Life Science Journal

Websites:
http://www.lifesciencesite.com
http://www.sciencepub.net

Emails:
editor@sciencepub.net
sciencepub@gmail.com

MARSLAND PRESS
Multidisciplinary Academic Journal Publisher

Technical Efficiency Analysis of Arable Crop Farmers with and without Access to Credit in Nigeria

Oluwatusin F.M.*, Ajiboye A., Osundare F.O., Adekunmi A.O., Toluwase S.O.W. and Akokoh F.E.

Department of Agricultural Economics & Extension Services, Ekiti State University
P.M.B 5363, Ado-Ekiti, Nigeria
Corresponding Author E-mail*: femi.oluwatusin@eksu.edu.ng

Abstract: Many reasons have been advanced for the declining agricultural productivity in Nigeria, part of which include, the issue of relative efficiencies (allocative, technical and economic) and farmers' limited access to credit facilities. This study investigates the technical efficiency of the arable crop farmers access and without access to credit in Nigeria. A multi-stage sampling procedure was used to select 240 arable crop farmers randomly from the study area while a well-structured questionnaire was used to retrieve information from the respondents. Descriptive statistic and Stochastic Frontier Production Function (SFPF) were used to analyze the data collected. The result shows that males were more prominent with 75.8 percent for the farmers with access to credit and 78 percent for farmers without access to credit. The average ages of those with and without access to credit were 47 years and 47.28 years respectively. Also, 81.9 percent (access to credit) and 85.7 percent (without access to credit) of the respondents were married. Most (62.4%) of the farmers with access to credit had tertiary level of education while most (50.5%) of the farmers without access to credit attained secondary education. The means household size of 5.76 and 5.69 members were recorded for farmers with access and without access to credit respectively. Farmers with access to credit over-utilized labor while the resource was under-utilized among the farmers without access to credit. Both categories of farmers under-utilized planting materials but over utilized agrochemical and fertilizer inputs. Inefficiency model revealed that as arable crop farmers grow older their levels of technical efficiency in production increase. For the farmers with access to credit, men are less technically inefficient but more technically efficient while with those without access to credit, men are more technically inefficient and less technically efficient when compared with their women counterparts. In addition, for both categories of farmers as the educational level (number of years spent in formal schools) increases, farmers technical inefficiencies reduce and their technical efficiencies increase and vice versa. Also, result indicated that increase in household size increases the technical inefficiency and reduces technical efficiency for both categories of farmers. The mean output oriented efficiency of 34 percent and 35 percent for those with access and non-access to credit respectively showed that the farmers without access to credit are more technically efficient as the farmers operate on the same frontier. It is recommended that in order to utilize the available credit facilities extended to farmers wisely, there is need to monitor and provide technical information on how to combine the limited factors of production efficiently.
[Oluwatusin F.M., Ajiboye A., Osundare F.O., Adekunmi A.O., Toluwase S.O.W. and Akokoh F.E. **Technical Efficiency Analysis of Arable Crop Farmers with and without Access to Credit in Nigeria.** *Life Sci J* 2020;17(5):72-80]. ISSN: 1097-8135 (Print) / ISSN: 2372-613X (Online). http://www.lifesciencesite.com. 7. doi:10.7537/marslsj170520.07.

Key words: Efficiency, credit, arable crops, Stochastic Frontier

1. Introduction

Agriculture is the hub of the economy of most African countries, Nigeria inclusive. It plays dominant role in job creation and livelihood for a major part of the society, contributes to the Gross Domestic Product (GDP) and essential for creating values and wealth (NEPAD, 2013). Arable crops are grown by almost all households in Nigeria (Onubuogu, Esiobu, Nwosu, Okereke, 2014) and serve as a major source of income especially for the increasing rural dwellers (Zamanti and Jaderka, 2016). These crops contribute to the share of agriculture in the country's GDP and possess a great potential comparative advantage to compete in the liberalized economy (Mohammed and Isgin, 2016). Similarly, either one arable crop or the other is grown by almost every households in Nigeria (Onubuogu, Esiobu, Nwosu, Okereke, 2014) and serves as a major source of income especially for the increasing rural dwellers (Zamanti and Jaderka, 2016).

