



## **ANALYSIS OF THE RESPONSIVENESS OF RICE HECTARAGE TO COMMERCIAL AGRICULTURE LOAN IN NIGERIA FROM 1966 - 2015**

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### **ABSTRACT**

This study examined the responsiveness of rice hectareage to commercial agriculture loan in Nigeria from 1966 to 2015 using time series data. The Augmented-Dickey Fuller test was used to test the stationarity of the individual series. The bounds testing were used as a precursor to the application of Autoregressive Distributed Lags (ARDL) to estimate the short-run and long-run elasticities of rice hectareage response to commercial agriculture loan. The empirical results revealed that effect of commercial agriculture loan on rice hectareage was insignificant and inelastic both in the short run (-0.11) and long run (-0.10), an evidence that rice hectareage was not responsive to commercial agriculture loan both in the short-run and long-run. The study concludes that commercial agriculture loan did not make impact on rice hectareage both in the long run and short run. Therefore, the study recommends that government should review its Land Use Act of 1978 to enable producers have more access to land for rice cultivation. Also, the government should increase the amount of loanable funds to ease the ability of farmers to procure all the necessary inputs and make the fund readily and promptly available.

**Keywords:** Agriculture, Hectareage, Loan, Nigeria, Responsiveness, Rice.

### **INTRODUCTION**

The problem of farmers not having sufficient access to hectareage for sustainable agriculture in Nigeria has not been addressed, following gross agricultural underproduction dominated by small scale farmers. There are copious studies revealing inaccessibility to arable land for agricultural purpose as one of the major challenges confronting farmers in Nigeria and also impeding progress to food security goal (Akinsola and Oladele, 2004; Nwajiuba, 2012; Adefeko, 2018). It then implies that most of the farmers operate on fragmented holdings, which makes it a far cry for the nation to attain self-sufficiency in rice production.

Rice (*Oryza sativa*) is the staple food for majority of the world's population, especially in developing nations. Rice is the most popular staple food in the Nigeria, and the world's second popular crop after maize (Boansi, 2013). Annually, Nigerians consume around six million tons of rice, which can be produced locally, but the country is still far from achieving this due to the sector and spending at least \$5m daily in the last few years on importation of rice from Thailand, among other rice producing countries (Akinfenwa *et al.*, 2017). Rice can thrive virtually in all ecological zones of Nigeria, but vary in prospects from one location to the other. Development of the local rice production industry in Nigeria as accounted by Daramola (2005) are inhibited by several factors including high cost of inputs like credit, imported equipment and agrochemicals due to taxes, high transportation costs, absence of extension advice, low mechanization of rice farms, scarcity of labor due to alternative (and more remunerative) off-farm employment opportunities and due to rural-urban migration, land tenure system (which mostly limit size of holdings and investment in land improvement), high cost of land preparation and the broad use of genetically inferior (unimproved) varieties that exhibit low productivity.



The challenge confronting farmers in the context of accessibility to hectareage for agricultural purpose has been one of the fundamental issues impeding rice output in Nigeria, though Ricepedia (Global Rice Science Partnership, 2013), reveal that expansion of land under cultivation for rice has increased by over 30% in the last decade, which has been the main driver of increases in rice output. However, this is not enough considering the increasing population of the nation and the urgent need to be self-sufficient in rice production. According to PWC (2017), the area under rice cultivation expanded from about 2.4 million harvested hectares in 2010 to 3.2 million harvested hectares in 2017 being the highest in the last 5 years. Though this is commendable, but still has a long way to go when compares to The United States of America (USA). The USA tops the lead as the 12th largest rice producer, which accounts for 8% of global rice exports. In 2017, USA produced 5.67 million tonnes and exported 3.37 million tonnes of rice, by engaging hectareage of 0.97 million hectares (USDA and PwC Analysis, 2017) adding that this is 30% of Nigeria's hectareage. This disparity according to PWC (2017) is reflected in the fragmented holdings characterized by small holders' farmers dominating the Nigeria's rice industry accounting for 80% of land holdings with an average farm size of 1.33 hectares.

In Nigeria, the rice production mainly dominance by small-holder producers ranges between 1-2 hectares has been a perennial issue and farmers are constrained to exploit any benefit associated with economies of scale. The small sizes of farms obviously impede the capacity of farmers to mechanize or modernize their production and make efficient use of available labor (obtained at relatively high cost due to alternative off-farm employments which are as well more remunerative). Increasing area cultivated of rice, will therefore pave room for farmers to exploit economies of scale and make optimum use of labor available to them (Akinfenwa *et al.*, 2017).

