size is 2.54 hectares. This implies that majority of Nigerian farmers are small scale operators that cultivate less than 5 hectares of farm land.

Estimation of Efficiency of Categories of Farmers in Nigeria

In order to determine the efficiency of the various categories of farmer borrowers (small and medium), four functional forms were fitted to the data. These are the Linear, Double-log, Exponential, and Semi-log forms. Based on the size and signs of the estimated coefficients, their statistical significance, and the magnitude of the coefficient of multiple determination (R^2) as they aid in the explanation of the results (Olayide and Heady, 1982), the double log function was chosen as the lead equation and used for further analysis of the data. The coefficients of the variables and their significance levels are summarized in equations (3) and (4) respectively.

$$\underset{}{LnY_{ss}} = \underset{}{Ln12.56} + \underset{(26.70)*}{0.34LnX_1} + \underset{(2.64)*}{0.06LnX_2} - \underset{(1.97)*}{0.013LnX_3} - \underset{(-3.45)*}{0.01LnX_4} + \underset{(-2.54)*}{0.01LnX_5}$$

$R^2 = 0.86$ F-cal = 207.2 n = 175 ..... eqn. (3)

$$\underset{}{LnY_{ms}} = \underset{}{Ln10.54} - \underset{(5.66)*}{1.23LnX_1} + \underset{(-7.34)*}{0.46LnX_2} + \underset{(4.21)*}{0.17LnX_3} - \underset{(3.15)**}{0.20LnX_4} + \underset{(-2.65)**}{0.06LnX_5}$$

$R^2 = 0.74$ F-cal = 2.31 n = 10 ..... eqn. (4)

* Significant at 1% level

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** Significant at 5% level
Figures in parentheses are T-ratios
Ln = Natural logarithm

The results of the multiple regression analysis estimated for small scale farmers (eqn.3) and medium scale farmers (eqn.4) show that all the coefficients estimated for the variables are statistically significant within 1% to 5% levels. The coefficients estimated for farm size (X_1), planting materials (X_2), and capital inputs (X_5) (depreciated) in equation (3) are positively correlated with gross farm income. This suggests that the cultivation of greater hectares of farm land, an increase in the purchase of improved planting materials and capital equipment will significantly enhance gross farm income among small scale farmers in Nigeria. On the other hand, the coefficients estimated for labour input and fertilizer in equation (3) are shown to be negatively correlated with gross farm income. This implies that further increases on the amount spent on labour and fertilizer will significantly reduce gross farm income among small scale farmers in Nigeria. This may be the case considering the fact that 60% of this category of farmers cultivate between 1.1 to 2hectares of land.

Furthermore, the coefficients estimated for planting materials (X_2), labour input (X_3), and capital inputs (X_5) in eqn.(10) are positively correlated with gross farm income, while the coefficients estimated for farm size (X_1) and fertilizer (X_4) are negatively correlated with gross farm income. These results show that while increased expenditures on planting materials, labour input and capital equipment will significantly enhance farm income among medium scale farmers, the cultivation of more hectares of farm land and increased expenditures on fertilizer will significantly reduce gross farm income among medium scale farmers in Nigeria. As a result, it is suggested here that these categories of farmers should always seek the advice of extension agents on matters concerning fertilizer application and labour use on farm land so as to adhere to levels that will maximize their farm income. The values of the constant terms estimated for small scale farmers (12.56) and medium scale farmers (10.54) imply that these categories of farmers are highly efficient in the use of farm inputs. The value of the returns to scale estimated for small scale farmers (0.387) suggest that these farmers are operating in the region of decreasing positive returns, while the value estimated for medium scale farmers (-0.74) imply that they are operating in the region of decreasing negative returns to scale. Although the values of the constant terms estimated for small scale farmers (12.56) and that estimated for medium scale farmers (10.54) show that both categories of farmers are highly efficient in input use, the values of the returns to scale suggest that small scale farmers are more efficient than medium scale farmers.

