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The Determinants of Rice Farmers' Productivity in Ekiti State, Nigeria

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ABSTRACT

The issue of low productivity of the Nigerian farmers is becoming topical particularly in rice production. Rice is an annual crop and one of the most important staple food crops in Nigeria. Since the mid-1970, the demand for rice has been increasing at a much faster rate in Nigeria than in any other African country.

This paper therefore examines the factors affecting rice farmers' productivity as well as constraints limiting rice production in Ekiti State, Nigeria. Primary data was used for this study with the aid of a well-designed questionnaire to collect data from 160 randomly selected rice farmers. A multi-stage random sampling procedure was used in selecting the respondents. Three major rice-producing Local Government Areas (LGAs) were purposively selected from the State, followed by the random selection of two villages from each LGA. In all, 160 rice farmers were randomly selected from six villages. The objectives were analysed using descriptive statistics, OLS regression and Likert-type scale.

The results showed that the linear functional form gave the best line of fit. R^2 value was about 77% and statistically significant at 1% level. Farm size, level of education and quantity of fertilizer were positively and significantly related to productivity at 1% and 10% respectively, while years of farming experience and quantity of seeds used were negatively significant at 10% and 1% respectively. Pest infestations and financial constraints were ranked as the most challenging factors limiting rice production in the study area.

It is therefore recommended that extension services should be intensified in the area to educate the farmers on the appropriate application rate of fertilizer and seed rate per hectare. In addition, the relevant research institutes should develop a technology for controlling or preventing birds' infestations in the area.

Keywords: Rice, Productivity, Constraint, Regression and Likert-type Scale.

1.0 INTRODUCTION

Productivity is generally defined as the level of output in relation to levels of resources employed in a given period of time. It is the rates of flow of output when compared with rates of flow of resources such as land inputs used in production (Oyaide, 1994). Rice is an annual crop and one of the most important staple food crops in Nigeria. Commercially, the crop is the most important cereal after wheat. It is widely consumed and there is hardly any country in the world where it is not utilized in one form or the other (Omofonwan and Kadiri, 2007). In 2003, Africa produced about 15.08 million tons of paddy rice on 10.23 million ha (FAO, 2000 and 2003) while Nigeria was in same period the highest rice producer in West Africa, producing an average of 3.2 million tons of paddy rice or 2.0 million tons of milled rice (Daramola, 2005). West Africa accounts for 70.4% (approx. 8.74 million ha) of rice area, in Africa. The major contributing countries in this region are Nigeria (47.9%), Guinea (5.20%), Côte d'Ivoire (5%) and Mali (4%). East Africa accounts for 16.1% of rice area. The major contributing countries are Tanzania (6.0%) and Madagascar (3.19%). Central and Southern African countries account for about 7.5% of rice area. The major contributing countries are Democratic Republic of the Congo (4.05%) and in Mozambique, it is 1.8% (Norman and Otoo, 2003). The demand for rice has been increasing at a much faster rate in Nigeria than in any other African country, since the mid 1970 (FAO, 2001).

Although rice production has increased during the last two decades in Nigeria, the country's production capacity is far below the national requirement. Nigeria's inability to meet her rice consumption needs through local production has resulted in high cash outlays for importation (Fakayode, 2009). Among the explanations for SSA's poor agricultural performance has been its slow adoption and low usage rates of agricultural technologies such as inorganic fertilizers and improved seeds. Hence, the nation depends on the international markets to fill the demand-supply gap at a colossal amount of foreign exchange as a result of low productivity in the local production of rice. The

