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Research Article

Demand Preference of Consumers as a Catalyst for Local Rice Supply in Niger State

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Abstract
The research looked at Demand preference as it affects local rice supply in Niger State, Nigeria. Multi – stage sampling method was employed to obtain 125 household consumers of local Rice. The sampling of respondents cut across Agricultural zones 1, 2 and 3 of Niger State. Primary and Secondary data were used. Descriptive statistics like mean, frequency tables and percentages were employed to describe the socio – economic characteristics of the respondents. Vector Autoregressive model (VAR) was used to estimate production variables that granger caused local Rice supply. . Hedonic model was used to determine the effect of local Rice characteristics on the preference and willingness to pay by consumers. The result indicated the mean age of 45 for Niger. The household size has mean of 6 and years spent in school stood at 17 for Niger. The annual income mean were 414 thousand naira for Niger State. The granger causality equations show that, all variables granger caused production of local, Rice in Niger States except dlnarea. The dlnarea in Niger State was not significant. This means that it does not granger caused local Rice production. The result of hedonic model revealed that free from stone, whiteness, aroma, cohesion and taste were all significant. This means that all these attributes have great effect on price, preference and willingness to pay higher price for local Rice. These will encourage the producers to produce more and will lead to higher supply in the market.

Keywords: *Consumers, Demand, Local, Preference, Rice*

Introduction

Rice grain qualities or characteristics are important among rice consumers in Nigeria. Consumer's choice of local rice is always guided by taste, price, convenience, variety, as well as quality (Tetteh *et al*. 2011). A study conducted by Opeyemi *et al*. (2015) revealed that the taste of rice was significant to the consumers, with higher price premium. The work of Ahmad *et al*. (2011) used Lancasters theory (1966) to argue that consumers derived satisfaction from the characteristics of goods, not from goods consumed. In the result, food safety, tastes and size of the grain were ranked first, second and third, respectively. Ahmed *et al*. *(*2011) observed that consumers want regular supply of rice and reported positive utility (satisfaction) for conventional rice. The fragrant rice and brown rice (imported rice) were of high quality and higher price. Another attribute which was considered with conventional rice (local rice), when compared with organically produced rice (also imported rice), was satisfaction derived from it. Consumers derive low satisfaction (utility value) from conventional, but cheaper than imported rice. This finding agrees with Onu *et al*. (2015) and Schobesberger *et al.* (2008) who observed that food safety is significant and should be one of the qualities that should be considered for grain. The study of Ahmed (2011) observed three characteristics to be considered namely; short grain with low utility value followed by medium and long grains that has the highest utility values respectively. A study conducted by Gideon *et al.* (2014) found that factors that affected the use of local rice were poor packaging, poor texture and

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unattractiveness to the consumers. The study of Opeyemi *et al*. (2015) observed that the price of locally produced rice was very low due to poor quality. The study revealed that consumers ranked stone free rice "first" to be the reason why they prefer imported rice. Olurunfemi (2014) revealed that consumers preferred rice without foreign matter as the first criterion, followed by whiteness. Price was the least, indicating that consumers were ready to pay high prices for clean rice that is of high quality. Gideon *et al*. (2014) observed that local rice is of poor quality and that was why Ghanaians prefer imported rice (fragrant, brown and organically produced rice) to locally produced rice, largely because imported rice is free from foreign materials and has better grain quality. Moreover, Nwanze *et al*. *(*2006) and Tomlins *et al*. (2005) opined that consumers in Africa have much interest in grain quality and are ready for higher quality local rice. A lot of studies on demand preference of local rice were conducted in difference States but few or none has been done in Niger State. The study want to find out demand preference of consumers as it affect locally produced rice in Niger State.

Agricultural contribution to the economy depends on how well the producers respond. The producer could respond to price change and non-price factors. In Nigeria, the response of supply to price is mostly low. However, supply responds very well to bio - physical factors (Rahji *et al*., 2008). For instance, supply responds to rainfall, area expansion and fertilizer utilization. Rahji *et al*. (2008) observed that growth in output is because of a planted and policy intervention. Ogazi (2009) used error correction version of auto regression distributed lag model to estimate output supply response to the change in real price in Nigeria. It was observed that the supply response of rice was not elastic in both the short and long runs. This inelastic effect means rice producers were not responsive to price. What mostly determined output supply response for both short and longs runs were weather factors. Ayanwale *et al*. (2011) worked on rice supply response in Nigeria and found that in the long run, area cultivated was insignificant and fertilizer was significant at 10% level of probability. The study reported that local rice supply did not respond to price, importation and trade regulation policies, but only to area cultivated and fertilizer utilization. The non-response of supply agrees with the work of Rahji *et al*. (2008) and Muchapondwa (2008). However, the short run indicated that the area cultivated was important in rice supply in Nigeria. The coefficient of land was significant at l% level of probability and fertilizer was significant at 5%.

