

THE EFFECT OF MICROCREDIT ON TECHNICAL EFFICIENCY OF SMALLHOLDER RICE FARMERS IN IKOT EKPENE AGRICULTURAL ZONE, AKWA IBOM STATE, NIGERIA.

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ABSTRACT

The study analyzed the effect of microcredit on technical efficiency of smallholder rice farmers in Akwa Ibom State, Nigeria. The specific objectives were to; describe the socio-economic profile of the rice farmers in the study area; identify microcredit sources accessed by rice farmers; analysis the factors that determine access to credit as well as examine the influence of credit and other factors on technical efficiency. A multi-stage sampling technique was employed to sample the rice farmers in the study area. Data obtained was analyzed using descriptive statistics, profit regression and stochastic production frontier. Results showed that 64.7% were male, 68.2% were married, and about 96.5% were literate. The mean household size was 7 persons per households, with a mean farm size of 2.19 hectares, 38.8% had 6-10years of farming experience, and 83.5% belonged to an association and earned an annual income of above ₦400,000. The main source of credit accessed by the smallholder rice farmers is the cooperative society. Extension contact, farm size, farming experience and household size were the significant factors that determined the access to credit by the smallholder farmers. Quantity of seed, farm size and family labour were the significant variables that had a significant effect on the output of rice at 1% and 5%. The value of the returns to scale (RTS = 0.914) shows that the farmers were producing at the decreasing return to scale (Stage II). The mean technical efficiency was 0.64 with minimum and maximum efficiencies of 0.09 and 0.92. Respondent's educational level, household size, farming experience and credit were the significant variables that increased the technical efficiency of the smallholder rice farmers. The study recommends that smallholder rice farmer should increase access to credit per production season, since the access to credit has efficiency increasing effect

KEYWORDS: Microcredit, Technical Efficiency, Smallholder Rice Farmers

INTRODUCTION

Rice is from the family Gramineae, Genus oryza, and species; sativa, glaberrima, longistaminata and nivara. It was taken into West Africa in early 19th century (Jirgi, Abdurrahman and Ibrahim, 2009). It is the leading cereal crop which can be grown in the standing water areas of flat, low lying tropical soils according to West Africa Rice Development Association (2003). Akunde (2002) optioned that rice is a staple food for most people than any other crop and 90% of it is grown and consumed in South East

Asia which is a major center of the world population. It is an increasingly important crop in Nigeria, thus, it is grown for sale and home consumption. Rice is known as one of the major cereals and has assumed cash crop status in Nigeria, especially in the production areas, where it produces employment and income for more than 80% of the rural farmers as a result of the activities that take place along the production and distribution chains from cultivation and consumption (Imolelin and Wada 2002).

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Moreover, rice production, its consumption or demand is growing faster than any other major staples.

However, rice production system is beset with problems associated with poor access to credit/capital base, low-labour output, low yield, and relatively high production costs of labour, poor acquisition of land, poor producer price and marketing system. In line with this, Adeniyi (1987) observed that related problems of that nature have led to the low yield and hence the decline in the local production of this crop by rural farmers. Though it is a major staple food in Nigeria, its domestic production has never been able to meet demand (FAO, 2015). It is on this note that Rahji and Fakayode (2009) observed that the demand and supply gap in rice production is widening, resulting in huge import bill on rice.

One of the major factors responsible for low agricultural productivity in Nigeria is farmers' limited access to production inputs and credits which are necessary for attaining a high level of production (Nwaru, 2004). Amaza and Olayemi (2002) observed that crop farmers mostly carry out their production under conditions involving the use of inefficient tools and unimproved seed varieties and therefore, maximum efficiency is elusive to them. Production credit is essential in enhancing the technical efficiency and welfare of smallholder farmers in Africa. Credit affects farm production directly and indirectly (Brambilla and Potor, 2005, and Guirkingner and Bourcher, 2005). However, smallholder farmers face the challenge to access credit.