Estimation of Technical Efficiency of Categories of Farmers in Nigeria

To determine the level of technical efficiency of small scale and medium scale farmers, equation 2 was estimated for them. To determine the technical efficiency of the two categories of farmers, the constant terms associated with the functions estimated for them were examined. Following Koutsoyiannis (1979), who observed that the more efficient farmers will have a larger constant term than the less efficient farmer, small scale farmers with a higher constant term of 12.56 (eqn. 3) than medium scale farmers value of 10.54 (eqn. 4) would be judged the technically more efficient category of farmers. However, since to judge technical efficiency by mere examination of the constant term of the individual production function may be misleading, the multiplicative dummy approach (eqn. 2) was

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estimated to separate the two groups of farmers. The coefficients of the estimated function and the t-ratios are presented in eqn. (5).

$$LnY_i = Ln10.50 + 2.02D - 1.23LnX_1 + 1.57DLnX_1 + 0.46LnX_2 - 0.39DLnX_2$$
$$(2.58)^* \quad (1.97)^{**} \quad (-1.30) \quad (2.38)^* \quad (1.81)^{***} \quad (-1.91)^{***}$$
$$+ 0.17LnX_3 - 0.19DLnX_3 - 0.20LnX_4 + 0.19DLnX_4$$
$$(2.13)^{**} \quad (-3.14)^* \quad (-2.33)^* \quad (2.16)^{**}$$
$$+ 0.06LnX_5 - 0.05DLnX_5$$
$$(1.62) \quad (-1.50)$$

$R^2 = 0.61$ F-cal = 23.99 n = 185 .....eqn. (5)

* Significant at 1% level
** Significant at 5% level
*** Significant at 10% level
Figures in parentheses are T-ratios
Ln = Natural logarithm
D = dummy (1= Small Scale Farmers, 0 = Medium Scale Farmers)
Other variables remain as previously defined

From eqn. (5), the intercept and slope coefficients for small scale farmers are given by the summation ($A_0 + \beta_0$,) and ($A_i + \beta_i$) respectively, while the intercept and slope coefficients for medium scale farmers are given by A_0 and A_i respectively. The coefficient β0 is statistically significant and positive, thereby suggesting that small scale farmers' function has a larger intercept denoting a higher level of technical efficiency. Considering the values of β_0 (2.02) and ($A_0 + \beta_0$)(12.52) which are positive and statistically significant at 5% and 1% levels respectively, we note that small scale farmers are technically more efficient than medium scale farmers. The result obtained here is consistent with Masterson (2007), Meliko et al (2010), and Van den Brink et al (2006). Considering the result obtained here, we conclude that the loan facility significantly improved the output of small scale borrowers in Nigeria.

Estimation of Efficiency of Borrowers with Primary or Secondary Education in Nigeria

To evaluate the efficiency of borrowers in Nigeria with primary or secondary education, equation (1) was estimated. The estimated coefficients of the variables and their significance levels for primary and secondary education are presented in equations (6) and (7) respectively.

$$LnY_{pe} = Ln13.71 + 0.31LnX_1 + 0.04LnX_2 - 0.11LnX_3 + 0.03LnX_4 - 0.04LnX_5$$
$$(16.18)^* \quad (2.96)^* \quad (2.85)^* \quad (-1.74)^{***} \quad (1.89)^{***} \quad (-1.99)^{***}$$

$R^2 = 0.81$ F-cal = 27.45 n = 41 ..... eqn. (6)

$$LnY_{se} = Ln16.4 + 0.43LnX_1 - 0.25LnX_2 - 0.21LnX_3 - 0.64LnX_4 - 0.60LnX_5$$
$$(4.71)^* \quad (2.37)^{**} \quad (-4.37)^* \quad (-1.42) \quad (-0.10) \quad (-2.15)^{**}$$

$R^2 = 0.58$ F-cal = 48.3 n = 79 ..... eqn. (7)

* Significant at 1% level
** Significant at 5% level
*** Significant at 10% level
Figures in parentheses are T-ratios
Ln = Natural logarithm