The essential inputs necessary for the advancement of the agricultural sector identified over the years is agricultural credit (Central Bank of Nigeria [CBN], 2005). Loan availability to farmers therefore becomes highly essential to the sustenance of the agricultural sector in Nigeria. The Federal Government of Nigeria via her policy instrument has intervened in providing loan to farmers as a means to assist them carry out farming activities, by the establishment of agricultural credit schemes in order to finance the sector. CBN (2004) and Federal Ministry of Agriculture and Water Resource [FMAandWR] (2009) identify four key objectives of the scheme as to stimulate development of the agricultural sector of the Nigerian economy by providing credit facilities to commercial agricultural enterprises at a single digit interest rate. To foster national food security by increasing food supply and effecting lower agricultural produce and product prices, by so doing diminish inflation. To reduce the cost of credit in agricultural production to empower farmers to take advantage of the potentials of the sector and finally to surge output, create employment opportunities, diversify the revenue base, increase foreign exchange earnings and provide input for the industrial sector on a sustainable basis. Some of these agricultural credit schemes include Commercial Agricultural Credit Scheme (CACS), Nigerian Agricultural and Cooperative Bank (NACB), Agricultural Credit Guarantee Scheme Fund (ACGSF), and Nigerian Incentive-based Risk Sharing for Agricultural Lending (NIRSAL). This has empowered farmers in one way or the other.

The question is how hectareage has responded to commercial agriculture loan in Nigeria over the years. Despite the much-vaunted interventions by the Federal Government towards attaining self-sufficiency in rice production, it appears as if more is left to be desired. Against this backdrop, this study examines the effects of commercial loan to agriculture on rice hectareage in Nigeria from 1966 to 2015.



Abu *et al.* (2015) examined acreage response of Soybeans to price in Nigeria. Augmented Dickey Fuller (ADF) test and the Johansen co-integration technique were employed to test for the stationarity of the variables and the long-run relationship between variables respectively. Results indicate the presence of one co integrating long run equilibrium relationship between the variables. The Vector Error Correction Model (VECM) estimates showed that soybean price had a negative influence on the area harvested. Suggesting that a decrease in soybean price will result in reduction in area cultivated, leading to a decrease in profit and a decrease in profit gives disincentive to farmers to produce more.

Mairiga (2014) examined Hectarage Response of Some Selected Cereal Crops to Price and Non-Price Factors in Nigeria (1983-2008). Estimation was carried out using the Heteroskedasticity and Autocorrelation Consistent Covariance Estimator. Results of maize response function showed that, own price and yield were significant at 10%, lagged hectarage was significant at 1%; while yield of sorghum was significant at 5%. On the other hand, results of sorghum response function showed that lagged hectarage was significant at 1%, while the yield of the crop, yield of maize and weather were significant at 5% level. The major trend in this study is that lagged dependent Variable(lagged hectarage) has been found to be a significant determinant of hectarage allocation in the cultivation of the crops studied; and yield, rather than price was more important in hectarage allocation decision of farmers in Nigeria.

Kavinya and Phiri (2014) examined Maize hectarage response to price and non-price incentives in Malawi, employing Auto-regressive Distributed Lag (ARDL) model to assess the farmer's responsiveness. Results show that the important factors affecting smallholder farmers' decision to allocate land to maize included the lagged hectarage allocated to maize, availability of labour and inorganic fertilizer. Lagged maize prices and weather were found not to be statistically significant in influencing farmers' decision to allocate land to maize. The research concludes that price incentives are on their own inadequate to influence smallholder farmers' decision to allocate land to maize.

Mkpado (2010) carried out a study on Hectarage and Output responses of major crops to market liberalisation and price risk in Nigeria. Data were analysed using descriptive statistics and seemingly unrelated regression model estimation. The study covered a period of 38 years from 1970 to 2007. The descriptive statistics results showed that output of rice was the lowest among the cereals. Regression analysis showed that the coefficient of determination for hectarage and output equations accounted for about 80% and 85% of variation in hectarage and output of the majority of the crops. Price and price risks were major determinants of hectarage allocation and output of the crops. Real exchange rate had positive relationship with hectarage of yam but negative relationship with output of beans, cocoa and coffee. 10% increase in rice price will lead to about 16 and 24 % increases in its hectarage and output, respectively. Sorghum showed a similar pattern only that an increase in its output was percent, which was less than that of rice.