Rice is extensively cultivated in Akwa Ibom State but there is little information on the effect of credit on the technical efficiency of smallholder's rice farmers. One way farmers can raise productivity is improving the efficiency within the limit of the existing resource base and technology (Udoh, 2005). Productivity is reduced in the presence of technical inefficiency whereas the more efficient the firm, the higher its productivity, *ceteris paribus*. Boosting rice production would require that farm resources be use efficiently since efficiency in the use of the production inputs is essential for optimum production. Numerous studies have been carried out on the technical efficiency of rice farmers in Nigeria (Oladeebo, 2007). However, limited studies exist in Ikot Ekpene Agricultural zone relating credit to technical efficiency of smallholder farmer. Hence, this necessitated the study which seeks to address the following questions.

- i What are the socio-economic profiles of the respondents in the study area?
- ii What area the different credit sources available to the respondents in the study area?
- iii What are the factors that determine the access to credits by the respondents?

iv What is the influence of credit and other factors on the technical efficiency of rice farmers in the study area?

Study Objectives:

The general objective of this study was to analyze the effect of credit on technical efficiency of smallholder rice farmers in Ikot Ekpene Agricultural Zone, Akwa Ibom State. The specific objectives were to:

- i. describe the socio-economic profile of rice farmers in the study area.
- ii. identify credit sources accessed by small holder rice farmers in the study area.
- iii. analyze the factors that determine access to credit by the rice farmers.
- iv. examine the influence of credit and other factors on technical efficiency of rice farmers in the study area.

JUSTIFICATION OF THE STUDY

Over the years, credit has emerged as an effective strategy for poverty alleviation which is a very important aspect of the Millennium Development Goals (MDGs) (Iganiga, 2008). Specifically, to the government and policy makers, it will serve as a yardstick for appraising the policy shifts of the government towards regulating farmers' access to credit. To the farmers, the study will provide useful information and technical advice to rice farmers on how to allocate limited resources efficiently in orders minimize cost. To the students/fellow researchers, it would serve as a reference material for further research.

METHODOLOGY:

Study Area:

Akwa Ibom State is situated in the South-South geopolitical zones in Nigeria, and is bordered on the east by Cross River State, on the West by Rivers State and Abia State, and on the South by the Atlantic Ocean. Geographically, it lies between latitude 4° 32' and 5° 33' N, and longitude 7° 35' and 8° 25' E. it occupies a total area of 7, 245,933km² (kilometers square) and estimated population of 5,482,200 (National Population Commission, NPC, 2016). The state has six (6) Agricultural Development Programme (ADP) zones namely: Uyo, Ikot Ekpene, Oron, Abak, Eket and Etinan. The people are predominantly farmers producing such food crops as rice, palm oil, cassava, maize, melon, sweet potatoes, cocoyam, fluted pumpkin, pepper, among others.

SAMPLING PROCEDURE

A multistage sampling technique was employed in the study. The first stage was the purposive selection of four (4) blocks (Ukpomita, ibiaku Ntok Okpo, Ikpe Ikot Nkon and Aka Ekpeme) out of the eight (8) blocks in

Ikot Ekpene Agricultural Zone on the basis of predominance of ADP registered rice farmers. In stage two, fifty percent (50%) of the cells in each of the selected blocks in (in stage one) was randomly selected to have a total of 17 cells. In stage three, five (5) rice farmers from each of the 17 sampled cells were selected, to achieve a proportionate and even spread in the study area thus giving a total sample sizes of eight five (85) respondents for the study.

DATA ANALYSIS

MODEL SPECIFICATION

Logit Regression model

The logit regression model was estimated as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_7 X_7 + e \dots \dots \dots (1)$$

Where;

Y = Access to credit (1 if respondent has received credit and 0 if otherwise)

X₁ = Age of the respondents (in years)

X₂ = Sex of the respondents (male = 1, female = 0)

X₃ = Household size (number of persons)

X₄ = Farm size (hectares)

X₅ = Marital status (married = 1, otherwise = 0)

X₆ = Farming experience (in years)

X₇ = Years of formal education

B₁ – B₇ = Parameters to be estimated

B₀ = Intercept

e = error term

Stochastic frontier model

This methodology has been used by many researchers including Battiere *et al.*, (1996). The production technology of the former is specified by the Cobb-Douglas frontier production function.