Yield response was low in Nigeria due to low use of important inputs such as fertilizer, pesticide, extremely low mechanization of rice farm, rice farmer's over reliance on rainfall. Other problems are wrong use of farm management practices, irrigation facility, inadequate labour supply to carry out important cultural practices like weeding, pest control, use of local seed materials, low prices in the output market and small number of extension personnel (David, 20l4). West Africa Rice Development Association (2003) observed growth increased was statistically significant, but that such increase may not be enough to increase farmers' incomes. This may not provide the opportunity of meeting the decision of equating demand with supply of rice.

Materials and Methods

This study employed secondary and primary data. Secondary data were collected from Niger State Agricultural Mechanization Development Authority Annual Review Publications. The data included local rice production output, annual price of rice in naira per tons from 1980-2016, yield in tons, fertilizer in kg, rainfall in mm and area cultivated in hectare. For the primary data, a multi - stage sampling method was employed in the selection of respondents. The sampled Local Government Areas and their communities were Mokwa with Kudu and Rabba, Katcha with Badeggi and Gbakogi. Paikoro and Shiroro local Government Areas have their communities as Kwakuti, Tungamalam, Gwada and Kato respectively. Others include Wushishi and Mariga Local Government Areas with Zungeru, Maito, Beri and Bangi as their communities. First, purposive selection of two local government areas from each of the three (3) agricultural zones of the state due to predominant production of local rice in these areas. Simple random sampling method was used in the selection of two communities from each local government where rice cultivation is highly predominant. The third stage was simple

random selection of 125 household heads from sample frame of 165,697 selected from 12 communities chosen from 6 local governments in the state using Taro Yamane's formula at 8.4% precision (Table 1). Using

Yamane (1967) formula $n = \frac{N}{1+N(e)^2}$

Where n = sample size
N = population size
e = margin error
Primary data were collected using structured questionnaire. Information regarding socio-economic characteristics of respondents was collected.

Analytical tool

Hedonic model was used to determine the effect of local Rice characteristics on the preference and willingness to pay for local Rice consumers

Unit root test

As an important stage in co integration the data collected has to be checked for stationarity of each series and to be sure of order of integration of each series. Hair *et al.* (2010) pointed out that for co integration to prevent spurious result all the series considered should have the same order of integration, mostly *1* (1). The study used Augmented Dickey Fuller (ADF) by Dickey and Fuller (1979) which is as follows:

$$\Delta Y_{t=}\alpha+\beta_i T+\delta_1\Delta Y_{t-1}+\sum_{t-1}^{k} b_i\Delta Y_{t1}+\varepsilon_i$$

Where
B_i, δ, b_i = co-efficient
T= time trend
Δ = Change;
Y_t = Variables (under investigation for stationary).
$Y_{t-1=}$ Past value of variables;
ΔY_{t-1} = $(Y_{t-1} - Y_{t-2})$, ΔY_{t-2} = $(Y_{t-2} - Y_{t-3})$,
t= time variables; and
ε_i = error term

Existence of unit root in Y_t agrees with null hypothesis δ = 0 that is Non stationary series**.** When the value of ADF statistic is less than critical values it means Y_t is stationary **(***$Y_{\sim} I(0)$* and otherwise if is greater than and null will be rejected. Differencing at first means the series is not stationary at level and may be stationary at first difference *I*(1).