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The results of the function estimated for borrowers with primary education (eqn.6) show that all the coefficients estimated for farm land (X_1), planting materials (X_2), labour input (X_3), fertilizer (X_4) and capital equipment (X_5) are statistically significant within 1% to 10% levels. The coefficients estimated for farm land (X_1), planting materials (X_2), and fertilizer (X_4) are positively correlated with gross farm income. This suggests that the cultivation of greater hectares of farm land, an increase in the purchase of high yielding seeds and fertilizer will significantly enhance gross farm income among farmers with primary education in Nigeria. On the other hand, the coefficients estimated for labour input (X_3) and farm tools (X_5) are shown to be negatively correlated with gross farm income, suggesting that further expenses on labour and capital equipment will significantly reduce farm income among farmers with primary education in Nigeria. The results of the function estimated for borrowers with secondary education (eqn.7) show that the coefficients estimated for planting materials (X_2), labour input (X_3), fertilizer (X_4) and capital equipment (X_5) are negatively correlated with gross farm income. However, the coefficients for planting materials (X_2), and capital equipment are statistically significant within 1% to 5% levels. This implies that further increases on the amount spent on planting materials (X_2), and capital equipment (X_5) will significantly reduce gross farm income among farmers with secondary education in Nigeria. The coefficient estimated for farm land (X_1) is positively related with gross farm income. Again this may suggest that additional hectares of farm land (X_1) cultivated by farmers with secondary education will significantly increase gross farm income among this category of farmers in Nigeria.

The policy implication of the findings here is that while the cultivation of greater hectares of farm land with improved and high yielding planting materials will significantly enhance gross farm income among borrowers with primary or secondary education in Nigeria, further expenditures on labour, fertilizer and capital equipment by both categories of farmers will reduce their gross farm income. This underscores the importance of the role of extension in agricultural production especially in educating farmers on the best possible combination of hybrid inputs necessary for maximum output. The value of the returns to scale estimated for farmers with primary education (0.22) suggest that these farmers are operating in the region of decreasing positive returns, while the value estimated for farmers with secondary education (-1.27) imply that they are operating in the region of decreasing negative returns to scale. Although the values of the constant terms estimated for borrowers with primary education (13.71) and that estimated for borrowers with secondary education (16.4) show that both categories of farmers are highly efficient in input use, the values of the returns to scale suggest that borrowers with primary education are more efficient than borrowers with secondary education.

Estimation of Technical Efficiency of Borrowers with Primary or Secondary Education

To determine the technical efficiency of borrowers with primary or secondary education, equation (2) was estimated. In order to determine the technical efficiency of the two groups of borrowers, the constant terms associated with their functions were examined. According to Koutsoyiannis (1979), the more efficient farmers will have a larger constant term than the less efficient farmer. In this regard, borrowers that possess secondary education with a higher constant term of 16.4 than borrowers with primary education with a value of 13.71 would be judged the technically more efficient category of farmers. However, since to judge technical efficiency by mere examination of the constant term of the individual production function may be misleading, the multiplicative dummy approach (eqn. 2) was estimated to separate the

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two categories of farmers. The coefficients of the estimated function and the t-ratios are presented in eqn. (8)

LnY_i = Ln13.32 + 0.39D + 0.18LnX_1 + 0.11DLnX_1 - 0.04LnX_2 + 0.08DLnX_2
(3.84)* (1.69)*** (1.51) (2.35)** (-1.56) (1.85)***
- 0.03LnX_3 - 0.09DLnX_3 + 0.04LnX_4 - 0.01DLnX_4
(-1.92)*** (-1.86)*** (2.00)** (-1.25)
- 0.02LnX_5 - 0.02DLnX_5
(-2.50)* (-2.41)*
R^2 = 0.67 F-cal = 22.33 n = 120 .....eqn. (8)
* Significant at 1% level
** Significant at 5% level
*** Significant at 10% level
Figures in parentheses are T-ratios
Ln = Natural logarithm
D = dummy (1= primary education, 0 = secondary education)
Other variables remain as previously defined