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + v_i - u_i \dots (2)$$

Where;

Y = Output (grain equivalent)

Objective 1: The socio-economic profile of the rice farmers was analyzed using percentages, frequencies, tables, means and standard deviation.

Objective 2: Identify credit sources accessed by small holder rice farmers were analyzed using percentages and frequency counts.

Objectives 3: Analyze the factors that determine access to credit by the respondents was analyzed using logit regression model.

Objective 4: Examine the influence of credit and other factors on technical efficiency were analyzed using stochastic frontier model.

X₁ = Quantity of seed (kgs or tons)

X₂ = Farm size (hectare)

X₃ = Quantity of fertilizer (kgs)

X₄ = Hired labor (man day)

X₅ = Family labour (man day)

V_i = Random variables which are assumed to be independent of U_i, identical and normally distributed with zero mean and constant variance i.e N (0, σ²).

U_i = Non-negative random and variables which are assumed to account for technical inefficiency in production and are assumed to be independent of v_i such that it is the non-negative truncated (ut zero) of half normal distribution (Coelli, 1995; Battase, and Carra, 1977).

The inefficiency effect model is specified thus:

U_i is modeled in terms of the socioeconomic factors that affect the technical efficiency of the farmers

$$U_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + \delta_7 Z_7 + \delta_8 Z_8 \dots \dots \dots (3)$$

Where;

Z₁ = Age (year)

Z₂ = Marital status (1 = married, 0 = otherwise)

Z₃ = Educational level (years of schooling)

Z₄ = Household size (number of persons)

Z₅ = Farming experience (years)

Z₆ = Extension contact (number of contact)

Z₇ = Access to credit (yes = 1, no = 0)

RESULTS AND DISCUSSION:

Table 1: Socio-economic characteristics of rice farmers

Variable	Frequency	Percentage
Gender		
Male	55	64.7
Female	30	35.3
Total	85	100
Age		
≤30	31	36.5
31-40	23	27.1
41-50	22	25.9
51-60	5	5.8
>60	4	4.7
Total	85	100
Mean	37.66	
Marital status		
Single	21	24.7
Married	58	68.2
Divorced	2	2.4
Widowed	4	4.7
Total	85	100
Educational level		
No formal education	3	3.5
Primary education	7	8.2
Secondary education	49	57.7
Tertiary education	26	30.6
Total	85	100
Household size		
<6	31	36.5
6-10	48	56.5
11-15	5	5.9
16-20	1	1.1
>20	-	-
Total	85	100
Mean	6.95	
Farm size		
≤3	67	78.8
4-6	17	20.0
7-8	1	1.2
Total	85	100
Mean	2.19	
Member to Association		
Yes	71	83.5
No	14	16.5
Total	85	100

Farming experience		
<6	10	11.8
6-10	33	38.8
11-15	22	25.9
16-20	14	16.4
>20	6	7.1
Total	85	100
Mean	12.34	
Extension contact		
Yes	42	49.4
No	43	50.6
Total	85	100
Number of visit		
≤3	48	56.5
4-6	31	36.5
7-8	6	7.0
Total	85	100
Mean	2.54	
Engaged in other business		
Yes	67	78.9
No	18	21.1
Total	85	100
Annual income		
≤100,000	11	12.9
100,001-200,000	24	28.3
200,001-300,000	12	14.1
300,001-400,000	13	15.3
>400,000	25	29.4
Total	85	100
Mean	318764.71	

Source: Field survey, 2018.

