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IMPACT OF ACCESS TO CREDIT FACILITY ON THE PRODUCTIVITY OF RICE FARMERS IN KANO STATE, NIGERIA

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Abstract

The Nigerian government banned rice importation to upsurge its production in the country for food security. Financial institutions are expected to provide the needed finances to the rice farmers to increase rice production in the country. Though. Many people have accepted rice farming, most of them are small-scale rice farmers; having limited funds to support rice farming. Unfortunately, most of the small-scale rice farmers could not access credit facility. The inability of rice farmers in Kano to access credit facility reduced their productivity hence, depriving them access to fertilizer, improved rice variety, and extension services. The study aimed at identifying the impact of credit facility on the productivity of rice farmers in Kano, Nigeria. A disproportionate 768 rice farmers selected randomly from seven clusters. The stochastic Frontier Model (SFM) was used to analysed the data. The results from the SFM show that; credit from commercial banks reduces rice productivity, credit from government, friends and relatives increase rice productivity. Furthermore, age, experience, and access to extension services reduced the inefficiencies of rice farmers. Therefore, the study recommends improving government credit facilities, establishing an Islamic banking in the rural areas, and improving access to extensions.

Keywords: Credit facility, Rice productivity, Kano state, Extension services.

1. Introduction

Many farmers and civil servants have accepted rice farming in Kano State, Nigeria, due to the ban on rice imports to bust its production for food security in the country. The growth rate of people involved in rice farming has been tremendous and encouraging. Hence, improving the productivity of small-scale rice farmers in the country is vital due to prevalent market imperfections and limited resources. Ideally, the financial institutions are to provide the needed finances to the rice farmers to increase rice production in the country. But most small-scale rice farmers do not have access to the credit facility. Most rice farmers are small-scale, having limited funds to support rice farming. There are 38 million farmers in Nigeria (20% of the population), and 90% do not have access to credit facilities (Oluwadare, 2019). In 2014, the federal government of Nigeria, in its effort to boost rice output, introduced the Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL). It puts aside US$500 million, a non-bank financial institution wholly-owned by the central bank of Nigeria. Further, in 2019, the federal government introduced the Agricultural Credit Support Scheme (ACSS), a single-digit interest rate loan of 8% to rice farmers.

However, rice farmers in Kano continue to face problem in accessing credit facility. The inability of rice farmers to access credit facilities deprive them access to modern rice inputs such as; fertilizer, improved rice variety, and extension services. Therefore, relaxing credit constraints would improve the productivity of small-scale rice farmers in Nigeria. The objective of this paper is to identify the impact of credit facility on the productivity of rice farmers in Kano state, Nigeria.

2. Literature Review

Technical efficiency (TE) viewed in terms of output-oriented or inputs-oriented. For instance, Coelli et al. (2002) defined TE as the ability of a farmer to produce the maximum possible output from a given variable input (output-oriented). While the input-oriented TE refers to the ability of the farmer to utilise the minimum inputs to produce a given level of output Coelli et al. (2002). The aim is to efficiently utilise inputs to produce a feasible output to maximise profits. Study by Odu et al. (2019) reported that formal and informal credit were the sources of credit to rice farmers. Further, experience in rice farming facilitates access to formal and informal credit. Duy (2015) posited that access to formal and informal credit surges rice efficiency in Delta Mekong, Vietnam. Jimi et al. (2019) theorised that access to credit led to a rise in output by 14%. Further, Ajah et al. (2018) showed that most rice farmers obtain credit from money lenders, and their age affects access to credit. The main restrictions to credit access were lack of guarantor, collateral, and high-interest rate. Thus, increasing the supply of credit raises rice output in Nigeria (Ikpesu., 2018).

Mahoukedegbe et al. (2015) shows that the use of credit in rice farming influences the productivity of rice farmers' yield, rice output, income from rice, per capita rice revenue, yearly household pay, and household's per capita revenue. Besides, interest rate affects credit amount received by rice farmers thus, advise easing credit access to increase rice productivity (Ojo et al. (2019). Also, Akinbode (2013) reported that access to credit upsurges rice efficiency and profits. The results further show that age, education, and extensions determined access to credit. Gwaram et al. (2015) reported that age, qualifications, and experience of rice farmers affect access to credit. Ngong et al. (2022) opined that banks' credit to farmers affect their productivity. Also, Shabir et al. (2020) posited that credit affect wheat productivity and 30% of credit users purchased fertilizers and seeds. Also, Akudugu (2016) reports a significant positive impact of formal and informal credit on agrarian productivity. Similarly, Nan et al. (2019) reported that credit access increases farm output. Also, Martey et al. (2019) reported that credit facility positively impacted on the efficiency of small-scale maize farmers, and extension services influenced access to credit.