Lokonon and Odilon (2015) examined Acreage Response of Cotton in Benin: Macro-level Response and Some Policy Implications. Ordinary Least Squares (OLS) over the period 1971-2011. In this regards, the model is estimated using the Hendry Error Correction Model. The results revealed that, in the long run, cotton acreage depends positively and significantly on the exchange rate, total number of tractor used, and lagged real producer price of cotton seed, and negatively and significantly on lagged producer price of rice paddy. In the short run, cotton acreage is significantly driven by rural population growth, and lagged real producer price of cotton seed, and is negatively influenced by lagged producer price of rice paddy. These results suggest that Benin could improve cotton production by putting in place measures to



increase area devoted to cotton production, reduce labour shortages, eliminate inefficiencies in cotton sector management, and promote tractor use.

## MATERIALS AND METHODS

### The Study Area

The study was conducted in Nigeria. Nigeria lies between latitude 4° and 14° north of the equator and longitudes 3° and 14° east of the Greenwich Meridian. The country lies entirely within the tropical zone. It occupies about 923 773 km<sup>2</sup> (made up of 909,890 square kilometers of land area and 13,879 square kilometers of water area) (National Bureau of Statistics [NBS], 2011). According to National Population Commission (2016), Nigeria's population was currently 182 million. To the north the country is bounded by the Niger Republic and Chad; in the west by the Benin Republic, in the East by the Cameroon Republic and to the south by the Atlantic Ocean (Aregheore, 2005).

### Method of Data Collection

The econometric model for the study relies on a comprehensive database covering the period 1966–2015. The empirical model uses country-level data to estimate output, acreage, and yield responses for rice in Nigeria. Time series data in respect of yields (kg/hectare), output (kg/hectare), hectarage (hectares), Producer price of rice (Naira), producer price of wheat (Naira), Producer price of maize (Naira) were sourced from Food and Agriculture Organisation (FAO), weather variable (that is, rainfall (mm) were obtained from The World Bank., fertilizer consumption (kg), availability of labor (agricultural labor force as proxy, ("000") persons, were sourced from International Rice Research Institute (IRRI) and commercial loans to agriculture was sourced from the Central Bank of Nigeria (CBN)

### Estimation Procedure

The study applied inferential statistics in the data analysis. Augmented Dickey Fuller (ADF) test was employed to determine whether or not the variables are stationary by detecting the presence of unit root. This is followed by bound testing as a precursor to the application of Autoregressive Distributed Lags (ADRL) to achieve the objective. The study adopts (Pesaran *et al.*, 2001) model to the bounds testing procedure by a general VAR in the order of p;

$$Q_t = \alpha + \beta_t + \sum_{i=1}^p \Pi Q_{t-i} + e \quad \dots (1)$$

where;

t is time = 1,2,3.....T; Q is the dependent variable;  $\alpha$  is the vector of intercept;  $\beta$  is the coefficient of the trend;  $\Pi$  is the coefficient of the lagged form of the dependent variable Q. Pesaran *et al.* (2001) further derived vector equilibrium correction model by differencing the dependent variable and introducing another independent variable by simply differencing  $G_{t-1}$

$$\Delta Q_t = \alpha + \beta_t + \sum_{i=1}^{p\Pi Q_{t-1}} Q_t + \varphi \Delta Q_{t-1} + e \quad \dots (2)$$

where;

$\Delta$  is the difference operator (as  $\Delta Q_t = \Delta Q_t = \Delta Q_{t+1} - Q_t$ )

$\varphi$  is the coefficient of differenced lagged form of the independent variable. While  $\frac{p}{\Pi} Q_{t-1}$  and  $\varphi$  contain the long run multiplier as well as the short run dynamics coefficients of the VECM. This is specified in Equation 3 below:

$$\Delta [LnRHA]_t = \alpha + \varphi_1 [LnRPPR]_t + \varphi_2 [LnRPPW]_t + \varphi_3 [LnRPPM]_t + \varphi_4 [LnAARF]_t \quad \dots (3)$$



$\varphi$  and  $\downarrow I$  are vectors of the long run multipliers and the short run dynamics coefficients, respectively, and  $\ln$  connotes the natural logarithm.