According to Marjanovic (2017), arable crops encompass a number of crops cultivated within a year and these include grains, pulse, oil, forage, fibre and tuber crops. Most common among these crops in Nigeria are, maize, rice, wheat, millet, lentil, soybean,

cowpea, cotton, jute, potato, cassava and yam. Also, most arable crops, apart from being a food crop have equally become a commercial crop on which many agro-based industries depend on for raw materials (Oluwatayo, Sekumade and Adesoji, 2008). However, there has been notable deterioration in the productivity of Nigeria's agriculture (Amaza and Maurice, 2005). Many reasons have been advanced for the declining agricultural productivity in Nigeria, part of which include, the issue of relative efficiencies (allocative, technical and economic) and farmers' limited access to credit facilities (Abiodun, 2011). Nwaru and Onuoha (2010) found out that when credit is properly utilized, it leads to diversification which increases resource productivity, agricultural production and net incomes of farmers. Thus, improved access to credit gives the farmers the opportunity to purchase other necessary inputs needed for agricultural production. This study seeks to investigate the technical efficiency among arable crop farmers with access and without access to credit in Nigeria.

2. Materials and Method

The Study Area

This research was carried out in Ekiti State, Nigeria. The State is one of the six States constituting the Southwestern region of Nigeria. The Ekiti is a sub-group of the Yoruba. They are culturally homogenous and speak a special dialect of Yoruba language known as Ekiti. Ekiti State is made up of 16 Local Government Areas. According to the 2006 population census, the State has a population of 2,384,212 and a land area of 5,435sq km [Ekiti State Government, (EKSG),2006]. The State is situated entirely within the tropics and found to the south of Kwara and Kogi States, East of Osun State and bounded by Ondo State in the east and in the south (EKSG, 2006). The State is mainly an upland zone and enjoys tropical climate with two distinct seasons, these are the raining season and dry season between April-October and November-March respectively. Temperature ranges between 21°C and 28°C with high humidity. The State is one of the predominantly agrarian States and the arable/food crops such as rice, yam, cassava, maize and cowpea are mostly grown by the farmers across the State (Ibitoye, 2012).

Sampling Techniques and Sample Size

A multi-stage sampling method was used for the selection from the identified population of arable crops farmers in the State. At the first stage, two (2) Agricultural Development Programmes (ADPs) zones were randomly selected from the three (3) ADPs zones in Ekiti State, while the second stage involved the selection of three (3) Local Government Areas (LGAs) randomly from each of the selected ADPs zones. Also at the third stage, a random selection of four (4) communities from each LGA was done and lastly ten (10) arable crop farmers were selected randomly from each community to make a total of two hundred and forty (240) respondents.

Data Collection

Primary data were supplemented with interview schedule. A well-structured questionnaire was used to retrieve information from farmers in the study area. Information retrieved includes the socio-economic characteristics of the respondents and arable crops' production activities. Also, secondary data from journals, textbooks, etc., were used.

Analytical Techniques

Data were analyzed using both descriptive and inferential statistics. Descriptive statistics such as, frequency and percentage tables were used to describe the socio-economic characteristics of the respondents while inferential statistics such as Stochastic Frontier Production Function (SFPF) was used to estimate the technical efficiency of the arable crop farmers.

Stochastic Frontier Production Function (SFPF)

Due to its flexibility and ability to closely link economic concepts with modeling reality, the use of stochastic frontier modeling has been increasingly popular among scholars. The modeling, estimation and application of stochastic frontier production to economic analysis assumed prominence in applied economic analysis and econometrics following Farrell's seminar paper presentation where he introduced a methodology to measure firms' efficiencies (Ambali, 2012). In the paper, Farrell argued that the efficiency of any firm consists of three parts, the technical efficiency (TE) which indicates the ability of a firm to get maximum output from the available resources, the allocative efficiency (AE) which shows the ability of a firm to use resources in optimal proportion given their respective prices and economic efficiency (EE) which is the product of technical and allocative efficiency (Oluwatusin, 2011). Economic efficiency is the capacity of a firm to produce a given quantity of output at a minimum cost with a given level of technology (Bravo-Uretra and Pinheiro, 1997).