Khanal and Regmi (2018) theorized that financial constraints reduce rice efficiency. Likewise, Ojo et al. (2020) pointed out that a shortfall of 80% in the required credit by a rice farmer reduces rice yield. Further, age, education, and experience increase inefficiency, while access to credit and extensions reduce inefficiency of rice farming. Fatai and Lawal (2016) stated that, banks' credit and interest rate negatively affect agriculture. The significant problems of farmers are high-interest rate, insufficient and timely farm credit (Mohammed et al., 2017). Bai et al. (2019) noted that the level of creditworthiness is affected by education and experience of a farmer. Besides, the inability of farmers to access credit limits adoption of modern farming technologies and increases inefficiencies (Hena et al., 2019). Also, Abdallah et al. (2019) and Sekyi et al. (2017) noted that the age and literacy of farmer affect access to credit. Further, Tran et al. (2016) pointed out that credit constraint is affected by the household's age and education.

Chandio et al. (2017) reported that level of education, experience, and collateral security positively affects farmers' access to credit. Matthew and Uchechukwu (2014) reported that most farmers could not access credit due to the absence of financial institutions in the rural areas. The few who accessed credit were through friends, relatives, and cooperative society. Further, Abdallah (2016) pointed out that farmers are producing below the frontier curve due to inadequate access to credit facilities. Similarly, Ahmad et al. (2016) attributed the decline in the agricultural yield of Kano to the conventional financial institutions in the state. Hence, ratify banks such as Ja'iz (Islamic bank), Keystone and Stanbic ITBC that operate window Islamic banking to open branches in the rural areas of the state. Also, Ahmad and Umar (2017) endorse creating a non-interest lending institution, especially in the rural areas, to provide Salam finance that would increase the output. Salam finance is a Shariah sales contract (a payment of sold item is made on the spot or at a later time while the delivery of the good is at a specified period) used by Islamic financial institutions.

3. Methodology

Kano state has a population of 9.4 million and 3.5% annual population growth rate. Located at latitude 130 N and 11.50 S, and longitude 8.50 W and 100 E. The

state bordered in the east with Jigawa state, south with Bauchi and Kaduna states, west with Katsina, and north with Jigawa and Katsina states. Further, the state has a daily mean temperature of 300C to 330C in March to May and a lowest temperature of 100C in September to February. The average rainfall is 600 mm with an average literacy level (Nuhu, 2014). Kano is part of the Sahel Savannah with tropical climate, has 20,760 km^2 land area, agriculture 1,754,200 hectares, and forest vegetation and grazing land of 75,000 hectares. Majority of the people are agrarian and 55% are rural dwellers producing sorghum, millet, cowpea, cotton, maize, rice, wheat, and varieties of fruits and vegetables (Agronigeria, 2016).

3.1 Sampling Technique and Sample Size

Seven local governments (LGs) out of forty-four LGs are producing rice as per available record thus, the seven LGs selected for the study. Further, a purposive random sampling of 768 rice farmers selected from nine rice clusters from the 17 rice clusters. The selected LGs are; Bunkure, Doguwa, Garun Malam, Garko, Kura, Tudun Wada, and Warawa. The selected nine rice clusters are; Doka sati, Lautaye, Kadawa, Garin Ali, Kura, Karfi, Bugau, Nata'ala, and Larabar G/sarki, selected purposely based their productivity level.

3.2 Method of Data Collection and Analysis

Data collected using structured questionnaire from 768 rice farmers in nine rice clusters during the 2020 irrigated and rain-fed rice farming. Extension workers and research assistants administered the questionnaires. The rate of questionnaires return is 96.22% and the rate of usable is 85.42%. The socio-economic characteristics of the respondents analysed using descriptive statistics. Moreover, the econometric analysis uses the Cobb-Douglas stochastic frontier model (SFM) to identify the efficiency of access to credit on rice productivity. Further, the inefficiency model was used to determine the determinant of productivity level among the rice farmers.

3.3 Model Specifications

Following Tanko et al. (2019b), Melese et al. (2019), and Ahmed, et al. (2018), this study used the SFM because the model splits random errors from inefficiencies that the farmer cannot control such as deterioration of weather, drought, pests, and insects (Coelli, 1995). Moreover, most of the rice farmers in Kano are small scale with a low level of formal education. Hence, the existing data are subject to measurement errors. The functional form of the model specified as;

$$\ln Y = f(B_n X_n) + E \quad (1)$$

Where: ln = natural logarithm, y = is the output of the ith farmer, X = vector of the inputs, n number of inputs, and B is vector of the unknown parameter to be estimated, and E is the error term further expressed as $E = V_i - U_i$; V_i is random error assumed N (0, q_v^2) independent of the U_i which is non-negative accounting for the technical inefficiency of the farmer.

