IMPACT OF COMMERCIAL AGRICULTURE CREDIT SCHEME ON TECHNICAL EFFICIENCY OF RICE FARMING IN KANO STATE, NIGERIA

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ABSTRACT
The purpose of this study is to empirically evaluate the effect of commercial agriculture credit scheme on technical efficiency of rice farming in Kano State, Nigeria. Primary data was sourced from 394 beneficiary farmers of commercial agriculture credit scheme (CACS) through survey method in the period 2009–2020. Multi-stage sampling technique was used for the study across the existing agricultural zones. The study employed the stochastic frontier model. The model specified was estimated by likelihood estimates of stochastic frontier production function and inefficiency determinants of rice farming using STATA 14. The findings revealed that before CACS, the regression of the stochastic frontier estimates of technical efficiency revealed that 96.7% had technical efficiency (TE) of 0.75 and above while 3.3% of the farmers operate less than 0.75 efficiency level. After accessing CACS, the regression of the stochastic frontier estimates of technical efficiency level revealed that 92.9% of the farmers had technical efficiency between 0.50 and 0.74, while 7.03% of the farmers operate at less than 0.49 efficiency level. This means that most of the farmers are technically inefficient. The value of the amount borrowed was positive with a value of 0.3453. The implication is that, after accessing CACS, the loan increased the inefficiency of rice farmers. Also the age of farmer and education of farmer led to technical inefficiencies in rice farming. Therefore the result concluded that commercial agriculture credit scheme have led to the technical inefficiency of rice farming in the study area.

Key words: Commercial Agriculture Credit Scheme, Efficiency, Technical Efficiency, Stochastic Frontier Model.
***JEL Classification Codes*: H21, H31, Q14**

1. INTRODUCTION

Commercial agriculture credit has the capacity to improve rice farming output if adequately harnessed, which can lead to efficiency and positive yield. In Nigeria, like other third world countries,

agriculture is the dominant economic activity. Even though dominant, it is characterized by small scale farming and low productivity. The total production output is hardly enough to meet domestic needs, and so exporting becomes difficult. Rather, food import bills have always been increasing. It has always been the prerogative of the government to develop the agricultural sector so as to diverse the economy away from the monocultural syndrome, which has plunged the economy to various shocks in the time past.

Rice is an important food crop in Nigeria that has in recent years become the major staple food. Because of its importance, rice farming is a common practice, which is a predominant occupation in most states including Kano State. But the farming of rice has been characterized by traditional practice of small holdings, broadcasting planting system, rain fed, low level of mechanization etc, and the end result is low productivity. In Nigeria, the yield of rice on the average is 1.51ton/ha. However, the low yield in Nigeria translates to rice shortage. Therefore the shortage in production creates the demand and supply gap. It has been observed that the local production of milled rice in Nigeria is estimated to be 5.8 million metric tonnes on the average annually while the demand needs is estimated to be7 million tonnes annually. This gives a supply gap of estimated to be 1.2 million metric tons. To make up for the shortfall, in 2014, Nigeria incurred a bill of N1 billion daily for rice importation. Also in the year 2012 and 2015 (between January and May respectively) the Government of Nigerian had an expenditure on rice importation of $2.41 billion (Emefiele, 2015). The national rice demand for rice in 2016 was estimated to be 6.3 million metric tons, the supply in the domestic economy was estimated to be 2.3 million tons (FMARD, 2016). And so the import was expected to fill the deficit of 4 million metric tons. This further show that the consumption needs and demand is high and supply low. The expectation is that the high import of the rice is to fill the shortage in supply instead of producing the rice domestically. This means that import of rice is expected to fill the shortage in the Nigerian economy in o other to meet up with the consumption needs of Nigerians. The implication is that rice importation can have negative effect in the economy which can cause serious danger on the earnings of Nigeria. The high importation is further aggravated by increase in high import bills. This has a negative effect on the terms of trade and balance of payment of Nigeria.

Credit is an important component to boost investment in rice production so as to bridge the domestic deficit of rice production. And so Adejoh (2021), Bello et al. (2021), and Okhankhuele (2021) described credit as an important component that is adequate to finance any investment. It is in this regards that successive governments in Nigeria came up with different programmes and policies over the years among which include commercial agriculture credit scheme (CACS). The CACS was established in 2009 as an intervention policy and new initiative to position the economy towards improving rice farming production. The policy is to provide finance for the country's agricultural value chain.