The model adopted in this study is based on the one proposed by Battese and Coelli (1995) as used by Oluwatusin (2011) in which the stochastic frontier specification incorporates models for the technical inefficiency effects and estimates all the parameters simultaneously. This was used to estimate the farm level technical efficiency of arable crop farmers with and without access to credit.

The model is expressed in equation 1.

$Y_i = X_i\beta + (V_i - U_i), i = 1, \ldots\ldots, N$ (1)

Where Y_i is the output of the i^{th} farmer;

X_i is a K x 1 vector of input quantities of the i^{th} farmer;

β is a vector of unknown parameters to be estimated;

V_i is the random variable which is assumed to be iid. N $(0,\sigma_V^2)$ and

U_i is the non-negative random variable which is assumed to account for technical inefficiency in production and assumed to be iid. | N $(0,\sigma_U^2)$ |.

The technical efficiency of farmer 'i' (TE_i) is defined as the ratio of observed output (Y_i) to the corresponding frontier output (Y_i*), conditioned on the level of input used by the farmers (Battese and Coelli, 1988).

That is:

$$TE_i = \frac{Y_i}{Y_i^*} = f(X_i:\beta)\exp(V_i - U_i)/f(X_i:\beta)expV_i = \exp(-U_i) \quad (2)$$

The technical efficiency is between 0 and 1.

The production technology assumed for the farmers in this study is specified by the Cobb-Douglas frontier production as in equation 3.

$$lnY = \beta_0 + \beta_1 lnX_{1i} + \beta_2 lnX_{2i} + \beta_3 lnX_{3i} + \beta_4 lnX_{4i} + \beta_5 lnX_{5i} + V_i - U_i \quad (3)$$

Where the subscript i (i=1,…..,240);

Y_i = Farm output (value in Naira) from i^{th} farm

X_{1i} = Farm size (hectares)

X_{2i} = Quantity of labor (man-days)

X_{3i} = Planting materials (₦)

X_{4i} = Agrochemical (litres)

X_{5i} = Fertilizer (kg)

V_i = Random error term with normal distribution N~ $(0, \sigma^2)$

U_i = A non- negative random variable called technical inefficiency associated with the farmer.

$\beta_0 - \beta_5$ = Parameters to be estimated

i = 1, 2, 3,…..,240 farms

The technical inefficiency effect is represented in equation 4 as:

$$U_i = \vartheta_0 + \vartheta_1\varphi_1 + \vartheta_2\varphi_2 + \vartheta_3\varphi_3 + \vartheta_4\varphi_4 + \vartheta_5\varphi_5 + \vartheta_6\varphi_6 \quad (4)$$

Where

U_i = Technical Inefficiency effect

φ_1=Age of farmers (years)

φ_2= Gender (1, Male and 0, otherwise)

φ_3=Educational level of farmers (year)

φ_4=Household size (number of person)

φ_5= Farming experience (year)

φ_6= Membership of association (1 member, 0 non-member)

$\vartheta_0 - \vartheta_6$= Scalar parameters to be estimated

3. Results and Discussion

Socio-economics Characteristics of Arable crop Farmers

Table 1 shows the socio-economic characteristics of respondents by credit accessibility. The result shows that both sexes were involved in the production of arable crops. However, the males were more prominent with 75.8 percent for the farmers with access to credit and 78 percent for farmers without access to credit. Meanwhile, 24.2 percent and 22 percent were the proportion of female respondents with and without access to credit respectively. This result supports the findings of Matanmi Adesiji, Owawusi and Oladipo, (2011), Mustapha, Undiandeye, Sanusi, and Bakari, (2012) and Osanyinlusi and Adenegan, (2016) that revealed that majority of the arable crop farmers are men.

The age distribution of the respondents as presented in Table 1 shows that the majority, 62.5 percent and 60 percent of the respondents with and without access to credit respectively fell within the age bracket of 30 and 49 years, followed by the age interval of 50-59 years with 27.4 percent and 30 percent for farmers with and without access to credit respectively. The average ages of those with and without access to credit were 47 years and 47.28 years

respectively while the minimum and maximum ages were 30years and 76years respectively for the two categories of farmers. It implies that the majority of the respondents are energetic and in their productive age which is good for the labor-intensive type of agriculture we practice in Nigeria. There is tendency for younger farmers to operate more efficiently than the older ones. This finding is in line with that of Osanyinlusi *et al.* (2016), Mustapha *et al.* (2012) and Matanmi *et al.* (2011) who found out that majority of the arable crop farmers are within the active age range.