3.4 Selection and Estimation of the Empirical Model

Following Tanko et al. (2019b), Melese et al. (2019), and Ahmed et al. (2018) this study uses the Cobb-Douglas in log functional form of the SFM despite its restrictions. The Cobb-Douglas functional form provides a yardstick for the adequacy of a data and feasibility of computations. Also, it is ideal for uncertainty condition of production of which most farmers operate. So, Stata 14 was used to estimate the result of the study. The Cobb-Douglas in log form as specified by Aigner and Chu (1968) and Meeusen and van Den Broeck (1977), selected based on the generalised log-likelihood ratio (LR) test specified as;

$$ln\gamma = \beta_0 + \sum_{j-1}^{k} \beta_1 X_1 + v - u \quad (2)$$

Where: ln = natural logarithm; Y = rice output in quantity; Xi = input used, β = unknown vector of parameters to be estimated through the maximum likelihood (ML), V = is the symmetric error term accounting for inefficiencies beyond the control of the farmer, and U = is the asymmetric error term accounting for the inefficiencies resulting to the farmer. Besides, the generalised likelihood ratio (LR) test was used to test some hypotheses regarding the chosen model.

3.5 Variable of Rice Production Efficiency.

The variables are the inputs used in the efficient production of rice. The inputs could be production or cost inputs which determine the general production efficiency. Hence, the functional form of the model depicting the relationship between the dependent and the inputs as;

$$\ln Y_i = \beta_0 + \beta_1 + \beta_2 Abcr + \beta_3 Afrc + \beta_4 Aml + \beta_5 Ps + \beta_6 Acnp \quad (3)$$

where; ln = log of output, Y_i = output, Agcr = access to government credit, Abcr = access to bank credit, Afrc = access to friends and relative credit, Aml = access to money lenders, Ps = personal saving, and Acnp = credit access not a problem.

Furthermore, the likelihood ratio (LR) conducted to test some hypotheses given as;

$LR = \lambda = -2\ln[L(H_0) / L(H_1)$ (4)

Where $L(H_0)$ is the value of log-likelihood function for the hull hypothesis, $L(H_1)$ is the value of log-likelihood for the alternative hypothesis.

3.6 Sources of Inefficiency in Rice Farming

The socioeconomic characteristics as identified to affect the efficiency of rice farmers are age, marital status, level of education, experience, access to fertilizer, access to improved rice seed, and access to extension services. Thus, the inefficiency model estimated to identify the effect of the socioeconomic characteristics on the efficiency of rice farmers in Kano state for the 2020 rice cropping. The model specified by Coelli and Battese (1996) as;

$U = \delta_0 + \sum_{n=1}^{\infty} \delta_1 Z_1 + v$ (5)

Where: U = is random symmetric error term, Z_1 is the socioeconomic characteristics identify to cause inefficiency in rice farming. And V is the random symmetric error term.

Furthermore, the U has asymmetric distribution equivalents to the chi-square distribution. The total variation from symmetric and asymmetric (δ^2), and the ratio of output that deviates from the maximum likelihood (y) as presented by Aigner, Lovell, and Schmidt (1977) and Battese and Corra (1977) estimated as:

$$\delta^2 = \delta_u^2 + \delta_v^2 \quad (6)$$

$$y = \delta_u^2 / \delta^2 \quad (7)$$

$$\lambda = \delta_u^2 / \delta_v^2 \quad (8)$$

so that $0 \leq y \geq 1$

where; δ_u^2 is the variance of the error term due to technical inefficiency (showing how far is the observed output deviates from the maximum output), δ_v^2 is the variance of the error term, δ^2 is the total variation of the output produced due to random shocks (δ_v^2) and the technical inefficiency (δ_u^2). y is the amount of output lost from the maximum due to the technical inefficiency of the farmer. Further, y lies between 0 and 1, if y = 0, the production function signifies absence of U thus, all deviation from the frontier is due to noise. But when y = 1, the production function implies all shortfalls from the frontier are caused by technical inefficiency.

4. Results and Discussion

4.1 Definition of explanatory variables and socioeconomic characteristics of the respondents

Table 1 presents the data summary and the variables used in the econometric analysis. This study selects the socioeconomic characteristics of the sampled respondents subsequent Melese et al. (2019), Ahmed et al. (2018), and Gebretsadik (2017).