Kano State is one of the States in Nigeria that is known for rice production. Most of the production areas are in the fadama and the Kano River Basin areas. Therefore this study seeks to analyze the effect of commercial agriculture credit on technical efficiency of rice farming in Kano State.

2. LITERATURE REVIEW

2.1 Conceptual Literature

The term credit as agreement between those who lend and those who borrow. In a situation where those who lend agree to give particular amount of money to those who borrow. On the other hand, those who borrow will pay back the money with interest in the future scheduled date as agreed. They also identified credit as the credit worthiness of those borrowing. This is when those borrowing are able to repay the credit at the due date.

Commercial Credit: it refers to preapproved money that is made available by a bank or an institution saddled with the role of lending to company, group and cooperatives. These entities can obtain money in form of commercial credit based on their discretion so as to meet up with its financial obligations.
Commercial Agriculture: This involves a large scale of production where various types of farming are involved. Commercial agriculture refers to any form of agricultural production that is on a large scale with the major aim of producing for local, regional, national or international markets. Commercial agriculture involves large scale farming intended for profit maximization.
Commercial Agriculture Credit: It refers to commercial credit that is arranged and disbursed to individual households, groups, cooperatives or companies in form of cash for large agricultural production activities with the sole aim of paying at a later date. Commercial agriculture credit is intended to improve small scale production for large scale production in agriculture which is intended for the market. Therefore the use of commercial agriculture credit is intended to shift agriculture production from a small scale level to a large scale level.
Commercial Agriculture Credit Scheme (CACS): The CACS is a policy introduced and launched by Nigerian government in 2009. The CACS is a strategy of achieving one of the Central Bank of Nigeria development policy aimed at ensuring improved agricultural production which can translate to higher income and food security.
Concept of Efficiency: This concept of efficiency is used in production analysis and rice farming is one of such. Efficiency is the ability to produce a given set of output at the lowest possible average total cost. The efficient use of resources can eliminate waste which can lead to productivity.
Technical efficiency: The concept refers to degree or extent to which the maximum possible output can be achieved from a given combination of inputs. For example, it is a situation where the farmer is able to obtain maximal output from a given combination of set of inputs. A farmer is technically efficient as long as they can produce output at the maximum level using input with the minimum quantity and resources such as capital, labour, technology and techniques.

2.2. Theoretical Literature

Commercial Loan Theory of Liquidity

Adam Smith described bank liquidity by explaining that short term loans made to finance goods that are salable, in the process which moves from the producer to the consumer are considered to be the loans that are liquid that bank(s) can make. These loans are termed to be self-liquidating. The reason is that these goods that are being financed will be sold within the shortest period of time. And so the borrower ability to pay back to the bank is based on the loan which a transaction is financed and the transaction made can provide the needed funds to the borrower. These loans according to Adam Smith are liquid. This is because of the collateral attached to this loans and the purpose in which they are used for. Secondly the loans are the most liquid because of the value chain where it moves very fast (or quickly) from the producer to the distributors, to the retailer and it reaches the consumer who buys and pay for their purchases. The theory has three advantages which shows that the loans are short term self-liquidating. The loans liquidate themselves automatically, since the loans are for productive ambitions, their maturity is in the short run and so there is absence of risk in terms of running into debt. Lastly these loans earn income for the banks because their productivity is high.

2.3. Empirical Literature

Cahyad, Iskandarini, and Rahmanta (2021) carried out a study on technical efficiency analysis of organic rice in Perbaungan District, Serdang Bedagai Regency, Indonesia. The results of the analysis showed that the variables of land area, seeds, and labor had a significant effect on rice production. The results of the calculation of organic rice farming showed an average technical efficiency (ET) of 0.84, and the factors affecting the level of technical efficiency were the dummy position in the farmer group members and the number of training.

Okoh et.al. (2021) examined the determinants of technical efficiency among lowland rice farmers in Enugu State, Nigeria. Primary data were sourced from rice producers through the use of well designed questionnaires. The Cobb-Douglas stochastic production frontier function was used for analysis. The result revealed that (98%) of random variation in the output of farmers was because of their inefficiency in their use of productive inputs in the study area. Apart from the coefficient of farm size, the coefficient of fertilizer, seed, labour and agro-chemical show that they were underutilized by the rice farmers. The average technical efficiency for the farmers was 0.71 implying that, on the average, the respondents are able to obtain 71% of potential output from a given mixture of production inputs. Thus, in a short run, there is a minimal scope (29%) of increasing the efficiency, by adopting the technology and techniques used by the most technically efficient farmer.