Considering eqn. (8), the intercept and slope coefficients for borrowers with primary education are given by the summation (A_0 + β_0,) and (A_i + β_i) respectively, while the intercept and slope coefficients for borrowers with secondary education are given by A_0 and A_i respectively. Since β0 is statistically significant and positive, then borrowers with primary education have a larger intercept denoting a higher level of technical efficiency. Therefore considering the values of β_0 (0.39) and (A_0 + β_0; i.e 13.71) which are positive and statistically significant at 10% and 1% levels respectively, we observe that borrowers with primary education are technically more efficient than borrowers with secondary education. The result obtained here is consistent with Lockheed et al (1980) who noted that basic literacy skill usually attained during primary schooling is more relevant in farm production than higher levels of education.

Estimation of Efficiency of Borrowers with Secondary or Tertiary Education in Nigeria

In order to estimate the efficiency of borrowers in Nigeria who possess secondary or tertiary education, equation (1) was used. Following Olayemi and Olayide (1981), the double log function was chosen as the lead equation and used for further analysis of the data. The estimated coefficients of the variables and their significance levels for secondary and tertiary education are presented in equations (9) and (10) respectively.

LnY_{se} = Ln16.4 + 0.43LnX_1 - 0.25LnX_2 - 0.21LnX_3 - 0.64LnX_4 - 0.60LnX_5
(4.71)* (2.37)** (-4.37)* (-1.42) (-0.10) (-2.15)**
R^2 = 0.58 F-cal = 48.3 n = 79 ..... eqn. (9)

LnY_{te} = Ln19.6 - 0.81LnX_1 - 0.79LnX_2 + 0.10LnX_3 + 0.85LnX_4 + 0.76LnX_5
(2.04)** (-3.03)* (-2.19)** (1.10) (1.48) (3.41)*
R^2 = 0.88 F-cal = 76.5 n = 58 ..... eqn. (10)
* Significant at 1% level
** Significant at 5% level
Figures in parentheses are T-ratios
Ln = Natural logarithm

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The results of the multiple regression analysis estimated for borrowers with secondary education (eqn.9) and borrowers with tertiary education (eqn.10) show that the coefficients estimated for farm land (X_1), planting materials (X_2), and capital equipment (X_5) are statistically significant within 1% to 5% levels. The coefficients estimated for farm land (X_1), and capital inputs (X_5) in equations (9) and (10) are positively correlated with gross farm income. This suggests that the cultivation of greater hectares of farm land, and an increase in the purchase of capital equipment will significantly enhance gross farm income among farmers with secondary and tertiary education in Nigeria. On the other hand, the coefficients estimated for planting materials (X_2), labour input (X_3), fertilizer (X_4) and tools (depreciated)(X_5) in equation (8) are shown to be negatively correlated with gross farm income. However, only planting materials (X_2), and tools (depreciated)(X_5) are statistically significant within 1% to 5% levels. This implies that further increases on the amount spent on planting materials (X_2), and tools (depreciated)(X_5) will significantly reduce gross farm income among farmers with secondary education in Nigeria. Similarly, the coefficients estimated for farm land (X_1) and planting materials (X_2) for borrowers with tertiary education (eqn. 10) are shown to be negatively correlated with gross farm income and statistically significant within 1% to 5% levels.