The Equation 3 above is the first step in testing co-integration relationship between rice output and the accompanied explanatory variables. The presence of a co-integrating equation was determined by conducting a test (f test) for the joint significance of the lagged levels of variables. The direction of the relationship between domestic rice output supply response to its real price and other variables are determined by analyzing the null hypothesis of no co-integration through a joint significance test of the coefficient of lagged dependent variables. Under the null hypothesis of (no co-integration):

$$H_0 = \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = \varphi_6 = 0 \quad \dots(4)$$

$$H_0 = \varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq 0 \quad \dots(5)$$

This was followed by conducting a bound test to initiate co-integration equation. The asymptotic distribution of F-statistic obtained from bound test is non-standard regardless of the degree of integration of the variables. The F ratio estimate in the hypothesis test was set as a standard and compared against the critical values tabulated on C111 of Paseran *et al.* (2001) for a case of intercept without trend, i.e.,  $K = 7$ , where;  $K$  = number of regressors + 1. The rule is if the F Ratio is less than the lower bound, the null hypothesis of no co-integration is not rejected. On the other hand if the calculated F is greater than the upper bound, the null hypothesis of no co-integration is rejected. However, in a situation where the F ratio falls between the two bounds, such is declared inconclusive. The test was also conducted by juxtaposing the independent variables as the dependent and vice versa. Conclusion is drawn in the event that only one of the tests established a co-integrating relationship.

The co-integration and long run form of was adopted to produce an ADRL framework. Finally, the short-run elasticities associated with the long-run estimate were obtained by including the error term in an ECM from the co-integration and long run form of ARDL (1, 1, 0, 2, 1, 3, 2, 3) framework to estimate the short-run elasticities, the lag length in the ARDL was selected based on the lowest AIC.

$$\Delta[LnRHA]_t = a + \varphi \downarrow I[LnRPPR]_t + \varphi \downarrow 2[LnRPPW]_t + \varphi \downarrow 3[LnRPPM]_t + \varphi \downarrow 4[LnAARF]_t \quad \dots(6)$$

In a situation where the coefficients are the short-run dynamics elasticities of the model convergence to long run equilibrium,  $ECT_{t-1}$  is a one period lagged error correction term and  $\lambda$  is the speed of adjustment to attain equilibrium in the event of shock to the system. The study adopted the co-integration and Long run Form in the selection of the preferred ECM.

The outcome is now subjected to diverse diagnostic test, such as serial correlation LM Test, Breuche-Pagan-Godfrey heteroskedasticity Test, normality Test and structural stability (sensitivity analysis).

## RESULTS AND DISCUSSION

### Unit root test of variables used in the analysis

The unit root test as presented in Table 1 shows that rainfall (RF) is stable at level  $I(0)$ . producer price of rice (PPR), producer price of wheat (PPW), producer price of maize (PPM), rice hectareage (RHA), rice yield (RY), commercial loan to agriculture (CLA) and fertilizer consumed (FCONS) were integrated of order  $I(1)$ . Thus the variables is a mixture of  $I(0)$  and  $I(1)$  variables. Based on this combination, the ARDL analytical technique was applied via the bounds testing approach to examine the short and long run effects.





**Table 1:** Result for Unit Root Test of Variables

Variable	ADF In Levels	ADF In First Difference	Integration Order
RO	-1.253729	-8.941832***	I(1)
PPR	-2.976775	-9.337294***	I(1)
RY	-1.713355	-11.06756***	I(1)
PPW	-2.526088	-6.620830***	I(1)
PPM	-1.988887	-10.88379***	I(1)
RHA	-1.093405	-9.915511***	I(1)
CLA	-1.254203	-10.40131***	I(1)
FCONS	-2.393449	-6.307241***	I(1)
RF	-6.006146***	-6.594163	I(0)

Source: Author's computation

The unit root equation includes a constant and time trend for level series, but only includes a constant for first differenced series. \*\*\*  $P < .01$ , \*\* $P < .05$ , \* $P < .10$  (one-tailed test) based on critical values for rejection of the hypothesis of a unit root by MacKinnon (1991); where; rice output is (RO), rice hectarage is (RHA), producer price of rice is (PPR), producer price of wheat is (PPW), producer price of maize is (PPM), rainfall is (RF), commercial loan to agriculture is (CLA), fertilizer consumed is (FCONS), rice yield is (RY).