Adejoh (2021) assessed commercial bank credit to MSMEs. The estimation revealed that there was no causal relationship between commercial bank credit to MSMEs and economic growth in Nigeria for the period under analysis. Similarly the study of Bello, Alexander and Farouk (2021) assessed impact of bank credit to manufacturing sector. The findings of the ganger causality revealed that bank credit does not have significant impact on manufacturing sector output; there is no significant long-run relationship between bank credit and manufacturing sector output; and there is no causality between bank credit and manufacturing sector output.

Abiola, Omhonlehin and Sani (2021) empirically investigated technical efficiency of rice production in north central Nigeria. Primary data were used to accomplish the objectives of the study. North Central zone of Nigeria. The parametric stochastic frontier production function was estimated using a likelihood estimator in two-stage approach. Results indicated that none of the rice farmers was technically efficient but rice farmers can increase their output by more than 63% without any increase in input utilization if the farmers adopt the farm practices of the technical leader.

Chikezie et.al. (2020) carried out a study on analysis of technical efficiency among rice farmers in Ebonyi State of Nigeria, using a stochastic frontier approach. The Cobb-Douglas production function model was used to predict the farm level technical efficiency. Results from the Cobb-Douglas Regression showed a sigma square ($\sigma 2$) of 0.06584 which was statistically significant at 1 percent. The technical efficiency scores among the rice farmers ranged from 0.012 to 1.000 with a mean of 0.350. Farm size, quantity of rice seedlings, quantity of fertilizer and quantity of agrochemical all were showed positive correlation while farm labour showed a negative correlation with technical efficiency. The determinants of technical inefficiency were age, household size and extension visits.

Ndubueze-Ogaraku and Ogbonna (2016) carried out a study to determine the technical efficiency of rice production in Abia State, Nigeria. The study used stochastic frontier production function model. The results showed majority (65.6%) of the rice farmers were in the age bracket (40-60 years), 58.1% of them were women and most of the farmers (48.4%) had farming experience of 11 years and above. A mean technical efficiency of 83% was recorded in the area. The major factors which influenced the farmers' technical efficiency were farm size and labour while gender and occupation exerted a significant effect on their inefficiency level.

The study of Ataboh, Umeh, and Tsue (2014) evaluated the determinants of Technical Efficiency among Rice Farmers in Kogi State, Nigeria using stochastic production frontier analysis to analyze the determinants of technical efficiency among rice farmers in Kogi State, Nigeria. The study noted that farm size, seed and fertilizer were the most important factors increasing rice productivity. Also, the technical efficiency of rice farmers varied due to the presence of technical inefficiency with the mean efficiency value of 0.54 implying that about 46% of rice output is lost due to inefficiency on the part of farmers. Variables such as age (-0.05), household size (-2.38), and the use of improved variety (-0.10) caused an increase in technical efficiency of farmers.

3. METHODOLOGY

3.1 Theoretical Framework

The framework for this study is the commercial loan theory of liquidity. The theoretical framework shows credit and production relationship (rice production) which is focused largely on the positive effects of access to commercial agriculture credit. The accumulation of a credit has the potentials of self liquidation within the shortest possible time as long as it is used for production transmitting to various stages of production.

Accessing commercial credit can finance rice product because it can increase quick turn over. Rice product is liquid in the short term because of its high consumption demand. And so if credit resources are adequately utilized it can increase production and sold within the shortest possible time. The quick turn over can enable the rice farmer pay back commercial credit. It is also expected that rice production can move quickly from the producers through the retail outlets, and purchased by the ultimate cash paying consumer. The reason is that there is high demand for rice in the market. Farmers' access to commercial credit for rice farming will improve successive phases of production, storage, transportation and distribution. Utilizing commercial credit can improve rice farming. Utilization of commercial credit by the rice farmer to cultivate on land can meet the needs of the rice farmer, by engaging in different activities to create wealth and increase wealth through engaging himself in different activities (i.e. off farm and on farm activities). And can as well sell his product in the market. Efficient utilization of commercial credit can transform into increased wealth and desired outcome. Since commercial agriculture credit scheme came with various innovative strategies to transform rice farming so as to realize the objectives of commercial rice farming. These innovations include improvement in production, technique of farming and various innovations to be applied in farming so as to achieve efficiency and self sufficiency of commercial rice production.