Table 1: Variables used in the stochastic and inefficiency models

Variable	Unit	Description	Mean	Std. Dev.
Age	Nominal	Number of years lived by the respondent: 0 if below 20 years; 1 if 20 – 29 years; 2 if 30 – 39 years; 3 if 40 – 49 years; 4 if 50 and above years	2.10	1.19
Qualification	Nominal	0 if respondent no formal education; 1 if respondent has primary education; 2 if respondent has secondary education; 3 if respondent has tertiary education	1.68	1.05
Experience	Nominal	Number of years spent in rice farming by the respondent: 0 if 1 – 5 years; 1 if 6 – 10 years; 2 if 11 and above years.	1.22	0.77
Access to fertilizer	Dummy	1 if respondent has access to fertilizer; 0 otherwise	0.62	0.48
Access to hybrid seed	Dummy	1 if respondent has access to seed; 0 otherwise	0.77	0.42
Access to extension visit	Dummy	1 if respondent has access to at least one extension visit; 0 if otherwise	0.48	0.50

Access to bank credit	Dummy	1 if respondent has access to bank credit; 0 otherwise		
Access to government credit	Dummy	1 if respondent has access to government credit; 0 otherwise		
Access to friends and family credit	Dummy	1 if respondent has access to friends and family credit; 0 otherwise		
Access to credit from money lender	Dummy	1 if respondent has access to money lender credit; 0 otherwise		

Source: Field survey 2020

Table 2 present the results of the socioeconomic characteristics of the respondents. The results show that the active populace (30 to 49) years are 55.3%, with a good prospect working population of 20 to 29 years (20.4%). Thus, the age of respondents signifies a high farmers' productivity, as reported by Abdallah et al. (2019); that access to credit facilities is affected by farmers' age. So, efficiency would be high in the study area. Further, the result shows that 16.6% do not have western education, 55.3% have a low level of education (primary and secondary), while 27.1% attained a higher education level. The result put some doubt on the possibility of higher productivity by the rice farmers because the low level of education may not necessarily raises productivity as recast by Abdallah (2016) that higher level of education is vital to productivity of farmers.

Further, 78.7% spent more than six years in rice farming signifies the possibility of high yield while 21.3% spent one to five years in rice farming. Most rice farmers (61.9%) have access to nitrogen fertilizer, and 76.7% have access to improved rice seed, indicating that productivity is high. But access to at least one extension visit is 47.7% which is low and can inversely affect the productivity of the rice farmers as stated by Martey et al. (2019) and Abdallah (2016) that frequent contact with extension agents by farmer's increases productivity.

Table 2: Socioeconomic characteristics of the respondents

Item	Frequency	Percentage
Age		
Below 20 years	84	12.8
20 – 29 years	134	20.4
30 – 39 years	212	32.3
40 – 49 years	151	23.0
50 and above years	75	11.4
Qualification		
No formal education	109	16.6
Primary education	157	23.9
Secondary education	212	32.3
Tertiary education	178	27.1
Experience		
1 – 5 years	147	22.4
6 – 10 years	230	35.1
11 and above years	279	42.5
Access to fertiliser		
Yes	406	61.9
No	250	38.1
Access to improved rice		
Yes	503	76.7
No	153	23.3
Access to extension visit		
Yes	313	47.7
No	343	52.3

Source: Field survey 2020

Table 3 presents the results of the LR test. The LR test conducted to test the hypothesis that, there is no inefficiency in the model. The result of the LR test rejects the null hypothesis as there is inefficiency in the model. Also, the result of the LR test rejects the null hypothesis that the inefficiency is non-stochastic because it is stochastic. The hypothesis that all the variables in the frontier model equals to zero rejected as the LR test shows that at least one variable is not zero. Similarly, the result of the LR test reject the hypothesis that all the variables in the inefficiency model are zero, as at least one of the variables in the inefficiency model is not zero.

Table 3: Generalised LR tests of hypotheses involving the parameters of the frontier, stochastic, and inefficiency model for rice production in Kano State.