Co – integration

Definition of vector Auto regression as used by Johansen co-integration method defined vector auto regression (VAR) as shown below

$$\Delta Yt = ø + \sum^{n}_{i-1} \Gamma_1 \Delta Y_{t-1} + \prod Y_{t-1} + \varepsilon_i$$

Where;
Yt = rice supply in year t, proxies by rice output (tons)
Ø = vector parameter
$\prod$ = matrix parameters
$K_{1=}$ variables under investigation
$\prod \sum^{n}_{i-1} K_i$ -1, $\Gamma_1 = \sum^{p}_{j= i+1}$

The model specification for co-integration is;
$Y_{t=}$ (Price of rice, Output of rice, Quantity of Fertilizer, Hectares cultivated, Amount of rain) gives (nx1) vector of the variable series that are non – stationary *I (1).*
Ø = (nx1) vector parameter
ε_i = (Kx1) vector or random shocks
$\prod$ = (m x m) matrices parameters showing long run effect, called impact matrix
Γ = (nx1) vector coefficient of lagged Y_t variable

VAR specification

$$\Delta \ln Yt = \sum^{n}_{i=1} B_{1i} \Delta \ln PR_{t-1} + \sum^{n}_{i=1} \Delta_{1i} \Delta \ln PI_{t-1} + \sum^{n}_{i=1} \delta_{1i} \Delta \ln RFt_{-1} + \sum^{n}_{i=1} \delta_{1i} \Delta \ln FU_{t-1} + \sum^{n}_{i=1} \delta_{1i} \Delta \ln YR_{t-1} + \sum^{n}_{i=1} \delta_{1i} \Delta \ln AC_{t-1} + \alpha ECT_{t-1} + \varepsilon_i \quad (24)$$

All other variable will be incorporated as above

Where:
ΔlnYt = Output = rice supply in year t, proxies by rice output
$\ln PR_{t-1}$ = Logarithm price of rice in year t (₦ /tons)
$\ln RFt_{-1}$= Logarithm Amount of rain fall in year t (mm) as climate element
$\ln FU_{t-1}$ = Logarithm quantity of fertilizer used in year t (tons)
$\ln YR_{t-1}$ = Logarithm of yield of rice (tons)
lnACt-1 = Logarithm of area cultivated in year t (ha)
ECT_{t-1} = Error correction term
Δ = change
$\varepsilon_{i=}$ error for variables that are not capture
n = lagged observed terms

Results and Discussion

Socio - economic characteristics of the respondents

The result presented in Table 2 shows that majority of household heads were in the age range of 41 years and above. Age of household heads may have influence on quantity of rice demanded; this is because as the age increases the household size may also increases due to delivering and newly married couples. This agrees with the work of Salihu *et al.* (2017).Who argued that as youths grow and get marry the demand for food especially rice increases.

Gender

Gender of the household heads has great impact on rice consumption pattern; this was also noted by Agboola (2003). The result in the Table 2 shows that all the respondents (100%) were male. This could be the influence of the two common religions practiced in the northern part of Nigeria. The religions belief that only male should be the head of the family.

Household size

Household size determines the quantity of local rice to be bought and used. The household size was high among the respondents. Majority (80%) of the respondents have household size of 1-8 persons and only one person (0.8%) has household size above 17 persons. This also agrees with the study of Salihu *et al.* (2017) *and* Ehiakpor (2017) respectively

Marital status

Majority (99.2%)of the respondents were married, this deterring the household size. Household size will not increase without increase in number of wives or children. As this determine the quantity of local rice that will be demanded and consumed. This study agrees with the works of Opeyemi *et al.* (2005) and Ehiakpor (2017).

Educational attainment

It is assumed that a well-educated respondent can easily get access to information concerning nutritional value of all kind of local rice available in the market. This information could affect positively or negatively the use of local rice. Qualitative local rice that is clean may be favoured while low quality local rice may be affected negatively. Majority of the respondents attended secondary and tertiary education (60.8%) while 39.2% attended primary and non-formal education. This is to say that all the respondents were educated in one way or the other. This agrees with the work of Ahmad *et al.* (2010), Ahmad *et al.* (2011) and Olurunfemi (2014).whose works reported that all the respondents were educated.

Occupation of the respondents

This refers to different activities individual do to earn income. It is expected that diversification of good occupation will make the individual richer and be able to consume more rice. The result presented in Table 2 shows that (40%) of respondents combined farming with business while 31.32% were sole farmers. It is clear that diversification of occupation give more income leading to more consumption of rice. This study agrees with the works of Kassali *et al*. (2010) and Salihu *et al*. (2017) who separately pointed out that diversification of occupation generate extra income for the respondents.

Income of the respondents annually

Income is a vital factor that influences household food consumption. As income of the households increase the food consumption also increases. Although there could be exceptional situations that as the income increases the respondents may change to foreign rice. The result presented in Table 2 shows that 41.6% of the respondents were low income earners. This agrees with the studies of Salihu *et al.* (2017), Kassali *et al*. (2010) and Ahmad *et al*. (2011) that found out that most of the respondents were low income earners.

