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ECONOMICS OF RICE PRODUCTION IN LAFIA LOCAL GOVERNMENT AREA OF NASARAWA STATE, NIGERIA

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ABSTRACT
This study assessed the economics of rice production among rice farmers in Lafia Local Government Area of Nasarawa State. The primary data used for the study were obtained through the use of structured questionnaire. Descriptive statistics, Gross Margin Analysis, and Production Function Estimation were used to analyze the data. Results indicate that the gross margin per hectare was ₦580,950.00 implying that rice production is a viable enterprise in the area. The male contribution to rice production constituted 76.7percent farmers against 23.3percent for female. The mean age of the farmers was 42 years with 65percent of farmers falling within the age bracket of 36 to 51 years. The mean household size was 10 inhabitants. The mean years of farming experience was found to be 12, which falls between 11 to 20 years, representing 56.7percent of the respondents and the mean farm size was 3 ha. Results also show an inefficient scale of production and resource use efficiency analysis indicates that seed and chemicals were underutilized while labour was over utilized. The non-significant variables were farm size and fertilizers. This may be as a result of low adoption. Major constraints faced by the farmers were inadequate capital, problem of pests and diseases, high cost of fertilizers and chemicals among others. It is recommended that rice farmers increase their scale of production in terms of farm size, seed, fertilizers and chemicals usage, which will also lead to a reduction in unit labour cost.
***Keywords**: Economics, Rice farming, Inputs use, Production function, Efficiency, Nasarawa State*

INTRODUCTION

In Nigeria, despite the dominance of the National Economy by the Oil sector, Agriculture still occupies about 70 percent of the population; serving as source of livelihood for the people, raw materials for the industry and foreign exchanges for the country (Odoemenem and Inakwu, 2011). Rice (*Oriza*, spp.) of the group of cereals is gradually becoming an important food item in the diet of most Nigerians and the growing demand is creating a situation of food shortage due to deficiency in local production, leading to huge bill on importation (Ogundari, 2006; USDA, 2015). It is also increasingly preferred over many traditional food crops like sorghum, millet, maize, yam, cassava, etc. (Defoer *et al.,* 2004). In terms of world production, rice ranks third after wheat and maize among cereals (Imolehin and Wada, 2005) and FAO statistics show that rice is consumed by over 4.8 billion people across the world, with an estimated 40 million people in Africa. Rice is also gaining economic importance as cash crop in the producing areas as it employs about 80 percent of farm labour (FAO, 2003). The per capita consumption of rice in Nigeria has been increasing at an annual average rate of 7.3 percent. From the low score of 3kg per capita and per annum in the 1960s, rice consumption in Nigeria increased to 18kg during the 1980s and reached 22kg in the period 2000-2005 (Ogundele and Okoruwa, 2006).

According to FAS (2002), rice has shown great potentials at ensuring food and nutrition security, income generation, poverty alleviation and economic growth in Nigeria. The country was adjudged to become self – sufficient in rice production as most of its ecological zones are suitable for rice cultivation (FAS, op. cit). An increase in demand in recent times has made Nigeria a net importer of rice with an import bill of over US $267 million per annum (Eke, 2008) for a current imports volume of about 4,500 Million tonnes (USDA, 2015). Different rice production systems are available in Nigeria, and production is mainly realized at small-scale level using traditional farming techniques (Odoemenem and Inakwu, 2011). Actual yields of rice are below potential yields making this a sign of low productivity (FMA, 2001). According to Singh & Mowa (1997) diseases and pests are also important factors impeding output that induce important crop losses at farm level.

The current poor rice output in Nasarawa State, which is below expected level, might not be unconnected with a poor resource use among farmers; though the economic theory has shown that Agricultural output can be improved either by increasing the amount of inputs or by improving the level of efficiency of use of farm resources (Reddy *et al.,* 2009). Studies have reported resource use efficiency problems among rice farmers in Nigeria including constraints such as poor technology, high costs of inputs, farmer's inefficiency, and low farm productivity (Ogundele and Okoruwa, 2006; Okpe *et al*., 2012; Kadiri *et al*., 2014). In view of the growing interest in improving rice production so as to increase its contribution to the economy of the state, this study intends to assess the level of efficiency in resources use among rice farmers in the study area.