The results in Table 1 show that 81.9 percent (access to credit) and 85.7 percent (without access to credit) of the respondents were married, while about 18.1 percent and 14.3 percent were in the category of single, divorce, widow and widower for farmers with and without access to credit respectively. This implies that the married are more involved in arable crop production than their unmarried counterparts and labor might not be problem to majority of the respondents. This conforms to the findings of Osanyinlusi et al. (2016), Ayoola, *et al.* (2011) and Matanmi (2011) that most of the arable crop farmers are married.

The distribution of the respondents by educational status (Table 1) shows that the majority of the farmers acquired formal education. 73.8 percent and 94.5 percent of the farmers with access to credit and without access to credit respectively had formal education. Also, most (62.4%) of the farmers with access to credit had tertiary level of education while most (50.5%) of the farmers without access to credit attained secondary education. Similarly, more (26.2%) farmers with access to credit had no formal education when compared to their counterparts (5.5%) without access to credit. This suggests that the farmers without access to credit are more literate and this could enhance their understanding and desirability of adopting new farm technologies.

Table1: Distribution of Arable crop Farmers by Socio-economic Characteristics

	Access to Credit		**Non-Access to Credit**	
Variables	**Frequency**	**Percentage**	**Frequency**	**percentage**
Sex				
Male	113	75.8	71	78.0
Female	36	24.2	20	22.0
Age				
30-39	26	17.4	14	15
40-49	67	45.1	41	45
50-59	41	27.4	27	30
Marital Status				
Single	11	7.3	4	4.4
Married	122	81.9	78	85.7
Divorce	7	4.7	3	3.3
Widow	6	4.0	4	4.4
Widower	3	2.0	2	2.2
Education				
Primary	3	2.0	8	8.8
Secondary	14	9.4	46	50.5
Tertiary	93	62.4	32	35.2
No Formal	39	26.2	5	5.5
Household Size				
1-5	86	57.8	53	58.3
6-10	57	38.3	31	34.1
>10	6	4	7	7.7
Membership of Association				
Yes	59	39.5	42	46.2
No	90	60.5	49	53.8
Type of Crop Produced*				
Rice	57	38.25	30	32.97
Yam	129	86.57	65	71.42
Cassava	138	92.61	58	63.74
Maize	126	84.56	66	72.53
Cowpea	16	10.73	6	6.59
Cocoa yam	22	14.76	2	2.20
Sweet potato	4	2.68	-	-
Tomatoes	4	2.68	-	-

Source: Field Survey, 2019. *Multiple Responses

The household size distribution of the respondents reveals that 96 percent and 92.3 percent of the respondents with and without access to credit respectively had a family size of 1 – 10 persons. While the means of 5.76 and 5.69 were recorded for farmers with access and without access to credit respectively. This indicates a fairly large household size which is good for farm family labor. According to Onu (2005) cited in Olumba (2014), large family size could be as a result of polygamous nature of the rural farmers. He further opined that this could be linked to the fact that most rural farmers do keep large household size in order to minimize production cost through the use of family labor.

More also, the majority 60.5 percent for those with access to credit and 53.8 percent for those without access to credit did not belong to any arable crop farmers association while 39.5 percent and 46.2 percent of farmers with access and without access to credit respectively belonged to arable crop farmers association. It implies that the majority of the farmers are not likely to enjoy the benefits such as subsidized inputs and information on new innovations extended by governments and Non-Governmental Organizations (NGO) through the banks and ministries to farmers associations in the study area.

The majority (92.61%) of those with access to credit grew cassava followed by 86.57 percent for yam and 84.56 percent for maize. Most of the farmers without access to credit produced the crops in this order 72.53percent, 71.42percent and 63.74percent for maize, yam and cassava respectively. This implies that cassava is commonly grown among those with access to credit while maize is ranked as number one arable crop among those without access to credit. The result further shows that yam, cassava and maize are mostly produced when compared to other arable crops such as rice, cowpea, cocoyam, sweet potato and tomato by both categories of farmers in Ekiti State.