3.2 Cross-Sectional Survey

The cross sectional survey only was adopted for this study.

3.3 Sample Size of the Study

3.4 Study Population

The study population is made up of farmers in the productive age of 18 – 60 years in the selected agricultural zones of Kano State. The population of rice farmers in Kano State is 358120 (KIPA, 2018). Comprising of both wet season and dry season farmers. The computation below is a representation of the sample size taken for this research from the population using the Taro Yamane's formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n = sample size

N = Total Population e = Level of Significance $(0.05)^2$

$$n = \frac{358120}{1 + 358120\ (0.05)^2}$$

$$n = \frac{358120}{1 + 358120\ (0.0025)}$$

$$n = \frac{358120}{1 + 895.3}$$

$$n = \frac{358120}{896.3}\quad n = 399.55;\ \ n = 400$$

Therefore the sample size for the study is 400. Four hundred questionnaires were distributed but 394 questionnaires were returned. The sample size is the portion of the population which the researcher used to represent the total population.

3.5 Sampling Techniques

Multi-stage sampling technique was used for the study because Kano State has a widely disperse population of farmers. The existing agricultural zones, which are Zone 1, Zone 2 and Zone 3, form a cluster each. The farmers in the three agricultural zones are all in cooperative societies. Therefore the target population of this study comprised of all farmers that have benefitted from the commercial agriculture credit scheme involved in rice farming.

3.6 Model Specification

The study employed production efficiency model i.e stochastic frontier model.

i. Stochastic Frontier Model

Empirical model

The Cobb-Douglas functional forms will be used in estimating the physical relationship between inputs and output. It is preferable because the independent variables are more than four in the model. The empirical model of Cobb-Douglas production function shows the functional relationship between the quantity of a specific product that can be produced within a time and a set of inputs used, given the existing technology in a socio-cultural environment. It is assumed that $f(X_i\,;\beta)$ takes the log-linear Cobb-Douglas form. The empirical Cobb-Douglas stochastic frontier model is specified as:

$$ln\mathrm{y_i} = \beta_0 \sum_n \beta_n \, lnX_{ni} + \, v_i - u_i - \quad (3.1)$$

Stated differently:

$$ln\mathrm{Y_i} = \beta_0 + \beta lnX_1 + \beta lnX_2 \, + \beta lnX_3 + \beta lnX_4 + \beta lnX_5 + \, v_i - u_i - - - - - - - - - (3.2)$$

Where; ln = Natural Logarithm; Yi = Quantity of Rice output (kg); β_0 = constant term; $\beta_1 - \beta_5$ = regression coefficients; X1 = Farm size (ha); X2 = Quantity of seed used (kg); X3 = Labor input used (both family and hired labor) (man days); X4 = Quantity of fertilizer (kg); X5 = quantity of herbicides (Liters); v_i = random variability in the production that cannot be influenced by the farmer.
u_i = deviation from maximum potential output attributable to technically inefficiency.

So therefore, we can determine technical inefficiency model as:

$$u_i = \lambda_0 \sum_{j=i} \lambda_{ij} \, Z_{ij} + \, v_i - u_i - (3.3)$$

$$u_i = \lambda_0 + \lambda_1 Z_1 + \lambda_2 Z_2 + \lambda_3 Z_3 + \lambda_4 Z_4 + \lambda_5 Z_5 + \lambda_6 Z_6 \ldots\ldots\ldots\ldots . \lambda_{11} Z_{11} + \, v_i - u_i - - (3.4)$$

Where: u_i = inefficiency effects; Z_1 = is the age of farmer; Z_2 = years of experience of the farmer; Z_3 = educational level of farmer; Z_4 = farm location; Z_5 = amount of credit in Naira used (amount borrowed); λ_1 = constant; $\lambda_1 - \lambda_{11}$ = parameters to be estimated; u_i = deviation from maximum potential output attributable to technical efficiency.

4. RESULTS AND DISCUSSION OF FINDINGS

4.1 Estimated Technical Efficiency of Rice Farming

The model specified was estimated by likelihood estimates of stochastic frontier production function and inefficiency determinants of as specified rice farming using STATA 14. The model is seen in equation 3.2 and 3.4 respectively.