MATERIALS AND METHODS

The Study Area

This study was conducted in Lafia Local Government Area of Nasarawa state, Nigeria. The area is located within longitude 8^0-9^0E and latitude 8^0-9^0N of the Equator and occupies a land area of about 2733km^2 (Nasarawa State Ministry of Information, 2006). It is boarded to the North by

Nasarawa Eggon Local Government, to the South by Obi Local Government Area, to the West by Doma Local Government and to the East by Quan-pan Local Government Area of plateau state. The population of the Area is about 2,455,886 people in 2016, based on 2006 NPC statistics of 2006, using 2.8 % annual population growth. It has a tropical climate with two main seasons namely; rainy and dry season. The main crops grown in the area besides rice include: cowpea, sesame, groundnut, yam, maize and cassava.

Sampling Technique and Sample Size

A two stage random sampling technique was adopted to select the respondents for his study. The first stage was the random selection of six important rice producing villages in the Local Government Area, namely Sabon Gida Bakin Kogi, Assakio, Agunji, Gidan Makuya, Akurba and Mararaba Akunza. The second stage was the random selection of ten (10) rice farmers per village making a total of 60 rice farmers for the study.

Data Collection and Methods of Analysis

Primary data were used for the study. The data were collected with the aid of structured questionnaire on farmers' socio-economic and farm characteristics, quantiy of farm inputs, rice output and market prices among others.

Data were analyzed using descriptive statistics, budgeting technique, production function estimation and the Marginal Approach.

The production function adopted is specified as follows:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, U)$;

The Linear Form:

$Y = \alpha_0 + \Sigma\alpha_i X_i + U_0$ with i = 1….6

The Semi-Log functional form

$Y = \alpha_0 + \Sigma\alpha_i \text{Ln}X_i + U_0$ with i = 1….6

The Double-Log form:

Specifically,

$\text{Ln}Y = \alpha_0 + \Sigma\alpha_i \text{Ln}X_i + U_0$ with i = 1….6

Where:

Y= Rice output (₦)

X_1 = Seed cost (₦)

X_2= Farm size (ha)

X_3= Labour (₦)

X_4= Gender (male =1; female=0)

X_5 = Chemicals (₦)

X_6 = Fertilisers (₦)

$\alpha_0 \ldots \alpha_i$ = Coefficients of production

U= Error term

The most significant functional form was used for the analysis

Resource Use efficiency Analysis

Using the Marginalist Approach, the marginal value product is derived as follows.

α_i being elasticity of input X_i,

$\alpha_i = (\partial Y/Y)/(\partial X_i/X_i)$

$\alpha_i = (\partial Y/\partial X_i)/(X_i/Y)$

as, $\partial Y/\partial X_i = MPP$

$\alpha_i = MPP*(X_i/Y)$

Therefore,

$MPP = \alpha_i /(X_i/Y) = \alpha_i*(Y/X_i)$

and,

$MVP = P_y*MPP$

Since, $MPP = \alpha_i*(Y/X_i)$

Therefore,

$$MVP = \frac{P_y*[\alpha_i * \bar{Y}]}{X_i}$$

MVP = Marginal value product

MPP = Marginal Physical Product

Given the UFC = Unit cost of an input,

If, MVP = UFC, this implies that resource is efficiently utilized.

If, MVP < UFC, this implies that resource is overused.

And if, MVP > UFC, it implies that resource is underutilized.

UFC = ₦1 equivalent as every input is expressed in Naira.

Gross Margin Analysis

This was assessed as follows:

GM = TR –TVC

Where,

GM= Gross Margin (₦/ha)

TVC= Total Variable Cost (₦/ha)

TR= Total Revenue (₦/ha)

RESULTS AND DISCUSSIONS

Socio economic characteristics of the respondents

Table1 shows that majority (65percent) of the respondents were within the age range of 36 to 51 years. Most rice farmers in the area are therefore in the most productive age. It also revealed that 76.7 percent were men against 23.3 percent women. This shows rice production in the area as mainly a male dominated activity. It also reveals that 76.7 percent were married, against 5percent widows and widowers.