Table 1 shows that 64.7% of the rice farmers were male while 35.3% were female. This indicated that majority of rice farmers are males also with 68.2% of them married and 24.7% being single. This implies that married individuals dominated among the sampled rice farmers. Rice farmers had a minimum age of 31 and maximum of 60 with an average age of 38. This implies that the rice farmers are in their active ages that could contribute and undertake rigorous activities of rice farming. Majority (57.7 %) of the respondents had secondary education, 30.6% had tertiary education while only 3.5% had no formal education. The results revealed that majority rice farmers were literate. The high literacy level in the area would enhance their involvement in rice production in the area. This finding agrees with that of Enwerem and Ohajianya (2013). They reported that 57.9% of small scale farmers spent 7-12 years in formal education, thus implying that the rate of

adoption of innovation is expected to be high in the area.

Majority (56.5 %) of the respondents had household size that ranged from 6-10 persons and 5.9 % of the respondent had family size of 16-20 persons and a mean household size of 7 persons. The study showed that the respondents had large household size. The finding agrees with that of Erhabor and Ahmadu (2013). They reported that majority of the respondents were married with high average family size (10 persons).

Majority (78.8%) of the rice farmers had farm sizes less than or equal to 3ha and 1.2% had farm size within 7-8ha. The approximated average farm size is 2ha. This implies that most of the farmers were not into small scale rice production due to the large farm size. (83.5%) were member of an association, while (16.5%) did not belong to any association. The high proportion of membership might enhance their access

to agricultural information on improved techniques on rice production and easy access to credit to enhance their productivity. Majority (38.8%) of the respondents had 6-10 years farming experience, 25.9 % had 11-15 years of farming experience, 16.4% had 16-20 years of farming experience while only 7.1% of the respondent had above 20 years of farming experience. The average farming experience of the respondents is 12years. This implies that the respondents have been into rice production for a long time. However, it is expected that with increasing years of farming, respondents would gain experiences in farming to the advantage of increasing agricultural productivity. This agrees with the findings of Erhabor and Ahmadu (2013), they reported that the average farming experience of the respondents was high (17 years), the high level of experience may contribute to their ability to use resources more efficiently in their production.

Majority (50.6%) did not have access to extension agent while 49.4% had access to extension agent.

However, majority (56.5%) of the respondents were visited less than 4times a year while 36.5% were visited between 4-6times a year. The approximated average number of visit was 3times a year. The high proportion of respondents who did not have access to extension agent and the low number of visit may hamper their adoption of improved techniques of rice production which in turn have a serious implication on decreasing rice output.

Majority (78.9%) of the respondents reported that they are into other business apart from rice production while 21.1% were strictly into rice production. this shows a strong diversification of enterprise in the area.

29.4% of the respondents earned above ₦400,000 annually, 28.3% earned within ₦100,001-₦200,000, while 12.9% earned less than ₦100,001. The average annual income was ₦318,764.71. This income is from rice production only.

Table 2: Credit sources accessed by smallholder farmers

Variable	Frequency	Percentage
Microfinance	11	13
Commercial Bank	3	3.5
Akwa Ibom Agricultural loan scheme	26	30.6
Cooperative society	45	52.9
Total	85	100

Source: field survey, 2018.

Table 2 shows the main source of credit accessed by the smallholder rice farmers, the result revealed that the main source of credit accessed by the rice farmers is the cooperative society; about 52.9% of the rice farmers obtained their take off credit and fund for expansion from the cooperative society. This was followed by Akwa Ibom Agricultural Loan Scheme (30.6%) and microfinance bank (13%). On the other hand an insignificant proportion (3.5%) of the rice

farmer obtained credit facility from commercial banks. The high proportion of respondents who source credit from cooperative may be attributed to the fact that most of the respondents were members of an association. These therefore have enhanced their access to credit. The result is in line with the findings of Olasunkanmi *et al.*, (2013), who reported that cooperative society is a veritable tool for capital formation and agricultural development.