Maximum Likelihood Estimates of Stochastic Frontier Production Function for Arable Crop Farmers with and without Access to Credit

The results of the Maximum Likelihood Estimates (MLE) of the production function of those with access to credit and those without access to credit among the arable crop farmers are presented in Table 2. The variance parameters for sigma- square (σ^2) and gamma (γ) were 4.7261 and 0.84 respectively and significantly different from zero at 1 percent level of significance in each case for farmers with access to credit while farmers without access to credit had 4.2613 for sigma- square (σ^2) and 0.77 for gamma (γ). Both coefficients were significant at 1 percent. The estimated sigma-squares show the goodness of the model and correctness of the specified distributional assumptions while the gamma ($\gamma=\sigma_u^2/\sigma^2$) measures the total variation of output from the frontier which can be attributed to technical inefficiency. The results of gamma show that about 84 percent and 77 percent variations in outputs of farmers with access and without access to credit respectively were due to the differences in their technical inefficiencies.

According to Table 2, the coefficients of farm size (X_1) for those with access to credit and without access to credit were positively and significantly different from zero at 1 percent and 5percent levels of significance respectively. This implies that for both categories of arable crop farmers, increase in farm size leads to increase in outputs. Also, the positive sign signifies that land as a resource is underutilized in the area by both categories of farmers. Farm size with the highest coefficient (1.3672) exercised the highest impact on the output of farmers with access to credit. This finding is supported by the results of Ambali (2012) and Tephee (2015) that farm size is positively and significantly related to the output of arable crop farmers.

Also, quantity of labor (X_2) used by farmers with access to credit was negatively and significantly (5%) related to the farmers' outputs while it was positively related to the outputs of farmers without access to credit. This implies that as the farmers with access to credit increase quantity of labor used, decrease in output is recorded. But increase in the quantity of labor used by those without access to credit leads to increase in output. The results show that farmers with access to credit over-utilized labor while the resource is under-utilized among the farmers without access to credit.

In addition, planting materials (X_3) coefficient had positive and significant relationship to the outputs at 5percent for those with access to credit and 1percent for non-access to credit farmers. This implies that the resource is under-utilized by both categories of farmers and an increase in the use of planting material will lead to increase in output. Planting materials with the highest coefficient (0.5836) exercised the highest impact on the output of farmers without access to credit.

Furthermore, agrochemical (X_4) and fertilizer (X_5) resources coefficients had negative relationship with the outputs of both categories of farmers. This shows that increase in these inputs will lead to decrease in the output. These resources are both over-utilized by the arable crop farmers in the study area.

Table 2: Maximum Likelihood Estimates (MLE) of the Stochastic Frontier Production Function for Arable Crop Farmers

	Access to Credit		Without Access to Credit	
Variable	Coefficient	standard-error	Coefficient	standard-error
Production function				
Constant	2.3567*	1.3148	0.7371***	0.2077
farm size (X_1)	1.3672***	0.4255	0.1951**	0.0882
quantity of labor (X_2)	-0.1639**	0.0679	0.1836	0.1394
planting materials (X_3)	0.8350**	0.3841	0.5836*	0.3239
agrochemical (X_4)	-0.1731	0.1079	-0.1310	0.2326
fertilizer (X_5)	-0.4493	0.3790	-0.2341	0.3587
Inefficiency model				
Constant	0.3201***	0.0924	1.5718	3.0390
Age of farmers (Z_1)	-0.7390**	0.2878	-0.9861	0.6099
Gender (Z_2)	-0.9454	0.5783	0.5724*	0.3297
Educational level of farmers (Z_3)	-0.5792**	0.2900	-0.3641*	0.1946
Household size (Z_4)	0.8068	0.7846	0.0893	0.0716
Farming experience (Z_5)	-0.0317***	0.0106	0.9844**	0.4742
Membership of association (Z_6)	-0.4733*	0.2578	-0.0356	0.0218
sigma-squared (σ^2)	4.7261***	0.8838	4.2613***	1.1906
Gamma (γ)	0.8437***	0.2881	0.7694***	0.2734

Source: Field Survey, 2019 ***, ** and * means significant at 1percent, 5percent and10 percent respectively.