Thirty five (35) percent of households have 6 to10 persons; 31.7 percent had no formal education, against 26.7percent with primary education, 15percent secondary, 10percent tertiary 16.7percent with adult education only. The result indicates that rice farmers are relatively educated across board which could have a positive impact in terms of technology adoption. The farming experience for the majority (57percent) was between 11-20 years. Farmers therefore, could be said to have long experience. The farm size was between 0.5 and 2.5 ha for 36.7percent of the respondents, 36.6percent had between 2.6 and 4.5 ha; and 26.7 percent between 4.6 and 5.5 hectares. This means farmers' farm size is equally distributed between small, medium and large. The study also revealed that 51.7 percent of the respondents are rich, while 33.3 percent are in the medium class income; an indication that rice farmers are relatively rich. This is an indication, all things being equal, that rice farming business is impacting positively on farmers' socioeconomic status.

Costs and Returns Analysis

Table 2 shows that the variable cost per hectare made up of seed, fertilizer, chemical, land clearing, planting, weeding, harvesting and transportation costs was ₦ 71,196, while total revenue was ₦ 652,146. The Gross Margin per hectare therefore stood at ₦ 580,950.00 with ROI of 9.16; suggesting that rice production is a viable enterprise in the study area.

Table 2: Costs and Returns in rice production (₦/ha)

Variables	Mean Value	Std. Deviation
Total Revenue(TR)	**652145**	**334101**
Cost items		
-Seed cost	7929	3763
-Fertilizer	5048	1128
-Chemical cost	1532	7061
-Land clearing cost	8828	7061
-Planting cost	4386	2270
-Weeding cost	9307	3539
-Harvesting cost	15037	11625
-Transportation cost	19128	11072
Total Variable Cost(TVC)	**71195**	**3250**
Gross Margin (TR –TVC)	**580,950`9.16**	**131569**
Return on Investment (ROI)		

Source: Data Analysis, 2015

Estimation of Rice Production Function

Table 3 revealed that the result of the estimation of Cobb-Douglas production function providing best fit for the data. The result showed that the coefficient of multiple determinant (R^2) was 0.71 indicating that 71percent of the variation in the dependent variable was explained by the independent variables and the overall influence of variables included in the model on the output was significant at 1percent as shown by the F-value (15.21^{***}). Of the selected variables, only seed cost, labour, gender and chemicals significantly influenced rice output. Seed, gender and chemicals showed significant positive impact on output while labour had significant negative influence on rice output. Farm size and fertilizers had no significant effect on output. This result confirms the findings of Ogundele & Okoruwa (2006) who reported low level of fertilizers use by rice farmers, thus the observed non-significant result.

Table 3: Estimation of Cobb Douglas production function

Variables	Coefficient B	t-test value	Std. Error
Constant	0.792	0.681	1.162^{NS}
Farm size	-0.211	0.155	-1.36^{NS}
Seed cost	0.703	0.11	6.39^{***}
Labour	-0.431	0.22	-1.95^{**}
Gender	0.277	0.152	1.82^{*}
Chemicals	0.373	0.175	2.131^{**}
Fertilizers	-0.105	0.202	-0.519^{NS}
Adjusted R^2 0.71***			
$F=15.21^{***}$			

Source: Data Analysis, 2015. ***, **, *: value significant at 1percent, 5percent and 10 percent respectively

Resource Use Analysis

Analysis of the resource use efficiency in table 4 shows that seed and chemicals were under-utilized by rice farmers based on their efficiency ratio which is greater than 1. The result further revealed that the resources use efficiency of farm size, labour and fertilizer was less than 1 suggesting that farm size, labour and fertilizers seem to be over- utilized. Therefore the use of seed and chemicals should be increased, while the labour costs would be reduced by rice producers. The seemingly overutilization of farm size and fertilizers was rather an indication of general low level of usage among farmers. The results on fertilizers and chemicals were in tandem with Ogundele & Okoruwa (2006) as these authors also found underutilization for both.