major constraint to domestic production of rice in Nigeria is connected to poor resource utilization, environmental and institutional factors. Rice farmers in Nigeria are not getting maximum returns from the resources committed to their enterprises leading to a decline in per capita food production (Okoruwa et al, 2006). Its production has also mainly been in the hands of small-scale resource poor farmers who depend heavily on the use of traditional technologies, which result in low productivity. There has been a low level of improved farm inputs usage among the small-scale farmers. This could be as a result of high cost of inputs, diversion of subsidized farm inputs, soil degradation, annual bush burning which destroys the soil organic matter, land issues, lack of capital, neglect of agricultural sector, inadequate extension agents, market failures, insufficient technical-know-how in the area of fertilizer application and improved seeds among others. All these and more have resulted in low agricultural productivity and farm incomes thus, making it increasingly difficult for the country to achieve self-sufficiency in food production and in meeting the first goal of the Millennium Development Goals (MDGs) which was to eradicate extreme poverty and hunger by 2015 (FEPSAN, 2012). Although Nigeria is blessed with vast land and other resources suitable to produce enough rice for her population, the low productivity of the Nigerian rice farmers has constrained her rice sufficiency efforts.

Fakayode (2009) looked at Technical Efficiency and Factor Productivity in Upland and Lowland Rice Production Systems in Kwara State, Nigeria while Mbam and Edeh (2011) carried out research on the determinants of farm productivity among small-holder rice farmers in Anambra State. There is therefore dearth of literatures on the factors limiting rice production in this study area which is one of the largest rice-producing areas in the South-western part of Nigeria. Hence, this study examines the factors affecting rice farmers' productivity as well as the challenges limiting the rice production in the study area. Addressing at least most of these challenges would be a step towards improving productivity of farmers in this area. This paper is summarized in the following sections: Materials and method, results and discussions, conclusion and policy recommendations.

2.0 MATERIALS AND METHOD

2.1 The Study Area

The study was carried out in Ekiti State. It is one of the South-Western States created in 1996. The State was cut out of the former Ondo State. Ekiti had twelve Local Government Areas before its creation but four more Local Government Areas were created, now giving a total number of sixteen. Ekiti State is located between latitudes 7025' and 8005'N and between longitude 4045' and 5'46N East. Ekiti State is a landlocked State; having no coastal boundary. The main occupation of Ekiti people is farming; producing crops such as yam, maize, cassava, rice, palm oil, and some vegetables.

2.2 Sampling Technique

Primary data was used for this research and a multi-stage sampling technique was used to select representative rice farming households for this study. The first stage was the purposive selection of the State from the highest rice-producing States in the South-West, Nigeria. The second stage was the random selection of three Local Government Areas (Gbonyin, Ifelodun/Irepodun and Ijero) from about five major rice-producing LGAs in the State. The third stage was the random selection of rice farming households in the villages of the Local Government Areas selected. Two villages were selected randomly in each Local Government Area; making a total of six villages. In all, a total of 160 questionnaires were administered, collected and used for the analysis. Thirty (30) respondents were interviewed in Aisegba, Ikoro and Igbemo each while twenty-five (25) respondents were interviewed in Iluomoba and Iroko each and twenty (20) respondents in Afao. This was done based on the proportion of rice farmers in each village based on the instruction given by an Agricultural Development Programme (ADP) officer in the State. The respondents cooperatively partook in this interview.

2.3 Analytical Technique

This study aims at examining and explaining those factors that determine the rice farmers' productivity and constraints limiting rice production in the study area. Productivity in this study as conceptualized by Coelli (1996) is the ratio of total revenue (product of the quantity produced and the unit price) to the total input cost. The higher the ratio, the more productive the farmer is and the more efficient he is in the use or allocation of the factors of production. The productivity of the rice farmers is therefore a measure of their economic performance.

2.4 Factors Affecting Productivity

The determinants of rice farmers' productivity were modelled on socio-economic and farm characteristics. Data collected were analysed using the Ordinary Least Squares multiple regression analysis. In line with the use of the Ordinary Least Squares regression (OLSR) technique and as used by Fakayode (2009), four functional forms (Linear, Double-log, Exponential and Semi-log) were fitted to the data. The equation that gave the 'best fit' was then selected as the lead equation based on its conformity with the a priori expectations (expected signs of the estimators, the magnitude of the coefficient of multiple determination (R^2), and the statistical significance of the parameter estimates). The four functional forms model are explicitly described thus:

Linear function:

$$Y= \beta_0 + \beta_1 X_1 + \beta_2 X_2 +\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \beta_n X_n + \varepsilon \qquad (1)$$

Semi-log function:

$$Y= \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 +\ldots\ldots\ldots\ldots\ldots\ldots+ \beta_n \ln X_n + \varepsilon \qquad (2)$$

Double –log function:

$$\ln Y= \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 +\ldots\ldots\ldots\ldots\ldots\ldots+ \beta_n \ln X_n + \varepsilon \qquad (3)$$

Exponential function:
$$\ln Y= \beta_0 + \beta_1 X_1 + \beta_2 X_2 +\ldots\ldots\ldots\ldots\ldots\ldots+ \beta_n X_n + \varepsilon \qquad (4)$$

Where:
Y_i = TFP of ith individual farmer
X_1 = Age of the farmers (years)
X_2 = Gender (male=1 or female=0)
X_3 = Level of education (yrs)
X_4 =Household size (number)
X_5 = Farming experience (years)
X_6 = Association (member=1, otherwise =0)
X_7 = Farm size (ha)
X_8 = Contact with extension agents (yes=1, no=0)
X_9 = Quantity of fertilizer (kg)
X_{10} = Quantity of seed used (kg)
X_{11} = Cost of labour (₦)
β_i= parameters to be estimated
$\in$ = Stochastic error term

2.5 Likert Scale

This was used to analyze, identify and rank the challenges limiting rice production activity in the area as adopted by Matanmi et al (2011). A Likert scale is a psychometric scale commonly involved in research based on survey questionnaires. The range of Likert scale captures the intensity of their feelings for a given item (Likert, 1932). After the data was collected with the aid of questionnaires, each Likert scale item was analyzed separately and summed up to create a score for a group of items. It was measured on a four-point Likert scale type: "Not a problem," "Minor problem," "Moderate problem," and "Serious problem." respectively. The attributes were drawn and their scale values were specified as follows:

Level of Challenges	Score
Serious problem (SP)	4
Moderate problem (M$_o$P)	3
Minor problem (MP)	2
Not a problem (NP)	1

3.0 RESULTS AND DISCUSSIONS

3.1 The Socio-economic Characteristics of Rice Farmers

Table 1 shows that majority (40.7%) of the respondents fell within 41-50 years of age followed by the age interval of 51-60 years. The least age percentage fell in the range greater than 60 years. The average age of the respondents sampled was about 46 years. This implies that majority of these respondents were still energetic and in their productive age which is good for the labour-intensive type of agriculture we practise in Nigeria and it is also energy-sapping. There is tendency for younger farmers to operate more efficiently than the older ones. Little wonder, the aged ones could not involve much in rice production due to its energy-sapping and time-consuming nature. This finding is in line with that of Mustapha, et al. (2012) carried out in Borno State and Matanmi et al (2011) in Patigi LGA in Kwara State.

It further reveals that majority (73.1%) of the rice farmers were men while 26.9 percent of the respondents were women. This suggests that male farmers dominate rice farming in the area probably due to its nature of intense and time-consuming activities or because women are more engaged in non-farm activities and domestic chores than their male counterpart. This supports the findings of Mustapha, et al., (2012) and Matanmi et al (2011). Ayoola et al. (2011) also opined that women are more involved in reproductive and domestic responsibilities such as care of children and keeping the home-front. This could impinge on their time and mobility which would reduce their involvement in rice production although they could be more involved in the processing and marketing sections of the farm enterprise.

About 88.0 percent of the respondents were married, while about 12 percent of them were unmarried. This implies that the married are more involved in rice production than their unmarried counterparts. This suggests that majority of the respondents had stable family which would enrich decision-making process especially in agricultural production and domestic responsibilities. This conforms to the findings of Ayoola, et al. (2011) and Matanmi (2011).