Table 3: Factors that determine access to credit by the smallholder rice farmers

Variable	Coefficient	Z-stat
Constant	0.1171 (2.2890)	0.0512
Education level	0.0535 (0.0891)	0.6004
Extension contact	-1.5515*** (0.5273)	-2.9424
Farm size	0.0443*** (0.0136)	3.245
Farming experience	0.0826* (0.0434)	1.9041
Gender	0.2186 (0.6284)	0.3479
Household size	0.3232** (0.1289)	2.5079
Marital status	0.3655 (0.4864)	0.7515

***, ** and *, Significant at $P < 0.01$, $P < 0.05$, and $P < 0.10$, respectively. log likelihood is -47.1046; MacFadden R^2 is 0.2630; LR statistic = 18.3524.

Table 4 shows the factors that determine the access to credit by the small holder farmers. The MacFadden R-square of 0.26 implies that all the explanatory variables included in the model were able to explain 26% of the variation in factors that determines the access to credit by the small holder rice farmers in the study area. Specifically, farm size (0.0443) had a positive influence on credit access and was statistically significant at 1%. This implies that an increase in area of land will increase the access to credit. Also, the variable household size (0.3232) had a positive and significant influence on credit access at 5% level of significance. This implies that as the household size increases, it creates room for expansion and this will increase the need to access more credit. Farming experience (0.0826) had a

positive and significant influence on credit access by farmers at 10% level of significance. This implies that with more years spent in rice farming the greater the opportunity to have access to credit. The result agrees with that of Nouman *et al.*, (2013), they reported that farm size and farming experience have a positive influence on access to credit by farmers. Extension contact (-1.5515) had a negative and significant influence on the access to credit by the farmers at 1% level of significance. The negative influence could be as a result of the fewer visits by extension to the rice farmers. The result is at variance with that of Adeyonu *et al.*, (2017) who carried a study on the factors that influence access to credit by poultry farmers in Abuja. They reported that extension visit has a positive influence on credit access.

Table 4 Maximum Likelihood Estimates of the Parameters of the Stochastic Frontier Production Function

Variables	Parameters	Coefficient	Std. error	t-ratio
Production Factors				
Constant	b_0	4.816	0.996	4.835
LnQuantity of seed (X1)	b_1	0.3655	0.0941	3.886
LnFarm size (X2)	b_2	0.0684	0.0193	3.538
Lnfertilizer (X3)	b_3	0.0763	0.0668	1.14
LnHired labour (X4)	b_4	-0.242	0.233	-1.039
LnFamily labour(X5)	b_5	0.572	0.240	2.38
Inefficiency effects				
Constant	δ_0	6.99	5.457	1.28
Age (Z1)	δ_1	0.022	1.355	1.62
Marital status (Z2)	δ_2	-0.131	0.753	1.74
Educational level (Z3)	δ_3	-0.113	0.033	-3.436
Household size (Z4)	δ_4	-0.693	0.284	-2.436
Farming experience (Z5)	δ_5	-0.015	0.004	-3.013
Extension service (Z6)	δ_6	0.0166	1.004	1.165
Access to credit (Z7)	δ_7	-0.0738	0.0268	-2.756
Diagnostic statistics				
Sigma squared	(σ^2)	1.706	0.539	3.165
Gamma	(γ)	0.951	0.0196	48.65
LR test		33.998		
Likelihood function	(λ)	-65.184		
Sample size	N	85		

*** (P <0.01) ** (P<0.05) * (P<0.10).all explanatory variables were expressed in natural log form. A negative sign of the parameter in the inefficiency function implies that the associated variable has a positive effect on technical efficiency level while a positive sign indicates otherwise.