Table4: Resource use efficiency analysis

Input	UFC (₦)	MVP	Comparison of UFC and MVP	Decision
Farm size	1	0*	MVP<UFC	Overutilised
Seed	1	51.227	MVP>UFC	Underutilised
Labour	1	-6.999	MVP<UFC	Overutilised
Chemicals	1	142.156	MVP>UFC	Underutilised
Fertilizers	1	0*	MVP<UFC	Overutilised

*: No significant contribution to output

Source: Data Analysis, 2015

Returns to Scale

There is 0.64 percent increase in output when all inputs increase by 1percent. This is shown by the estimation on sum of elasticities of production with respect to farm size, seed, labour, chemicals and fertilizers, as follows.

Returns to scale (RTS) = 0 + 0.703-0.431+0.373 + 0

=1.076-0.431

=0.645

This result indicates that rice farmers are operating in the area of decreasing returns, an indication of scale inefficiency. This result is confirms Kassali & Haruna (2010) and Nimoh *et al.* (2012). It means there is need for an increase in the current average scale to improve on overall efficiency and achieve optimum scale of production.

Constraints Facing Rice Farmers in the Area

Table 5 represents the various problems faced by rice farmers in the study area. The results revealed that 83.3percent of rice farmers claimed problem of inadequate capital, 73.3percent suffered from pest and diseases, 58.3percent reported high cost of transportation, 53.3percent experienced poor marketing outlet. Also 46.7percent suffered from high cost of labour, while 55.0percent complained of high cost of chemicals and fertilizers respectively. High costs of inputs such as fertilizers and chemicals were also reported by Kassali & Haruna (2010) in Niger Republic. These constraints would certainly impact yield, output and ultimately rice production efficiency.

CONCLUSION AND RECOMMENDATION

Rice farming is male dominated in the area and most farmers are within their active age. There is relative availability of family labour as indicated by household size distribution. Rice farmers were also relatively educated, which could impact productivity and technology adoption as farmers also had good experience in farming. Farm sizes are relatively distributed equally between, small, medium and large. This shows that farm size could be increased. The analysis also show that rice farming is profitable and the relative proportions of rich and medium class incomes producers are indications that rice farming is making a positive impact on farmers' livelihoods; therefore making it a good strategy for poverty alleviation in the area. Most rice farmers suffered from poor capital, pests and diseases attack and high costs of production inputs, and none of the inputs were efficiently utilized by farmers. The scale of operation of rice production is also inefficient. There is therefore the need to increase seed and chemicals

utilization by farmers. The average farm size and fertilizers usage need also be increased so as to impact significantly rice output and reduce unit cost of labour.

Table 1: Socio-economic characteristics of respondents

Characteristic	Frequency	Percentage Mean
Age:		
20-35	13	21.7
36-51	39	65.0
		42
> 51	8	13.3
Total	60	100
Gender:		
Male	46	76.7
Female	14	23.3
Total	60	100
Marital status:		
Single	8	13.3
Married	46	75.7
Widower	3	5.0
Widower	3	5.0
Total	60	100
Household size:		
1-5	13	21.7
6-10	21	35.0
11-15	19	35.0
		9.8
> 15	7	31.6
Total	60	100
Education qualification:		
No formal education	19	31.7
Primary	16	26.7
Secondary	9	15.0
Tertiary	6	10.0
Adult	10	16.7
Total	60	100
Farming experience:		
1-10	24	40
11-20	34	56.7
		12
>20	2	3.3
Total	60	100
Farm size (ha):		
0.5-2.5	22	36.7
2.6-4.5	22	36.6
		3.3
4.6-5.5	16	26.7
Total	60	100
Income class:		
Rich	31	51.7
Medium	20	33.3
Poor	9	15.0
Total	60	100

Source: Data Analysis, 2015

Table 5: Constraints faced by rice farmers

Variables	Frequency*	Percentage	Rank
Inadequate capital	50	83.3	1
Problem of pests and diseases	44	73.3	2
High cost of transportation	35	58.3	3
High cost of labour	28	46.7	7
Poor marketing outlet	32	53.3	6
Inadequate supply of farm inputs	26	43.3	8
High cost chemicals	33	55.0	4
High cost of fertilizer	33	55.0	4
Poor storage facility	22	36.7	9

Source: Data Analysis, 2015 * Multiple Responses

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