About 70 percent of the respondents had a household size of 6-10 members which was fairly large though good for farm family labour. 23.9 percent had within 1-5 household size, 6.3 percent had within 11-15 household members and only 0.6 percent had above 15 household members. This result strengthens the findings of Mustapha et al., (2012) in which the majority of the household size fell within 6-10 members. The mean household size was 7 persons. According to Olumba (2014) citing Onu (2005), 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 look at large household size as a good and economical way of maximizing farm returns by using family labour.

43.1 percent, 34.4 percent, 8.8 percent and 5.0 percent of the respondents had primary (6 years), senior secondary (12 years), junior secondary (9 yrs) and tertiary level of education (16yrs or above) respectively. Only 8.8 percent did not have any formal education; this shows that majority of the rice farmers in the study area had spent at least 6 years in formal education. The average number of years spent in formal education by the respondents was 8 years. This suggests that they were literate and this could enhance their level of understanding and desirability of adopting new farm technologies or interacting well with extension agents. This result does not conform to the findings of Mustapha et al., (2011) done in Pategi, Kwara State in which about 39% of the rice farmers had only adult education with very low formal education. However, it supports the findings of Olumba (2014) in a research carried out in Anambra State, where majority of the farmers had primary level of education.

Majority (68.1%) of the respondents were predominantly farmers while 31.9 percent of others engaged in one form of non-farming activities or the other such as civil service, trading, and commercial motorcycling among others. This supports the findings of Ayoola et al (2011), and Olumba (2014) carried out in Anambra State and this finding is objectively in line with the notion that rural dwellers are predominantly farmers.

Most of the respondents (36.9%) planted both (improved and local) rice varieties together in a season, 33.1% planted local rice variety while 30.0% of the respondents planted improved rice variety. This suggests that the rice farmers in the study area are still holding on to their local variety despite the availability of improved variety.

Majority (50.0%) of the farmers cultivated 1-3 hectares of rice farm. This implies that most of the respondents are small scale rice farmers. This corresponds with the findings of Mustapha et al., (2012) and Fakayode (2009) in which majority (61.25%) of the respondents of that study had 1-3 hectares of rice farms. 9.3 percent and 33.0 percent cultivated below 1.0 hectare and 4-6 hectares. 1.6 percent of the respondents cultivated above 10 hectares of rice farmlands.

Table 1: Socio-economic Characteristics of Rice Farmers

Characteristics	Frequency	Percentage
Age (yrs)		
21-30	13	8.2
31-40	33	20.7
41-50	65	40.7
51-60	39	24.2
>60	10	6.2
Total	160	100.0
Mean	45.9	
Gender		
Male	117	73.1
Female	43	26.9
Total	160	100.0
Marital Status		
Married	140	87.5
Otherwise	20	12.5
Total	160	100.0
Household Size		
1-5	38	23.9
6-10	111	69.5
11-15	10	6.3
>15	1	0.6
Total	160	100.0
Mean	6.8	
Level of Education (yrs)		
No formal education	14	8.8
Primary	69	43.1
Junior Secondary	14	8.8
Senior secondary	55	34.4
Tertiary	8	5.0
Total	160	100.0
Mean (yrs)	8	
Occupation		
Farming	109	68.1
Non-farming	51	31.9
Total	160	100.0
Rice Variety		
Improved	48	30.0
Local	53	33.1
Improved and local	59	36.9
Total	160	100.0
Farm size (ha)		
<1.0	15	9.3
1.1-3.0	80	50.0
4.0-6.0	53	33.0
7.0-10.0	10	6.2
>10.0	2	1.6
Total	160	100.0
Mean (ha)	3.5	

Source: Field Survey, 2014.

3.2 The Determinants of Productivity among the Rice Farmers

Table 2 shows the results of the multiple regression analysis on the determinants of productivity of rice farmers (respondents) in Ekiti State. Based on the magnitude of the coefficient of multiple determination (R^2), the size and signs of the parameter estimates, as well as their statistical significance, the linear function was chosen as the lead equation and the F-statistics was significant at 1% meaning that the explanatory variables were well fitted into the model. The linear equation was used for further analysis of the data. The coefficient of determination (R^2) of 0.77 implies that about 77 percent of the variations in productivity were explained by the joint action of the explanatory variables included in the model.