Null Hypothesis	LR	X^2 Critical value	Decision
1. There is no inefficiency effect H_0: $\gamma = 0$	16.66	11.911	Reject H_0
2. The inefficiency is non-stochastic H_0: $\gamma = 0$	20.21	10.371	Reject H_0
3. The coefficients of the frontier model equals zero H_0: $\beta_1 = \beta_2 = \ldots = \beta_{11} = 0$	22.25	8.761	Reject H_0
4. The coefficients of inefficiency model equals zero H_0 : $\delta_1 = \delta_2 = \delta_8 = 0$	13.86	10.371	Reject H_0

Source: Field survey 2020

Table 4 present the results of the SFM on access to credit by rice farmers in Kano State. The coefficient of access to government credit is positively significant at 5% level, access to credit from friends and relatives is positively significant at 1% level. The positive effect implies that a 1% increase access to credit from government, and friends and relatives would upsurge rice yield by 0.0290% and 0.033%, respectively, in the study area. The reason for positive effect of government loan on rice productivity could be link to non-interest loan offered by NIRSAL to farmers to motivate them increase their productivity. Similarly, loans from friends and relatives are interest free obtained by farmers to assist improving crop yield.

The coefficient of access to bank credit is negatively significant at the 1% level. The result signifies that a 1% increase in access to credit by a farmer from a bank loan would reduce rice yield by 0.04% in the study area. The reason could be due to the high-interest rate charged by the banks on loans; as pointed out by Ajah et al. (2018) that high-interest rates militate access to credit by farmers. Further, the rice farmers in Kano are small-scale farmers and thus do not have collateral or guarantor, thereby; depriving them of access to bank loans. Hence, rice farmers resort to loans from other sources such as the government, friends or relatives. Also, loans from money lenders attracts high interest rate and requires collateral security thereby, discouraging peasant farmers from collecting the loans. So, access to credit from money lenders is not a determinant of farmers' productivity in the study area. The reason may be due to non-availability of money lenders in the study area as most of the residents do not subscribe credit that attract interest; because Islam prohibits collecting, giving, writing, or abetting interest. As Islam is the dominant religion of the people of Kano State.

Equally, the result of personal saving shows that, rice farmers' personal saving is not a determinant of rice productivity in the study area; because most of the rice farmers are small-holders. They do not have other source of income thus, do not have savings to support the small-scale rice farmers.

Table 4: SFM results on access to credit by rice farmers in Kano

Variable	Coefficient	P-value	Std. Dev.
Constant	2.0963***	31.72	0.066
Access to bank credit	-0.035***	-2.57	0.013
Access to government credit	0.0290**	2.19	0.013
Access to credit from friends and relatives	0.033***	3.07	0.011
Access to credit from money lenders	-0.001	-0.06	0.010
Personal savings	-0.009	-0.67	0.013

Source: Field survey 2020

Sources of Technical Inefficiency

Table 5 present the results of the inefficiency model of rice farmers in Kano State. From the results, age of rice farmers negatively significant at 10% level. Hence, a unit rise in the age of rice farmer would increase rice yield by 8%. Implying that as the age of farmer increases, productivity of rice farming increases. The result could be related to the fact that most of the rice farmers are within the age bracket below 20 to 39 years (65.5%); as reported by Tanko et al. (2019a) that most of the respondents are within the economically active group with a future young rice farmers' prospect. Though, the result is contrary to Tanko et al. (2019b) who reported that older rice farmers are inefficient compared to younger ones.

The results further show that experience in rice farming is negatively significant at 5% level. The result is in consonance with Khanal et al. (2018) who posited that skilled farmers are more successful and adapt to modern farming techniques compared to less experience farmers. There are more experience rice farmers in the study area as 77.6% spent more than 6 years in rice farming. This could be linked to farmers adapting modern techniques of rice farming in the study area as the rudimentary method yields lower output. Thus, a unit surge in rice farmers' experience would raise rice productivity by 15%. Also, Access to extensions by rice farmers is negatively significant at 1% level. The results imply that, a unit rise access to extension services improves the productivity of rice farmers by 36%. As reported by Tanko et al. (2019b) that, access to extensions upsurge the productivity of rice farmers.

Table 5: Inefficiency results on access to credit by rice farmers in Kano

Variable	Coefficient	P-value	Std. Dev.
Constant	-0.025	-0.16	0.152
Age	-0.080*	-1.8	0.043
Qualification	0.013	0.29	0.046
Experience	-0.151**	-2.38	0.063
Access to fertiliser	-0.043	-0.44	0.099
Access to improved seed	-0.109	-1.10	0.098
Access to extensions	-0.365***	-3.63	0.101

Source: Field survey 2020

5. Conclusion and Recommendations

The research would help agricultural planners in developing policies to increase rice production for food security in Nigeria and Kano state in particular. Such policies may include; government to partner with private sector in facilitating suitable credit access to rice farmers. Review of interest rates is necessary in addition to the existing support provided under the Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL). Government should give priority to the training needs of small-holder rice farmers to improve the level of their knowledge. Finally, the research adds to the existing literature. Hence, access to credit, skills acquisition training, and access to modern rice inputs would lead to an increase in rice productivity.

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