The Inefficiency Model of the Stochastic Frontier Production Function for Arable Crop Farmers

The analysis of the inefficiency parameters is very important as a basis for informing agricultural policy makers on what need to be done to improve agricultural production. The inefficiency parameters as specified are those that relate to farmers specific socio-economic characteristics which appear to have significant roles in determining the level of technical efficiency of the farmers.

According to Table 2, the estimated coefficients of age for both categories of farmers had negative sign but that of those with access to credit was significant at 5 percent level of significance. This implies that as arable crop farmers grow older their levels of technical efficiency in production increase. This may happen when older farmers are more experienced and more willing to adopt new practices in agricultural production than their younger farmers' counterparts. This result is in line with the findings of Oluwatusin (2011) that increase in age leads to increase in the level of technical efficiency among farmers. The estimated coefficient for gender was negative for those with access to credit while it was positive for farmers without access to credit. The coefficient was significantly different from zero at 10 percent level of significance for those without access to credit. This indicates that, for those with access to credit, men are less technically inefficient but more technically efficient while with those without access to credit, men are more technically inefficient and less technically efficient when compared with their women counterparts.

Educational level of the household head coefficients for both categories of farmers were negative as expected but significant at 5 percent for those with access to credit and at 10 percent for those without access. The result implies that as the educational level (number of years spent in formal schools) increases, farmers technical inefficiencies reduce and their technical efficiencies increase and vice versa. This is in contradiction to the finding of Ogundari and Ojo (2005) that higher educational level promotes inefficiency in production among crop farmers. But the finding agrees with the result of Oladeebo and Fajuyigbe (2007) that farmers with greater years of formal education tend to be more technically efficient in agricultural production.

Also, the household size estimated coefficients were positive for both categories of farmers. This indicates that increase in household size increases the technical inefficiency and reduces technical efficiency. That is, farmers with smaller household sizes are more technically efficient when compared with their counterparts with larger household sizes. The estimated coefficient for farming experience was negative and significant (1%) for farmers with access to credit but positive and significant (5%) for farmers without access to credit. This shows that for farmers with access to credit, increase in years of farming experience reduces technical inefficiency and hence

favours technical efficiency. While for those without access to credit, technical inefficiency is promoted by increase in farming experience and this leads to decrease in technical efficiency.

Lastly, in Table 2 the estimated coefficients of membership of association displayed negative sign for both categories of farmers. The coefficient for farmers with access to credit was significant at 10 percent level of significance. This means that those that are members of associations are less technically inefficient and more technically efficient when compared with those who are not members of associations.

The Technical Efficiency Estimates of the Arable Crop Farmers

The distribution of the technical efficiency estimates of the farmers with and without access to credit is presented in Table 3. The results reveals that most (81.88%) of the farmers with access to credit had the technical efficiency above 0.1 while the remaining 18.12 percent had their technical efficiency below 0.11. The range of technical efficiency shows that the most efficient farmer had a technical efficiency of 0.81 while the least efficient farmer had a technical efficiency of 0.01. The mean technical efficiency of 0.34 implies that the farmers with access to credit are able to achieve about 34percent of optimal output from a given set of inputs under a given technology and have potential to increase their output by 66percent.

On the other hand, 76.92percent of the farmers without access to credit had their technical efficiency above 0.1 while the remaining 23.08 percent had their technical efficiency below 0.11. The most efficient farmer without access to credit had a technical efficiency of 0.80 while the least efficient farmer in the category had a technical efficiency of 0.01with a mean technical efficiency of 0.35. This implies that the farmers without access to credit are able to achieve about 35percent of optimal output from a given set of inputs under a given technology and have potential to increase their output by 65percent. The mean output oriented efficiency of 34percent and 35percent for those with access and non-access to credit respectively showed that the farmers with access to credit have more potential for technical efficiency increase while the farmers without access to credit are more technically efficient as the farmers operate on the same frontier. This is in contrary to the findings of Ambali (2012) that loan beneficiaries are more efficient technically.