Other source of income

Other source of income also complements in the role the household heads play in the feeding of household members. This is likely to have a positive influence on the purchasing power of the households and ability to consume more rice in the house. The result in Table 2 shows that majority of the respondents (60.8%) earn low income from other sources

Effect of quality characteristics on local rice preference and willingness to pay

The result of the hedonic regression measured

factors affecting consumption preference for quality characteristics of local rice and were presented in Table 2.The R square of 0.70 implies that 70% variability in the consumer willingness to pay for quality local rice characteristics in Niger State is explained by the explanatory variables. These variables are whiteness, aroma, free from stone, education level, household size and disposable income specified in the model. The F statistics of Table 2 were significant at 0.04 probability level and this shows the significance of the variable on the preference of local rice in Niger State suggesting that the model has a good explanatory power on the variation in the model.

Consumers' willingness to pay and consumed local rice grain was found to affect price. From the hedonic price analysis aroma had negative coefficient (- 62.43) and is significant. Reason been that aroma allow the consumers to choose from alternative rice in the market. The negative sign shows a discount in the price of local rice without aroma. The finding is consistent with the work of Diagne *et al*. (2017) that rice with aroma attracted consumers to pay higher price and rice with aroma are mostly patronized by richer countries.

Long local rice grain, whiteness of the grain, free from stone, cohesion of grain after cooking, education level, disposable income and household size were all statistically significant and affected consumer's preference and willingness to pay for quality characteristics. Long local rice (0.0079) was significant at 10 percent level of probability with a positive coefficient. This means that as the length of local rice looked long and attractive, it positively motivates consumers to pay more in Niger State. This also corroborates the findings of Diagne *et al*. (2017) who found that attributes such as size and length of rice grain were all very important to the consumers in Thailand and Pakistan. Whiteness of the local rice was significant at 5 percent probability level with a positive coefficient. This indicates that consumers are willing to pay more or increase the price of local rice that is clean and white. Free from stone (25.15) was significant at 5 percent and positive coefficient. This also shows that consumers were willing to pay more for local rice devoid of stone. This work also agrees with the findings of Hassan, (2017) who confirmed that clean white local rice devoid of stone compete effectively with foreign rice in terms of acceptability and higher price.

The result also revealed that all the socioeconomic characteristics were statistically significant. The education level, annual income and household size were significant at 5 percent and 1 percent respectively. This showed that education, annual income and household size also have significant effect on consumer willingness to pay for local rice quality characteristics. This also means that a unit increase in annual income and one person increase in household size will increase the willingness to pay by 5.1 and 5.8 respectively. Cohesion (2.61) was significant at1 percent and positive. This means that the ticker the local rice is after cooking the more consumers are willing to pay.

Stationary test on local rice supply variables in Niger State

The integration test has to do with the stationary of all-time series data. Stationarity is the stochastic properties of the time series data moving round the mean. Its mean, variance of the mean and covariance of the mean are all stationary and do not change with time. Bannerjee (1993) augured that factors like inflation and seasons make mean of the series to change with time and non-stationary. The Augmented Dickey Fuller (ADF) unit root test of stationarity was used to achieve this. The Augmented Dickey Fuller (ADF) unit root test of stationarity is shown in Table 3. The explanatory variables of local Rice production in Niger State (area, yield, price, fertilizer and rain) were not stationary at level but stationary at first difference. The series was of the same order of 1(1) in the first difference. The test statistics and P- value of dependent variables indicated that the null hypothesis was not accepted at level 1(0).

Co-integration investigation was done using Johansen test. The regression co efficient was used to identify most significant vectors. The johansen co integration test for production of local rice and production variables were shown in Table 4. The result for the production variables dlnpro, dlnarea, dlnyield, dlnpton, dlnfert and dlnrain shows that the null hypothesis of non co integration vector ($r = 0$) was accepted at $P < 0.0003$, 0.0002, 0.000,

0.000, 0.000, 0.000 and 0.000 respectively.