Age was positively related to productivity. This implies that an increase in age of the respondents would lead to an increase in productivity. The increase in age could make them to have had a mastery of the rice production activity in the aspect of management and resource utilization. This opposes the findings of Adeoti (2002) and Obasi et al (2013) which found that age has negative influence on productivity.

Educational level was positively and significantly related to productivity as expected. This implies that as the number of years spent in formal education increases, it makes the rice farmers more productive. This suggests that higher literacy level influenced the rice farmers' productivity positively in the study area. This conforms to the findings of Kehinde (2005) and Idjesa (2007) which found that education was key to enhanced productivity among farming households in the humid forest, dry savannah and moist savannah agro-ecological zones of Nigeria.

Farm size was significantly and positively related to productivity in the area. This indicates that as the size of the farm increases, the productivity of the rice farmers in the area increases. This suggests that the bigger a rice farm, the higher the productivity. This is in line with the results of Ajibefun et al (2002) which showed that large farm size enhanced productivity among farmers in the dry savannah and humid forest agro-ecological zones of Nigeria. However, the results from Oni et al., (2009) showed that there is an inverse relationship between farm area and crop productivity.

As expected, contact with extension agents had positive relationship with productivity. This suggests that rice farmers experienced higher productivity as more contacts were made with extension agents/ services in the study area. This confirms the studies of Adewuyi (2002), Ajani (2000), Amaza (2000) and Awotide (2004) which reported that extension services enhanced farmers' productivity in the humid forest and dry savannah agro-ecological zones of Nigeria.

Quantity of fertilizer used had positive relationship with productivity among the rice farmers in the area. This implies that the higher the use of fertilizer, the more productive the rice farmers become. This suggests that when the rice farmers adopt and utilize the fertilizer appropriately, it would lead to improved productivity. This supports the findings of Ogundele and Okoruwa (2006) which observed that the use of fertilizer increased agricultural productivity of crop farming in the dry savannah and humid forest agro-ecological zones of Nigeria.

The cost of labour had positive relationship with productivity. This implies that as cost of labour increases, the farmers' productivity increases in the study area. This confirms the studies of Ajibefun and Abdulkadri (2004), Ajibefun et al, (2002), and Ogundele and Okoruwa (2006) which showed that hired labour contributed positively to farm productivity.

On the other hand, Gender was negatively related to productivity. This supports the findings of Odii (1992) who offered evidence of gender differentials in agricultural productivity in Nigeria with women's lower productivity arising from their weak bargaining position within the family and in the labour market. In the same vein, household size also had a negative relationship with productivity. This implies that a unit increase in the household size decreases productivity of the rice farmers. This suggests that larger households will have more people for labour and hence, the more they are, the less work they have to do.

Farming experience was negatively related to productivity. This opposes the a priori expectation which suggests that as farming experience increases, the productivity of farmers also increases. In this study, the reverse is the case and it opposes the studies of Idjesa (2007) and Obasi et al., (2013) in which they observed that productivity in the humid forest and moist savannah agro-ecological zones of Nigeria was positively associated with the number of years in farming.

Quantity of seed and herbicide used were inversely related to productivity. This implies that increase in the level of use of these inputs would lead to decrease in the productivity of the rice farmers in the area. This could be as a result of misapplication or misuse of these resources. This supports the findings of Obasi et al., (2013) where they observed that quantity of seed sown was inversely related with productivity.