Table 3: Technical Efficiency Estimates of Arable Crop Farmers

Range	Access to Credit		Non-Access to Credit	
	Frequency	Percentage	Frequency	Percentage
0.01 – 0.1	27	18.12	21	23.08
0.11 – 0.3	48	32.22	21	23.08
0.31 – 0.5	33	22.15	21	23.08
0.51 – 0.7	28	18.79	23	25.27
> 0.7	13	8.72	5	5.49
Total	149	100.00	91	100.00
Mean	0.34		0.35	
Minimum	0.01		0.01	
Maximum	0.81		0.80	

Source: Field Survey, 2019

4. Conclusion and Recommendations

The concept of efficiency is regarded as the relative performance of the processes used in the transformation of factors of production into outputs or services. The analysis of efficiency is associated with the possibility of farm producing a given optimal level of output from the available resources at a least cost. Technical efficiency is defined as the ability to achieve a higher level of output given similar level of factors of production. The study analyses the technical efficiency of arable crop farmers with and without access to credit in Nigeria. A multi-stage sampling method was used to select 240 arable crop farmers from the study area while a well-structured questionnaire was used to retrieve information from the randomly selected respondents. Descriptive statistic and Stochastic Frontier Production Function (SFPF) were used to analyze the data collected.

The analysis shows that most of the respondents are males, energetic and in their productive age. Also, most of them are married with average household size of 6 members. Large percentage of the respondents acquires formal education and has access to credit. Land as a resource is underutilized in the study area by both categories of arable crop farmers (farmers with and without access to credit). Farmers with access to credit over-utilize labor while the resource is under-utilized among the farmers without access to credit. Both categories of farmers under-utilize planting materials but over utilize agrochemical and fertilizer

inputs. Inefficiency model revealed that as arable crop farmers grow older their levels of technical efficiency in production increase. For the farmers with access to credit, men are less technically inefficient but more technically efficient while with those without access to credit, men are more technically inefficient and less technically efficient when compared with their women counterparts.

In addition, for both categories of farmers as the educational level (number of years spent in formal schools) increases, farmers technical inefficiencies reduce and their technical efficiencies increase and vice versa. Also, result indicated that increase in household size increases the technical inefficiency and reduces technical efficiency for both categories of farmers. The mean output oriented efficiency of 34 percent and 35 percent for those with access and non-access to credit respectively showed that the farmers without access to credit are more technically efficient as the farmers operate on the same frontier. Based on the above findings, the following recommendations are hereby proffered:

- Since education enhances technical efficiency but reduces technical inefficiency, farmers should be encouraged to improve on their level of education.
- Also, farmers should be sensitized on the need to join farmers associations, since most of the respondents are not members of associations and the result shows that those that are members of associations are less technically inefficient and more technically efficient when compared with those who are not members of associations.
- Large household size should be discouraged among the farmers. The result posits that farmers with smaller household sizes are more technically efficient than farmers with larger household sizes.
- In order to utilize the available credit facilities extended to farmers wisely, there is need to monitor and provide technical information on how to combine the limited factors of production efficiently.