Table 4 shows the result of the influence of credit and other factors on technical efficiency of rice farmers. The maximum likelihood estimation (MLE) of the frontier function revealed that σ^2 and γ are significant at 1 percent level. The significant value of the sigma square (σ^2) indicates a good fit and correctness of the specified distribution assumption of the composite error term and also shows the presence of inefficiency effects and random error in rice production in the study area. The variable, quantity of seed (X_1), farm size (X_2), and family labour (X_5) had a significant effect on the output of rice. The positive coefficient of quantity of seed (X_1), farm size (X_2), family labour (X_5) were in line with *a priori* expectation and this implies that rice output increases with increase in these variables. The coefficient of quantity of seed (0.3655) and farm size (0.0644) were positive and statistically significant at 1% respectively. This implies that, increases in the level of use of these inputs will significantly increased output of rice in the study area.

The result obtained is in line with that of Erhabor and Ahmadu (2013). They obtained a positive relationship between quantity of seed and farm size. The coefficient of farm size was estimated at 0.0684 and statistically significant at 1% level, implying that a 1% increase in the hectares of land put into rice production will bring about increase in output of rice by 0.684%. This is attributed to the relative importance of land in crop production and corroborates the findings of Wakili (2012). The result agrees with that of Olasunkanmi *et al.*, (2013). Similarly, the variable family labour (X_5) also had a positive and significant effect on rice output. The coefficient of family labour (X_5) was 0.572 and was statistically significant at 5% level of significance. The result implies that an increase in family labour (X_5) will increase rice output in the area. This agrees with the findings of Omondi and Shikuku (2013). They reported that labour has a positive influence on paddy rice productivity.

Table 5: Elasticities and return to scale (RTS) analyzes of production functions

Variables	Elasticities
seed (X1)	0.3655
Farm size (X2)	0.0684
fertilizer (X3)	0.0763
Hired labour (X4)	-0.242
Family labour(X5)	0.572
Credit (X6)	0.0738
Return to scale (RTS)	0.914

Source: Computed from field survey, 2018.

The return to scale (RTS) analysis which serves as a measure of total resource productivity is given in Table 5. The result indicates that rice production was in Stage II (RTS = 0.914) of the production surface where production increases at decreasing rate. Stage II is the stage of decreasing positive return to scale. This implies that all inputs were used within the rational stage of production surface. This result was

in line with that of Wakili *et al.*, (2015). The estimate of their RTS was 0.9162 and 0.7967 for both rain fed and irrigated rice farmers respectively. Hence, it is advisable, according to Ogundari and Ojo (2007) that production units should maintain current levels of input utilization, as this will bring about maximum output from a given level of output, *ceteris paribus*.

Table 6: Distribution of farm technical efficiency scores

Technical efficiency scores	Frequency	Percentages
≤0.30	9	10.6
0.31-0.40	5	5.9
0.41-0.50	7	8.2
0.51-0.60	9	10.6
0.61-0.70	11	12.9
0.71-0.80	24	28.2
0.81-0.90	18	21.2
>0.90	2	2.4
Sample size	85	
Mean efficiency	0.64	
Minimum efficiency	0.09	
Maximum efficiency	0.92	

Source: Computed from field survey, 2018.

EFFICIENCY ANALYSIS FOR RICE PRODUCTION

The result in Table 6 shows the distribution of farmers according to technical efficiency. The technical efficiency is less than 1.0 indicating that all the farmers were producing below the maximum efficiency frontier. A range of technical efficiencies is observed across the sampled rice farmers and the spread is large. The most efficient (maximum efficiency) had technical efficiency of 0.92 (or 92 %), while the least efficient farmer had a technical efficiency of 0.09 (or 0.9%). The mean technical efficiency is 0.64 (or 64%). This implies that, on the average, the farmers were 64 % technically efficient; hence their observed output was about 36%

(efficiency differential) less than the maximum frontier output. The large variation in technical efficiency estimates is an indication that most of the farmers were not using their resources efficiently. The mean technical efficiency of 0.64 from this research is in line with the 0.61 and 0.63 obtained respectively for rice production by Onyenweaku and Ohajianya (2005) in Ebonyi state.