Table 4.1: Results of Likelihood Estimates of Stochastic Frontier Production Function of Rice production Before and After the Commercial Agriculture Credit Scheme Loan

	Before CACS					After CACS			
Variables	**Parameters**	**Coefficient**	**Standard Error**	**Z-value**	**Prob.**	**Coefficient**	**Standard Error**	**Z-value**	**Prob.**
Production function									
Constant	β_0	3.0278	0.2524	11.99	0.000**	0.3026	0.14	2.16	0.031**
lnFarm size	β_1	0.1399	0.9252	1.51	0.130	0.8079	0.0225	35.88	0.000**
lnSeed	β_2	0.0021	0.0877	0.02	0.980	0.0591	0.0564	1.05	0.295
lnHerbicides	β_3	0.1371	0.0823	1.66	0.096*	-0.0573	0.0453	-1.27	0.206
lnFertilizer	β_4	-0.2101	0.9186	-2.29	0.022**	-0.0935	0.0306	-3.05	0.002**
lnHired Labour	β_5	0.3471	0.0785	4.42	0.000**	0.007	0.031	0.23	0.820
lnHouse labour	β_6	-0.1739	0.1011	-1.72	0.085*	0.1203	0.0347	3.47	0.001**
Inefficiency model									
Constant		3.8071	1.7585	2.16	0.030**	-344.46	366.40	-0.94	0.347
Age of Farmer	Z_1	-0.8260	0.0429	-1.92	0.054**	4.1068	4.006	1.03	0.305
Farmer Experience	Z_2	0.0088	0.0791	0.11	0.911	-1.7663	2.7429	-0.64	0.520
Education of Farmer	Z_3	0.0524	0.0885	0.59	0.554	6.2945	6.8412	0.92	0.358
Farm location	Z_4	-0.1063	0.0774	-1.37	0.169	-2.3813	2.2627	-1.05	0.293
Amount Borrowed	Z_5					0.3453	14.437	0.02	0.981
Diagnostic Statistics									
Sigma-squared	(σ^2)	0.5778	0.0262	27.98	0.000**	64.134	0.0151	18.49	0.000**
Gamma	(γ)	0.2631	0.1242	2.12	0.034**	0.0012	3.4255	8.34	0.000**
Log likelihood function	L/*f*	-438.862				-266.545			
LR test		3.13				4.6528			
Total number of observation		394				394			
Mean efficiency		0.9533				0.7473			

Field Work (2021). **Level of significance: **=5%, *=10%**

Before access to CACS, the findings revealed that the generalized log likelihood function was -438.862, and after CACS the value is -266.5456. The log likelihood function implies that inefficiency exist in the data set. Before CACS the value of gamma (γ) is estimated to be 0.2631 and after CACS is estimated to be 0.0012 and they are significant at 5% level of probability and significance. The value of gamma is fairly high but less than zero and is not consistent with theory. Before CACS, it implies that 26.3% and 0.12% after CACS of random variation in the yield of the rice farmers was due to the

farmers' inefficiency in their various sites of farm land and not as a result of random variability. The gamma (γ) indicates the systematic influence that are unexplained by the production function and the dominant sources of random error. This means that the inefficiency effects make significant contribution. The value of sigma-squared (σ^2) was significant at 5% level of probability before CACS (57.7%) and after CACS (64.1%). This indicates a good fit and correctness of the Specified distributional assumptions of the composite error terms.

The estimated coefficients of all the parameters of production function of farm size was 0.1399 is positive and not significant, seed was 0.0021 is positive and not significant, herbicides is 0.137 is positive and not significant, seed was 0.0021 is positive and not significant, herbicides is 0.137 is positive and significant at 10%, and hired labour is 0.3471 is positive and significant at 5%. Although the coefficient of fertilizer and house labour was -0.2101 and -0.1739 and are significant at 5% and 10% level of probability respectively which play a major role in rice farming production in the study area. The average mean technical efficiency is 0.95 implying that on the average, the respondent farmers are able to obtain 95% of potential output from a given mixture of production inputs. Thus in the short run, there is the minimal scope (25%) of increasing the efficiency level. This can be by adopting the techniques and technology used by the best rice farmer.