### The Bounds Testing Result for Co-integration of Variables

The critical value for the case of unrestricted intercept and restricted trend for  $k = 7$  at 1% indicates lower bound  $I(0) = 2.96$  and upper bound  $I(1) = 4.26$ . A lag of 1 for the dependent variables and a lag of 3 for the independent variables were selected. According to the results of Table 2, the F-Statistics of 6.79 when hectarage was used as dependent variable falls above the upper bound which was significant at 0.05% thus suggesting that the null hypothesis of no co-integration is rejected. This implies that a long run structural relationship exist between the variables when hectarage appear as dependent variable at 0.05%. Therefore we cannot reject the existence of long-run relationship among variables. After establishing that there is co-integration in the model, the co-integration and long run form was employed to examine the speed of adjustment and short run elasticity.

**Table 2:** Bounds Testing Results for Co-integration of Variables

Dependent variable	Hectarage
F-statistic	6.786088**
I0 Bound	2.96
I1 Bound	4.26

Source: Authors' Computation; Note: \*\* significant at 5%.

### Multiplier Effects of Commercial Agriculture on Elasticities of Rice Hectarage in Nigeria

The empirical result revealed that producer price of rice was inelastic (-0.32) and highly significant (1%). This implies that a 1% increase in the producer price of rice will reduce hectarage by 0.32% allocated to rice in the short run. The hectarage was not sufficient as many



producers were willing to venture into rice production occasioned by the good price but were constrained due to lack of hectareage for rice cultivation. This implies that good price of rice attracted increased hectareage, as producers engaged the hectareage in rice production. The outcome is in synchronization with Tchereni and Tchereni (2013) in a study in Malawi which concedes that if the price of rice is good, farmers will reduce production of maize and increase rice production by engaging more of the hectareage to rice. The result also lend credence to Kwanashie *et al.* (1998), that if the previous period price of rice was bad, farmers would rather reallocate the land to maize cultivation expecting to realise better income. Muchapondwa (2009) obtained a value of -1.19 in Zimbabwe indicating that adjustment to long run equilibrium is faster in Nigeria than in Zimbabwe. This could be attributed to better agricultural infrastructure in Nigeria compared to Zimbabwe.

In the short run producer price of maize was positive and significant. The result shows that increase in producer price of maize by 1%, will increase rice hectareage 0.4%. This implies that maize is not a substitute for rice in the context of hectareage as farmers have high preference to cultivated rice instead of maize, because it is envisaged that the better the prices in a particular year the more will be the drive offered to farmers for land resources being allocated to rice than maize. This outcome is consistent with Kwanashi *et al.* (1998), that good price of rice is a stimulus to allocating more hectareage to increasing rice production rather than maize.

Rice output was positive and highly significant at 1%, implying that a 1% increase in hectareage will increase rice output by 0.64 in the short run. This suggests that rice hectareage plays a fundamental role in increasing rice output, such that as hectareage improves, it translates into robust output. This result is very similar to the estimate obtained by (Boansi, 2013) where a unit increase of rice hectareage led to 0.3% increase in output at 5% level of significance. However there is slight deviation from Ayinde *et al.* (2014), who observed that rice output to hectareage was statistically significant with a negative coefficient (-1.5135), attributing this phenomenon to the higher the hectareage cultivated, the higher the output supply of rice production in Nigeria, emphasizing that there is need to reduce the quantity imported into the country to ensure adequate supply output in Nigeria.

The coefficient of fertilizer consumed in the short run was elastic (0.05) and insignificant but was inelastic and highly significant (5%) in the preceding year. This implies that fertilizer consumption made impact on hectareage, revealing further that producers did not have initial access to fertilizer as occasioned by high price, as such resorted to the use of inorganic fertilizer, however as they subsequently had access to commercial loan to agriculture, they were able to commit the resources into the purchase of fertilizer to stimulate output.