The distribution of the efficiency analysis also revealed that 24.7% of the respondents had technical efficiency of about 50%, 51.7% had technical efficiency of 51-80% while 23.6% had technical efficiency of 81 and above. A study by Ebong (2009) on the efficiency of urban farming in Nigeria, they

found that all farmers were producing below the maximum efficiency frontier. The farmer's technical index varied from 10% to 95%, with a mean technical efficiency of 81%.

DETERMINANTS OF TECHNICAL EFFICIENCY OF SMALL SCALE RICE FARMERS

The parameter estimates from the inefficiency model included in the stochastic production frontier estimation (Table 4), was used to determine the factors influencing farmers technical efficiency of the rice farmers in the study area. For technical inefficiency model, the coefficients of educational level, household size, farming experience and credit was negative and significantly related to technical inefficiency at different level of significance. This result implies that an increase in these variables will decrease the technical inefficiency but increase the technical efficiency.

Specifically, household size was negatively (-0.693) related to technical inefficiencies. This implies that household size has a positive effect on technical efficiency and large family produce more labour force for rice production. This agrees with the findings of Onyenweaku and Nwaru, (2005) who noted that household size has an advantage on labour supply tremendously.

The coefficient of farming experience (-0.015) was negative, implying that technical efficiency among farmers increases with more years of experience in farming and *vice versa*. The more experienced a farmer is the more efficient his ability to make decisions on his own (Onyenweaku and Okoye, 2007), therefore farmers experience helps a lot for efficiency in production. This corroborates the finding of Fassasi (2007) who reported that increase in farming experience reduces technical inefficiency.

Similarly, the estimate for educational level (-0.113) was negative and significantly related to technical inefficiency at 1%. This implies that an increase in these variables may increase the technical efficiency of the farmers. Ogunniyi *et al.* (2012) obtained a negative relationship between educational level and technical inefficiency in their study.

Furthermore, the inefficiency function shows that credit (-0.0738) negatively influences inefficiency at 5% level of significance. This indicates that the volume of credit increases the technical efficiency of the rice farmers. Availability of credit to farmers at the right time, bearing in mind the timeliness of agricultural production could help increase the resource use efficiency in rice production. Bathon and Maurice (2015) also obtained a negative relationship between access to credit, educational level and technical inefficiency. Duy (2015) reported that credit has a positive influence on production and production efficiency. Also, Martey, *et al.*, (2015) reported that

credit impacted positively on farmers' technical efficiency. The study concluded that the provision of credit enhanced timely purchase and efficient allocation of factor inputs to produce the maximum output.

CONCLUSION AND RECOMMENDATION

- i. Extension activities should be increased in the study area and they should focus on improve techniques of rice production and encourage farmers to use available resources efficiently and effectively.
- ii. Financial institutions should be encouraged to collaborate with agricultural and farmer development projects to facilitate credit delivery to smallholder farmers.
- iii. The smallholder rice farmer should increase access to credit per production season, since the access to credit has efficiency increasing effect.
- iv. In order to improve efficiency in resource allocation in rice production, it is recommended that input such as farm size, labour, seed, etc should be made available by subsidizing the price by government and non-governmental organization so that farmers can increase the use of these input.
- v. There is need for the government to formulate policies aimed at promoting education as a means of enhancing efficiency in rice production, as this will enable the farmers to use their resources efficiently.