Granger causality of rice production in Niger State

A variable X_t is said to Granger caused another variable Y_t if given the lags of Y_t the lags of X_t are jointly Statistically Significant in the Y_t equation. Consider the Granger causality test for the Local Rice Production. In the production equation the null hypothesis that the co-efficient on lags of area, yield, price, fertilizer were zero was not rejected except rainfall and total joint contribution of all the lag variables were statically significant at 5% and 10% respectively. This means that rainfall and other lag variables jointly Granger caused Local Rice Production in Niger State. The result further showed that lags co efficient of the yield only in area equation was statistically significant at 5%. The null hypothesis that all the co efficient on lags was zero was not rejected. In another development joint contribution of the equation of all variables was not significant. This means area expansion does not Granger caused Rice Production in Niger State on the year under review.

The Table 5 revealed that lags co efficient of yield equation were statistically significant at 1%, 5% and 10% respectively. The lags jointly Granger caused Local Rice Production in Niger State. And the null hypothesis that all the co efficient on lags of yield equation were zero was rejected. Furthermore all the lags of price equation jointly Granger caused Local Rice Production in Niger State. The lags equation of price was all statistically significant at 1% level. And the null hypothesis that price does not Granger caused Local Rice Production in Niger State was not accepted.

The Table 5 also shows that the fertilizer equation lags were statistically significant at 10%, 5% and 1% level. Therefore the null hypothesis that lags of fertilizer equation were zero was rejected. All the lags of fertilizer equation jointly Granger caused Local Rice Production in Niger State and was statistically significant at 1% level. Lastly the result from the Table 5 also revealed that all the rainfall lags equation was statistically significant except area. The null hypothesis that lags equation of rainfall were zero was rejected. All the lags equation of rainfall Granger caused Local Rice Production in Niger State. The Table shows that all lags equations of yield, price, fertilizer and rainfall Granger caused Rice Production, only the area equation lags were not statistically significant. This means rice production does not increased as a result of area expansion.

Conclusion

The study concluded that the respondents have mean age of 45, household size mean of 6 and years spent in school stood at 17. The annual income mean were 414 thousand naira for Niger State...The granger causality equations show that, all variables granger caused production of local, Rice in Niger States except dlnarea. The dlnarea in Niger State was not significant. This means that it does not granger caused local Rice production. The result of hedonic model revealed that free from stone, whiteness, aroma, cohesion and taste were all significant. This means that all these attributes have great effect on price, preference and willingness to pay higher price for local Rice

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Table 1: Sampling distribution of respondents by zones in Niger State

Zones	LGAS	EAS	Sampling Frame	Sampling size
A	Mokwa	Kudu	20671	16
		Rabba	21267	16
	Katcha	Badeggi	12434	10
		Gbakogi	11452	9
B	Paikoro	Kwakuti	13272	10
		TunganMallm	14065	11
	Shiroro	Gwada	12693	10
		Kato	8026	6
C	Wushishi	Zungeru	12433	11
		Maito	4243	3
	Mariga	Beri	17130	13
		Bangi	18001	14
		Total	**165,697**	**125**

Table 2: Socio-economic characteristics of respondents

Variable	Frequency	Percentage
Age		
20-30	4	3.
31-40	35	27
41-50	52	44
Above 51	34	26
Total & mean	125(45)	100
Gender		
Male	125	100
Female	Nil	0
Total	125	100
Household size		
1-8	101	80
9-16	14	11.2
Above 17	1	0.8
Non	9	7.2
Total & mean	125(6)	100
Education		
Primary	13	10.4
Secondary	35	28
Tertiary	41	32.8
Non formal	36	28’8
Total	125	100
Marital status		
Single	1	0.8
Married	124	99.2
Total	125	100
Occupation		
Farming	39	31.2

Civil servant	3	2.4
Farming & civil servant	31	24.8
Farming & business	50	40
Civil servant &business	2	1.6
Total	125(414)	100
Income Annually		
101,000-500,000	52	41.6
501,000-1,000,000	32	25.6
Total	125	100
Other source of income		
<100,000	19	15.2
101,000-500,000	76	60.8
501,000-1,000,000	13	10.4
Above 1,000,000	17	13.6
Total	125	100

Source; Field survey, 2017

Table 3: Hedonic regression analysis of local rice characteristics in Niger State