The elasticity of rainfall was positive (0.06) and not significant. This implies the relevance of rainfall in the short run as it contributes to rice output, however in a situation of delayed rainfall; producers reverted to the use of irrigation as an alternative. This outcome is in consonance to (Akanni and Okeowo, 2013) in their study revealed that favorable weather and increase in hectareage are critical to raising the output supply of crop. Ogazi (2009) unveiled that rainfall is often one of the most important variables influencing yield and production of a given crop in sub-Sahara Africa countries, adding that in as much as rice farmers respond to prices, exogenous variables such as rainfall and other weather do have a daunting influence on yield



**Table 3:** Short and Long-run Elasticities of Rice Hectarage Response in Nigeria, 1966-2016

Variable	Coefficient	Std. Error	t-Statistic
<b>Short Run Coefficient</b>			
D(LOGPPR)	-0.317***	0.079	-4.030
D(LOGPPW)	-0.075	0.045	-1.677
D(LOGPPM (-1))	-0.144	0.062	-2.338
D(LOGRO)	0.640***	0.073	8.791
D(LOGCLA)	-0.110	0.063	-1.755
D(LOGCLA(-1))	0.136	0.072	1.879
D(LOGCLA(-2))	-0.064	0.030	-2.125
D(LOGFCONS)	0.053	0.052	1.019
D(LOGFCONS(-1))	-0.189**	0.055	-3.413
D(LOGRF)	0.063	0.147	0.427
D(LOGRF(-1))	-0.219	0.161	-1.361
D(LOGRF(-2))	-0.352	0.169	-2.087
ECM(-1)	-1.028***	0.147	-6.976
<b>Long Run Coefficients</b>			
Variable	Coefficient	Std. Error	t-Statistic
LOGPPR	-0.461***	0.084	-5.500
LOGPPW	-0.073	0.045	-1.629
LOGPPM	0.856***	0.118	7.252
LOGRO	0.781***	0.056	13.894
LOGCLA	-0.099	0.043	-2.320
LOGFCONS	0.115	0.052	2.229
LOGRF	0.832*	0.273	3.052
C	-2.769	1.264	-2.190
R-squared	0.897019	Mean dependent var	0.052542
Adjusted R-squared	0.817803	S.D. dependent var	0.189099
S.E. of regression	0.080716	Akaike info criterion	-1.894194
Sum squared resid.	0.169392	Schwarz criterion	-1.067532
Log likelihood	65.51356	Hannan-Quinn criter.	-1.583116
F-statistic	11.32370	Durbin-Watson stat	2.233362
Prob (F-statistic)	0.000000		

Source: Compiled from result print out of E-Views 9 Output.

**Note:** All variables are lagged. The dependent variable is also lagged. Dependent variable is yield of rice planted in hectare; the estimates are significant at \* = 10%, \*\* = 5%, and \*\*\* = 1%, respectively. Where- Rice output is (RO), Rice Hectarage is (RHA), Producer Price of Rice is (PPR), Producer Price of Wheat is (PPW), Producer Price of Maize is (PPM), Rainfall is (RF), Commercial Loan to Agriculture is (CLA), Fertilizer Consumed is (FCONS), and Rice Yield is (RY).

The commercial loan to agriculture was not significant and shows a negative elasticity (-0.11) to hectarage. This implies that the effect of the loan was not responsive to increased hectarage in the short run revealing that producers did not initially have access to commercial





loan to agriculture to enable them increase hectareage that will translate into increased output. It is pertinent to mention also that not having access to such funds as at when due will impede the acquisition of hectareage that is expected to guaranty a robust output. On this premise, the null hypothesis that there is no relationship between commercial loan to agriculture and rice hectareage in the short run in Nigeria is not rejected because it was not significant. Kwanashie *et al.* (1998) commented that loans for agriculture had positive effects on rice production.

The estimated outcome of regression result shows that the coefficient of lagged producer price of rice (-0.461167) has a negative sign and it is significant with respect to lagged hectareage. This shows that the required hectareage to obtain maximum price of rice has not been attained. This emphasizes that previous price of rice affects hectareage negatively and significantly at 1% in the long run, implying that a 1% rise in lagged producer price of rice will diminish hectareage by 0.46%. Lopez (1986) obtained values of 0.296 and 0.58 respectively. Similarly, Ogazi, (2009) found long run elasticity for area under rice production in Nigeria. However, Muchapondwa (2009) found price to be inelastic for aggregate agricultural production in Zimbabwe.