The coefficient of herbicides is 0.137 which is positive and statistically significant at 10% level. This implies that a 1% increase in the use of herbicides will increase rice output by 0.13%. This means that output will react to changes in the use of herbicides. The coefficient of fertilizer is -0.2101 and is significant at 5%. This implies that an increase in the use of fertilizer input by 1% will reduce rice output by 21%. The coefficient of hired labour is 0.3471 which is positive and statistically significant at 5%. This implies that a 1% increase in the use of hired labour will increase rice output by 34.7%. Lastly the coefficient of family labour is -0.1739 and is statistically significant at 10% level. The implication is that a 1% increase in the utilization of family labour will reduce the output of rice by 17.3%. The findings is in disagreement with the study of Ataboh, Umeh and Tsue (2014), Amaza and Maurice (2005).

The result of the inefficiency model in table 4.1 which shows the estimated coefficients with negative signs indicates that they reduce technical inefficiency among the farmers, while positive signs indicate that the coefficients increase technical inefficiency or reduce technical efficiency. The results showed that age, farming experience, education, and farm location were the determinants of technical inefficiency among the rice farmers. Age of farmer and farm location were negatively related with technical inefficiency. The coefficient of age of farmer was -0.8260 which is negative and significant at 5% probability level. This implies that as the age of the farmer increases, the technical inefficiency reduces by 82.6%, thereby increasing technical efficiency of farmers. Therefore age of farmer is an important determinant of efficiency in rice farming. The finding is in agreement with the study of Adewuyi and Amurtya (2021). Secondly the coefficient of farm location is -0.1063 and is not statistically significant. This implies that farm location increase efficiency of rice output by 10.3%. The findings is not in agreement with the study of Ataboh, Umeh and Tsue (2014), Amaza and Maurice (2005).

After accessing CACS, the estimated coefficients of all the parameters of production function of farm size is 0.8079, it is positive and significant at 5%, seed was 0.0591 is positive and not significant, hired labour is 0.007 and not significant, house labour is 0.1203 and it is significant at 5%. Herbicide is -0.0573, and significant, and fertilizer is -0.0935 and significant at 5%. The average mean technical efficiency is 0.74 implying that on the average, the respondents' farmers are able to obtain 74% of potential output from a given mixture of production inputs. Thus in the short run, there is the minimal scope (26%) of increasing the efficiency level. This can be by adopting the techniques and technology used by the best rice farmer.

Therefore the coefficient of farm size is 0.8079 which is positive and significant. This implies that an increase in the use of the size of farm by 1% will lead to a change and increase in output of rice by 80.7%. This further show that farm size is an important determinant that contributes to high rice output. The coefficient of fertilizer is -0.0935 and it is significant. This implies that 1% increase in the use of fertilizer will reduce the output of rice by 9.3%. Also the coefficient of house labour is 0.1203 and it is significant. This further show that when the use of house labour increase by 1%, it will lead to higher output of rice by 12%. Lastly the coefficient of seed, herbicide and hired labour is 0.0591, -0.0573, and 0.007 respectively and they are not significant. The finding is in agreement with the study of Ataboh, Umeh and Tsue (2014) and also in line with Amaza and Maurice (2005). The result of the inefficiency model can be seen in table 4.1. The estimated coefficients with negative signs indicate that they reduce technical inefficiency among the farmers, while positive signs indicate that the coefficients increase technical inefficiency or reduce technical efficiency. The results showed that age, farming experience, education, and farm location were the determinants of technical inefficiency among the rice farmers. Age of farmer, farm location, amount borrowed were negatively related with technical inefficiency.

The coefficient of farmer experience was -1.7663 which is negative and it is not significant. This implies that as the experience of the farmer increases, the technical inefficiency reduces thereby increasing technical efficiency of farmers. This is because as the experience of the farmer increases significantly, it can contribute positively to output. This implies that the experience of the farmer increases efficiency by 17.6%. Secondly the coefficient of farm location is -2.3813 which is negative and not significant. Farm location can boost can technical efficiency of farmers by reducing technical inefficiency. This implies that farm location increases efficiency of rice output by 23.8%.

The findings are similar to that of Amaza and Maurice (2005) and contradicts the findings of Ataboh, Umeh and Tsue (2014). The amount borrowed is our interest in this study. But the coefficient of the amount borrowed is 0.3453 and it is not significant. Amount borrowed is expected to have a negative sign. The positive sign denotes inefficiency. The positive sign implies technical inefficiency. That is to say amount of credit given to farmers led to their technical inefficiency (higher level of technical inefficiency). The finding is similar to the findings of Adejoh (2021), Bello et. al. (2021) and Agba (2014). But is not in line with the findings of Yusuf et. al. (2021), Adewuyi and Amurtya (2021), Omoregie, Ikpesu and Okpe (2018), Olubunmi and Nma (2021), It means amount of credit borrowed is not in line with commercial loan theory of liquidity.