References

1. Abiodun, E. (2011). Banks and agricultural funding in Nigeria. www.thisdaylive.com/articles /banks-and- agriculture-funding-in-nigeria/101838.
2. Amaza, P. S. and Maurice, D. C. (2005). "Identification of factors that influence technical efficiency in rice- based production systems in Nigeria". In P. Kormawa and A.A. Toure (eds.) Proceedings of a workshop on Rice Policy and Food Security in Sub-Saharan Africa held in Africa Rice Center (WARDA) Cotonou, Benin, 7th – 9th November. Pp.70- 8.
3. Ambali O.I., (2012). Production efficiencies of arable crop farmers in Ogun State: a comparative analysis of bank of agriculture loan beneficiaries and non-beneficiaries. *Journal of Agricultural Science and Environment* 12(1):104– 119.
4. Ayoola, J. B., Dangbegnon C., Daudu C. K., Mando A., Kudi T. M., Amapu I. Y., Adeosun J. O., and Ezui K. S. (2011). Socio-economic Factors Influencing Rice Production among Male and Female Farmers in Northern Guinea Savannah, Nigeria: Lessons for Promoting Gender Equity in Action Research. *Agriculture and Biology Journal of North America* ISSN: 2151-7517.
5. Battese, G.E. and Coelli T.J. (1988). "Prediction of Firm-Level Technical Efficiencies With a Generalized Frontier Production Function and panel Data", Journal of Econometrics 38, 387-399.
6. Battese, G. E. and Coelli, T. J. [1995]: A model for technical inefficiency effects in a stochastic frontier production function for panel data. Empirical Economics, 20(2): 325-332.
7. Bravo-Ureta, B.E. and Pinheiro, A.E. (1997). "Technical, Economic, and Allocative Efficiency in Peasant Farming: Evidence from the Dominican Republic". *The Developing Economies*, XXXV (1):48–67.
8. Ekiti State Government, (2006). "History and information of the fountain of knowledge". Ministry of information, (2006).
9. Ibitoye, S.I. (2012): Assessment of the levels of awareness and use of agricultural insurance Scheme among the rural farmers in Kogi State, Nigeria, *International Journal of Agricultural Science, Research and Technology,* Vol. 2 (3): 143-148.
10. Marjanovic (2017). The Practice That Marks the Beginning of Arable Crop Life Cycle. https://blog.agrivi.com/post/the-practice-that-marks-the-beginning-of-arable-crop-lifecycle.
11. Matanmi, B. M., Adesiji G. B, Owawusi, W. O and Oladipo, F. O (2011). Perceived Factors Limiting Rice Production in Patigi Local Government Area of Kwara State, Nigeria. *Journal of Agriculture and Social Research (JASR)* vol. 11 (2).
12. Mohammed, M. A. and Isgin T. (2016). Technical Efficiency of Cassava Production in the Savannah Zone of Northern Ghana: Stochastic Frontier Analysis; *Journal of Biology, Agriculture and Healthcare; Vol.6,* No.20,; Pp:62-72.
13. Mustapha, S. B, Undiandeye U.C., A. M. Sanusi, A. M. Bakari S. (2012). Analysis of adoption of improved rice production technologies in Jeer local government area of Borno State, Nigeria;

International Journal of Development and Sustainability, Volume 1(3): 1112-1120.
14. NEPAD (2013). Agriculture in Africa: Transformation and Outlook in Annual Trends and Outlook Report, 1-72. New Patnership for Africa Development.
15. Nwaru, J.C. and Onuoha, R.E., (2010). Credit Use and Technical Change in Smallholder Food Crop Production in Imo State of Nigeria, *New York Science Journal 3(11)*, 144-152.
16. Ogundari, K. and Ojo, S.O. (2005). Economic Efficiency of Small-Scale Food Crop Production in Nigeria. A Stochastic Frontier Approach. *Journal of Social Science* 14(2) 123-130.
17. Oladeebo J.O and Fajuyigbe A.A. (2007): Technical Efficiency of Men and Women Upland Rice Farmers in Osun State, Nigeria. Journal of Ecology, 22(2), 93-100.
18. Olumba, C. C. (2014). Productivity of improved plantain technologies in Anambra State, Nigeria. *African Journal of Agricultural Research, vol. 9 (29)*: 2196-2204.
19. Oluwatayo, I.B., Sekumade, A.B and Adesoji, S.A. (2008). Resource Use Efficency of Maize Farming households in Rural Nigeria: Evidence from Ekiti State. *World Journal of Agricultural Sciences,* 4(1), 91-99.
20. Oluwatusin F. M., (2011). Measuring Technical Efficiency of Yam Farmers in Nigeria: A Stochastic Parametric Approach. *Agricultural Journal, 6:* 40-46.
21. Onubuogu, G.C, Esiobu N.S, Nwosu C.S, Okereke C.N (2014). Resource use efficiency of smallholder cassava farmers in Owerri Agricultural zone, Imo State, Nigeria; *Scholarly J. Agric. Sci. Vol*. 7(8), 142-155.
22. Osanyinlusi, Oladele, Adenegan and Kemisola. (2016). The Determinants of Rice Farmers' Productivity in Ekiti State, Nigeria. Greener Journal of Agricultural Sciences.049-058.
23. Taphee, B. G., (2015). Resource productivity and efficiency of small-scale groundnut farmers in Taraba state, Nigeria. An unpublished PhD thesis submitted to the Department of Agricultural and Economics, University of Nigeria Nsukka, Nigeria.
24. Zamanti M. I. and Jaderka O. N., (2016). Evaluation of the socio-economic characteristics of cassava farmers and their profit efficiency: Empirical evidence from South western Nigeria. *African Journal of Agricultural Economics and Rural Development* Vol. 4 (4), pp. 345-350.

5/22/2020