Producer price of maize affects hectareage positively and significantly at 1% levels. This shows that increase in producer price of maize by 1% will increase rice hectareage by 0.9% in the long run. This implies maize is not a substitute for rice when hectareage is being considered. If the price of rice is better than the producer price of maize, farmers will prefer to allocate more hectareage to rice instead of maize. This is in tandem to Ogazi (2009) with a view that any increase in real price of rice will attract producer to channel resources to produce rice rather than maize and vice versa.

A positive and highly significant (1%) relationship exists between rice output and rice hectareage in the long run. A 10% increase of rice hectareage will increase rice output by 7.8%; this is above 5.6 estimates given by FAO. The positive relationship between the output and hectareage implied that extensive farming was practiced. The result alludes to a study by Rahji and Adewunmi (2008), who obtained an elasticity of 1.5779 with a view that local rice has a strong tendency to continue to be cultivated in spite of price-cost conditions.

Furthermore, the result showed that lagged commercial loan to agriculture was negative and statistically insignificant. This indicates that lagged commercial loan to agriculture do not influence farmers' decision in terms of the amount of hectareage allocated to rice in the long run. This also reveals that the loan obtained has not significantly resulted in increased hectareage to impact on rice; it also implies that the amount of loan obtained was not sufficient enough to acquire more hectareage to impact positively on rice. On this premise therefore, the null hypothesis that there is no relationship between hectareage and commercial loan to agriculture in the long run could not be rejected at 5% level of significance. Arene (1996) has emphasized that fund or micro credit was essential for increasing the level of operation of small-scale farmers in Nigeria.

A positive and significant relationship between rainfall and hectareage has been found in the long run. Increasing rainfall increases hectareage on rice in succeeding years. On the whole, the variable (rainfall) is significant at 10%. The coefficient of this variable has been found to be 0.832195. This implies that a 1 percent increase in rainfall translates into a 0.83% increase in hectareage allocated to rice in the next period. This is because weather is one of the important variables that affect agricultural production, and rice is not exempted from this. This is in consonance to a study by Ogazi (2009) who unveiled that weather remains one of the most important uncontrollable variables involved in agricultural production systems, especially in Nigeria, where it plays a short and long term key roles in rice production. Similarly Akanni



and Okeowo (2013) revealed that favorable weather and increase in hectareage are critical to raising the output supply of crop

A positive relationship also exists between fertilizer and hectareage in the long run. Availability of fertilizer translates into increased hectareage, hence the inputs was available. The positive influence exerted by fertilizer quantity on hectareage indicates timely and required amount of it applied into the soil to enhance rice production. This result alludes to Tchereni and Tchereni (2013), their estimates revealed that a 1% increase in fertilizer translates into a 0.04 change in hectareage. Liverpool-Tasie and Takeshiman (2013), comment that over the years the key focus of fertilizer subsidies in Nigeria have been on improved affordability, increased fertilizer use for productivity growth, and development of the private sector-led input distribution system.

## CONCLUSION AND RECOMMENDATIONS

Rice the study concludes that hectareage was responsive to producer price of rice both in the long and short run. This implies that the rice farmers were constrained by land; as such farmers were unable to increase hectareage in response to price. It is also an indication that the farmers had little or no control over land and similar factors that surge output. Producer price of maize responded positively to rice hectareage both in the long and short run. This signals the fact that maize is not a substitute to rice in terms of land allocation, as such farmers preferred to allocate more hectareage to rice instead of maize. The estimates of commercial loan to agriculture were negative and insignificant to hectareage both in the short and long run. This implies that the impact of the loan was not responsive to increase hectareage because the amount obtained did not significantly result in increased hectareage to impact on rice; it also implied that the loan obtained was not enough to acquire hectareage for extensive farming. Rice output was positive and highly significant to hectareage both in the short and long run. This implied that rice hectareage played a critical role in increasing rice output, such that as hectareage increased, it resulted into increased output. Rainfall was positive in the short and long run but was significant in the long run. This implied that increase in rainfall increased hectareage on rice in succeeding years. The estimates of commercial loan to rice production were negative and insignificant to hectareage both in the short and long run. The amount of money made available to the farmers was certainly not enough to increase hectareage. It was recommended that the government should increase its support to farmers (by increasing the loan amount) as there are obvious indications that the farmers suffered set-back resulting from insufficient hectareage. Government should review the Land Use Act of 1978 that will encourage farmers more accesses to land hectareage in order to attain self-sufficiency in rice production.

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