Table 2: OLS Regression Estimates for Determinants of Productivity among Rice Farmers

Variable	Linear (+)	Semi-Log	Double-log	Exponential
Constant	-263334 (204232.7)	9.8369 (0.9331)	17.1895 (4.5960)	-2798732 (2001425)
Age (yrs)	3613.16 (3782.586)	-0.00899 (0.0173)	-0.018 (0.0152)	-15944.44 (6600.145)
Gender	-69273.60 (65916.68)	0.0062 (0.3012)	0.0492 (0.2668)	60844.16 (116171)
level of education (years)	14873.22* (8237.776)	0.0242 (0.0376)	0.0148 (0.0332)	1.83E+04 (1.44E+04)
Household size	-9156.65 (13868.55)	0.0512 (0.0634)	0.0650 (0.0531)	29257.30 (23163.22)
Farming experience (Years)	-6877.12* (3968.337)	-0.0059 (0.0181)	-2.44E-02 (1.63E-02)	-4779.91 (7114.31)
Member of association	-10495.40 (84297.41)	1.7434*** (0.3852)	0.9334** (0.3654)	26320.37 (159123.8)
Farm size (ha)	135009.40*** (25419.77)	0.1577 (0.1161)	0.7669** (0.3655)	64408.39 (159180.8)
Contact with extension agents	34852.48 (71356.81)	0.3709 (0.3260)	0.1250 (0.2866)	-16693 (124823.8)
Quantity of fertilizer (kg)	7417.17* (4155.911)	0.0253 (0.0189)	-0.2954 (0.2472)	-135400 (107632.1)
Quantity of seed (kg)	-14806.10*** (2378.354)	-0.1186*** (0.0109)	-0.0447 (0.3359)	59583.5 (146277.3)
Total cost of labour (₦)	0.74*** (0.1209117)	5.52E-07 (1.28E-07)	-0.4832* (0.2502)	332867.8*** (108386.4)
Number of observation	160.00	160.00	160.00	160.00
F(17 , 124)	47.52	21.63	30.89	10.92
Prob>F	0.0000	0.0000	0.0000	0.0000
R^2	0.7664	0.5478	0.6090	0.4996
Adjusted R^2	0.7481	0.5132	0.5828	0.4447

Source: Data Analysis, 2014.
Note: Figures in parenthesis are standard errors
Note: + = Lead equation
Note: *, **, and * are significant at 10%, 5% and 1% levels respectively**

3.3 Constraints to Rice Production

The Table 3 reveals that pest (birds and grasscutter) infestations and inadequate funds (in form of credit access) were ranked as foremost constraints limiting rice production in the study area based on their weighted score. This is followed by labour availability, cost of labour, and cost of other inputs respectively. The problem of pest infestation has made the rice farmers to have sleepless nights particularly during rice-flowering period till maturity time. It has made many rice farmers in some of the villages to quit rice production due to the stress of chasing birds from dawn to dusk. The inadequacy of funds deprived the rice farmers the privilege to capitalise their farm enterprises. The high

cost of labour and its scarcity at peaks of farm work during the farming season was also a major constraint facing the rice farmers in the area. Labour as a problem perhaps explains why respondents cultivate small plots of rice. The least of the challenges considered by the respondents were adulterated fertilizer, flooding and market access respectively. This conforms to the findings of Fakayode (2009) where inadequate funds was considered as the greatest challenge limiting rice production and flooding was considered as the least challenge limiting (especially lowland) rice production in Kwara State, Nigeria.

Table 3: Ranking Constraints Limiting Rice Production

Constraints/Problems	Weighted Score	Ranking
Flooding	1.04	11th
Pest infestation	3.98	1st
Market access	1.11	10th
Adulterated fertilizer	1.00	12th
Adulterated seed	1.51	9th
Milling/Processing	2.18	7th
Feeder-road	2.40	6th
Drought	1.88	8th
Credit access	3.54	2nd
Labour availability	2.89	3rd
Labour cost	2.61	4th
Cost of input	2.54	5th

Source: Authors' Computation, 2014.

4.0 CONCLUSION

It is evident that increasing these variables (farm size, quantity of fertilizer used, level of education, cost of labour and transportation) at their present levels would lead to increased productivity whereas, the increase in the present level of quantity of seeds used would decrease productivity and vice versa. Their farming experience was at variance with the a priori expectation; implying that increase in the year of farming experience does not necessarily translate to improved farm productivity. Finally, pest (birds and grasscutter) infestations and financial constraints were ranked as the first and second respectively, the most challenging factors limiting rice production in the study area.

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