4.2. Frequency Distribution of Technical Efficiency

The frequency distribution of the technical efficiency estimates for rice farmers in the study area as obtained from the stochastic frontier model presented in table 4.2.

Table 4.2: Frequency Distribution of Technical Efficiency

	Before CACS		After CACS	
Efficiency level	Technical Efficiency		Technical Efficiency	
	Number of households	%	Number of households	%
0.00 – 0.24	02	0.51	23	5.99
0.25 – 0.49	03	0.76	04	1.04
0.50 – 0.74	08	2.03	357	92.97
0.75 – 1.00	381	96.7	0	0
Total	394		394	
Min	0.2284		0.0012	
Max	0.9948		0.0012	
Mean	0.9533		0.0012	

Field Work (2021)

4.3 Technical Efficiency Estimates of Rice Farmers

Before access to CACS, table 4.2 shows the findings from the study revealed that 96.7% had technical efficiency (TE) of 0.75 and above while 3.3% of the farmers operate less than 0.75 efficiency level. Therefore the rice farmers with the best and least efficiency practices had technical efficiencies of 0.99 and 0.23 respectively. This means that on the average rice output fall by 1% from the maximum possible output of 1.00 due to technical inefficiencies. The result also showed the mean technical efficiency of 0.95. This implies that the majority (96.7%) of the rice farmers operated closer to their production frontier. In addition, it also implies that on the average, rice farmers are able to obtain 95% potential output from a given mix of productive resources. In the short run, there is scope or options for increasing rice output by 5% through adopting the techniques and technologies employed by the best rice farmers.

After accessing CACS, the findings revealed that 92.9% of the farmers had technical efficiency of 0.50 and 0.74, while 7.03% of the farmers operate at less than 0.49 efficiency level. The best and least efficiency practice of the farmer is 0.0012 and 0.0012 respectively. It implies that the on the average rice output fall by 1% from the maximum possible output of 1.00. And this is due to technical inefficiencies. Similarly, the findings also reveal that majority of the farmers (92.9%) were operating closer to their production frontier. On the average the findings show that on the average rice farmers were able to obtain 0.12% potential output from a given mix of productive resources. Therefore in the short run, options for increasing rice output is 99.8% through adopting the techniques and technologies employed by the best rice farmer.

5. CONCLUSION AND POLICY RECOMMENDATIONS

From the findings there is the need for technical efficiency in rice farming in the study area. To attain self sufficiency there is need for farners to be technically efficient. The study has identified the factors that reduce technical efficiency of households. These factors that affect technical efficiency before CACS include Age of farmer which has reduced technical inefficiency by 82.6%, and farm location 10.6%. Also after the CACS loan, factors that reduced technical inefficiency are farm experience by 17.6% and farm location by 23.8%. The coefficient of the amount borrowed was not significant. Amount borrowed is expected to have a negative sign. The positive sign implies technical inefficiency. That is to say amount of CACS loan given to farmers in the study area has contributed to their technical inefficiency (higher level of technical inefficiency). Since the amount borrowed is not significant thereby leading to higher level of inefficiency, it means amount borrowed is not in line with commercial loan theory of liquidity. And so the CACS loan has reduced efficiency in rice farming. This is in line with the findings of Adejoh (2021), Bello et. al. (2021) and Agba (2014).

Based on the findings of the study, to sustain and improve technical efficiency of rice farming systems in the study areas. The study recommends that fiscal policy tightening should be put in place towards mitigating the factors that affect efficiency. For instance human and physical resources can be a priority and should be targeted as a form of public investment so as to improve rice farming. Age of farmer, education of farmer, and farmer experience are both significant variables for improving efficiency. Therefore deliberate policies such as training of farmers on the technique of farming through adoption of technologies to improve efficiency in farming. In addition, the export promotion policies should be designed, created and implemented so as to impact tremendously towards increasing the productivity efficiency i.e reduction in taxes charged on produced goods.

Secondly, there should be a sincere approach by the Central Bank of Nigeria towards allocating funds to real farmers in the study area without interest rate and provision of farm inputs at no cost. This can facilitate efficiency in rice production and reduce risk in production.

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