Variables	Coefficients	Std Error	/ t/	p>/t/
Constant	1472668***	169.303	8.70	0.000
Short rice	0,0139674	0.0140982	0.99	0.324
Long rice	0,011229839*	0.00645393	1.74	0.085
Period	-19.03287	97.25678	0.19	0.845
Whiteness	207.516802**	104.2789	1.99	0.049
Aroma	-6.23.807308***	134.7316	4.63	0.000
Taste	69.42252	68.19985	.1.0	0.919
Free from stone	25.1531244**	103.5108	2.43	0.017
Cohesion of rice	2612152***	97.75817	26.7	0.009
Education level	-28.23939**	14.65302	-1.93	0.056
Gender	10.92963	108.5633	0.10	0.920
Annual income	51.05116***	14.21383	3.59	0.000
Household size	59.3649906***	24.13211	2.46	0.000
Diameter	-10.89512	63.65422	-0.17	0.864
R^2	0.70			
Adjusted R^2	0.66			
F- statistics	12.112			

*** Significance at 1%, ** Significant at 5% and * Significant at 10%
Source: field survey data 2017

Table 4: Stationarity Test for Yearly Rice Production Variables at level/Intercept in Niger State

Variables	**Observation**	**Lag**	**ADFvalue**	**t-statistics (critical values)**	**Order level**	**P value**
Dlnpro	36	0	8.475	8..495 (2.972)***	1(1)	0.000
Dlnarea	36	0	9.992	9.992 (2.618)***	1(1)	0.000
Dlnyield	36	0	7.046	7.016 (3.682)***	1(1)	0.000
Dnpton	36	0	4.894	4.894 (2.972)***	1(1)	0.000
Dlnfert	36	0	6.717	9.169 (2.618)***	1(1)	0.000
Dlnrain	36	0	9.169	6.717 (3.62)***	1(1)	0.000

Source; study result output, 2017
Lag length were selected based on AIC
Critical values are significant at 1%
Argumented Dickey Fuller analysis carried out in Stata version 11.0

Table 5 Result of johansen Co integration analysis for Local Rice Production in Niger State

Variables	Null	Trace Test	Max Eigen	Critical value
Dlnpro	r = 0	258.92	0.97417	94.15***
Dlnarea	r = 0	141.92	0.85918	68.52***
Dlnyield	r = 0	79.19	0.69142	47.21***
Dlnpton	r = 0	41.57	0.44943	29.68***
Dlnfert	r = 0	22.47	0.36673	15.41***
Dlnrain	r = 0	7.85	0.21757	3.76***

Source; Study Result output, 2017
(***) **indicates significance at (1%) and 5% level Number of observation =36 and lag number 4 variables.

Table 6 Granger Causality Test Result

Equation($X_{t)}$	Excluded ($Y_{t)}$	Chi 2	Pro > chi 2
Dlnpro	dlnarea	1.0062	0.909
Dlnpro	dlnyield	2.8257	0.557
Dlnpro	dlnpton	3.3053	0.508
Dlnpro	dlnfert	5.1818	0.269
Dlnpro	dlnrain	11.427	0.022**
Dlnpro	all	31.233	0.052*
Dlnarea	dlnpro	6.6911	0,153
Dlnarea	dlnyield	10.949	0.027**
Dlnarea	dlnpton	5.1142	0.276
Dlnarea	dlnfert	3.6352	0.450
Dlnarea	dlnrain	3.1595	0.531
Dlnarea	all	21.97	0.342
Dlnyield	dlnpro	8.1812	0.085*
Dlnyield	dlnarea	8.1673	0.086*
Dlnyield	dlnpton	9.9033	0.042**
Dlnyield	dlnfert	13.808	0.008***
Dlnyield	dlnrain	10.041	0.040**
Dlnyield	all	54.099	0.000***
Dlnpton	dlnpro	25.392	0.000***
Dlnpton	dlnarea	19.555	0.001**
Dlnpton	dlnyield	31.775	0.000**
Dlnpton	dlnfert	75.874	0.000***
Dlnpton	dlnrain	21.38	0.000***
Dlnpton	all	286.9	0.000***
Dlnfert	dlnpro	16.033	0.003***
Dlnfert	dlnarea	9.4933	0.050**
Dlnfert	dlnyield	8.5337	0.074*
Dlnfert	dlnpton	10.004	0.040**
Dlnfert	dlnrain	27.684	0.000***
Dlnfert	all	91.769	0.000***
Dlnrain	dlnpro	8.6119	0.072*
Dlnrain	dlnarea	5.1199	0.275
Dlnrain	dlnyield	8.1706	0.086*
Dlnrain	dlnpton	42..416	0.000***
Dlnrain	dlnfert	20.824	0.000***
Dlnrain	all	89.584	0.000***

*** Significance at 1%, ** Significant at 5% and * Significant at 10%
Source; Study Result output, 2017