Again this may suggest that additional hectares of farm land (X_1) cultivated, and further increases on the amount spent on planting materials (X_2), will significantly reduce gross farm income among farmers with tertiary education in Nigeria. The policy implication of the findings here is that the cultivation of greater hectares of farm land without improved and high yielding planting materials will significantly reduce gross farm income among this category of farmers in Nigeria. This underscores the importance of the role of extension in agricultural production especially in the area of hybrid inputs delivery to farmers. The values of the constant terms obtained for borrowers with secondary education (16.40) and borrowers with tertiary education (19.60) imply that these two groups of farmers are highly efficient in the use of farm inputs. The result obtained here is in line with Ali and Flinn (1989), Wang et al. (1996), and Seyoum et al. (1998) whose results demonstrated significant role of farmers' education in raising farming efficiency in Pakistan Punjab, India, China, and Ethiopia respectively. The value of the returns to scale estimated for farmers with tertiary education (0.11) suggest that these farmers are operating in the region of decreasing positive returns (efficient region of production), while the value estimated for farmers with secondary education (-1.27) imply that they are operating in the region of decreasing negative returns to scale (inefficient region of production). Although the values of the constant terms estimated for borrowers with tertiary education (19.6) and that estimated for borrowers with secondary education (16.4) show that both categories of farmers are highly efficient in input use, the values of the returns to scale suggest that borrowers with tertiary education are more efficient than borrowers with secondary education.

Estimation of Technical Efficiency of Borrowers with Secondary or Tertiary Education

In order to determine the technical efficiency of borrowers with secondary or tertiary education, equation (2) was estimated. To determine the technical efficiency of the two groups of borrowers, the constant terms associated with the functions estimated for them were examined. According to Koutsoyiannis (1979), the more efficient farmers will have a larger constant term than the less efficient farmer. In this regard, borrowers that possess tertiary education with a higher constant term of 19.60 (eqn.10) than borrowers with

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secondary education with value of 16.40 (eqn. 9) would be judged the technically more efficient category of farmers. However, since to judge technical efficiency by mere examination of the constant term of the individual production function may be misleading, the multiplicative dummy approach (eqn. 2) was then estimated to separate the two categories of farmers. The coefficients of the estimated function and the t-ratios are presented in eqn. (11).

$$\begin{aligned}\ln Y_i = {} & \ln 11.74 + 1.20D + 0.14\ln X_1 + 0.25D\ln X_1 + 0.06\ln X_2 + 0.04D\ln X_2 \\ & (17.75)^* \quad (2.30)^{**} \quad (3.73)^* \quad (1.93)^{***} \quad (1.91)^{***} \quad (1.63) \\ & + 0.03\ln X_3 - 0.07D\ln X_3 + 0.05\ln X_4 - 0.10D\ln X_4 \\ & (2.64)^* \quad (-3.18)^* \quad (1.21) \quad (2.08)^{**} \\ & - 0.01\ln X_5 + 0.05D\ln X_5 \\ & (-2.19)^{**} \quad (1.84)^{***}\end{aligned}$$

$R^2 = 0.75$ F-cal = 34.00 n = 137 .....eqn. (11)

* Significant at 1% level
** Significant at 5% level
*** Significant at 10% level
Figures in parentheses are T-ratios
Ln = Natural logarithm
D = dummy (1= tertiary education, 0 = secondary education)
Other variables remain as previously defined

The intercept and slope coefficients for borrowers with tertiary education are given by the summation ($A_0 + \beta_0$,) and ($A_i + \beta_i$) respectively, while the intercept and slope coefficients for borrowers with secondary education are given by A_0 and A_i respectively. Furthermore, since $\beta 0$ is statistically significant and positive, then borrowers with tertiary education possess a function with larger intercept denoting a higher level of technical efficiency. Therefore considering the values of β_0 (1.20) and ($A_0 + \beta_0$; i.e 12.94) which are positive and statistically significant at 5% and 1% levels respectively, we observe that borrowers with tertiary education are technically more efficient than borrowers with secondary education, and therefore conclude that the loan facility significantly improved the output of borrowers with tertiary education in Nigeria.

CONCLUSION

Based on the results of the analyses, it was concluded that the efficient lending schemes in Nigeria are the Agricultural Credit Guarantee Scheme Fund (ACGSF) and the Commercial Agricultural Credit Scheme (CACS), but ACGSF is technically more efficient than CACS.

RECOMMENDATION

It was recommended that the government should continue to fund farmers in Nigeria through ACGSF and CACS, and to encourage agricultural mechanization in the country through the provision of heavy equipment needed to mechanize.

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