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NOMREG VAR00001 (BASE=LAST ORDER=ASCENDING) BY VAR00002 VAR00003 VAR00004 WITH VAR00005
VAR00006 VAR00007 VAR00008 VAR00009 VAR00010 VAR00011 VAR00012 VAR00013 VAR00014 /CRITERIA CIN (95)
DELTA (0) MXITER (100) MXSTEP(5) CHKSEP (20) LCONVERGE (0) PCONVERGE(0.000001) SINGULAR(0.0000001)
/MODEL/STEPWISE=PIN (.05) POUT (0.1) MINEFFECT (0) RULE (SINGLE) ENTRYMETHOD (LR) REMOVALMETHOD
(LR) /INTERCEPT=INCLUDE /PRINT=PARAMETER SUMMARY LRT CPS STEP MFI.
```

Nominal Regression

Notes

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Comments		
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	N of Rows in Working Data File	300
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		NOMREG VAR00001 (BASE=LAST ORDER=ASCENDING) BY VAR00002 VAR00003 VAR00004 WITH VAR00005 VAR00006 VAR00007 VAR00008 VAR00009 VAR00010 VAR00011 VAR00012 VAR00013 VAR00014 /CRITERIA CIN(95) DELTA(0) MXITER(100) MXSTEP(5) CHKSEP(20) LCONVERGE(0) PCONVERGE(0.000001) SINGULAR(0.0000001) /MODEL /STEPWISE=PIN(.05) POUT(0.1) MINEFFECT(0) RULE(SINGLE) ENTRYMETHOD(LR) REMOVALMETHOD(LR) /INTERCEPT=INCLUDE /PRINT=PARAMETER SUMMARY LRT CPS STEP MFI.
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[DataSet0]

Case Processing Summary

	N	Marginal Percentage
VAR00001 .00	67	22.4%
4.00	232	77.6%
VAR00002 .00	186	62.2%
3.00	113	37.8%
VAR00003 .00	224	74.9%
2.00	75	25.1%
VAR00004 .00	208	69.6%
1.00	91	30.4%
Valid	299	100.0%
Missing	1	
Total	300	
Subpopulation	299 ^a	

a. The dependent variable has only one value observed in 299 (100.0%) subpopulations.

Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	318.150			
Final	215.853	102.298	13	.000

Pseudo R-Square

Cox and Snell	.290
Nagelkerke	.442
McFadden	.322

Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	215.853 ^a	.000	0	.
VAR00005	216.641	.789	1	.375
VAR00006	226.329	10.476	1	.001
VAR00007	215.898	.046	1	.831
VAR00008	220.360	4.507	1	.034
VAR00009	218.009	2.157	1	.142
VAR00010	215.891	.038	1	.845
VAR00011	216.224	.371	1	.542
VAR00012	216.662	.809	1	.368
VAR00013	216.617	.765	1	.382
VAR00014	215.886	.034	1	.854
VAR00002	229.764	13.911	1	.000
VAR00003	252.918	37.065	1	.000
VAR00004	235.042	19.190	1	.000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Parameter Estimates

VAR00001 ^a	B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
Intercept	5.128	1.497	11.732	1	.001			
VAR00005	-.077	.087	.786	1	.375	.926	.781	1.098
VAR00006	-.322	.102	10.003	1	.002	.725	.593	.885
VAR00007	-.047	.222	.046	1	.831	.954	.617	1.473
VAR00008	-.337	.164	4.260	1	.039	.714	.518	.983
VAR00009	-.216	.148	2.122	1	.145	.806	.603	1.077
VAR00010	.023	.120	.038	1	.845	1.024	.810	1.294
VAR00011	.164	.270	.371	1	.543	1.179	.694	2.000
VAR00012	.000	.000	.845	1	.358	1.000	1.000	1.000
VAR00013	.023	.026	.753	1	.386	1.023	.972	1.077
VAR00014	.088	.480	.034	1	.855	1.092	.426	2.799
[VAR00002=.00]	-1.310	.361	13.141	1	.000	.270	.133	.548
[VAR00002=3.00]	0 ^b	.	.	0	.	.	.	.
[VAR00003=.00]	-2.208	.385	32.801	1	.000	.110	.052	.234
[VAR00003=2.00]	0 ^b	.	.	0	.	.	.	.
[VAR00004=.00]	-1.571	.371	17.925	1	.000	.208	.100	.430
[VAR00004=1.00]	0 ^b	.	.	0	.	.	.	.

a. The reference category is: 4.00.

b. This parameter is set to zero because it is redundant.