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Profitability of Rice Production in Aguata Agricultural Zone of Anambra State Nigeria: A Profit Function Approach

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Abstract

The study investigated the profitability of rice production in Aguata Agricultural Zone of Anambra State Nigeria by specifically determining the enterprise profitability; ascertaining the determinants of maximum variable profit; and identifying constraints to rice production. Multistage, purposive and random sampling techniques were used to select 90 rice farmers for the study. Structured questionnaire were used in collecting primary data while means, percentages, enterprise budgeting and profit function regression were employed in data analysis. A gross margin of ₦4,278,961, net farm income of ₦3,858,516, mean net farm income of ₦42,872,40 and net return on investment of 0.37 proved the enterprise profitable. Maximum variable profit was statistically and significantly influenced by per unit price of output, per unit price of labour and farm size at 5% level. High cost of labour and lack of capital were identified as the most serious constraints to rice production. Ensuring easy access to credit facilities for the farmers, supply of modern rice production technologies and inputs at subsidized rates through the provision of improved extension services would mitigate the problems and enhance the farmers' productivity and income.

1. Introductions

Rice (*Oryzea spp*) is one of the major staple food of the world, ranking third after wheat and maize on global production level and second in terms of area under cultivation (Adeoye, 2003). It is a major source of food for about half of the world's population supplying basic energy needs of the people. In Nigeria, rice cultivation is an age long enterprise providing employment opportunity and source of food to vast and diverse population of the country. It is ranked the fourth major cereal crop in Nigeria after Sorghum, millet and maize in terms of cultivated area and output (Babafada, 2003).

The importance of rice in the Nigeria diet can succinctly be explained by its demand and consumption pattern over the years. Starting from the 1960s when paltry 360 metric tonnes of locally produced rice was unable to meet local demand, to the 1.45 million tonnes produced in the 1990s which also fell far short of demand (National Cereals Research Institute [NCRI] 2004). The nation's current annual production level of about 3 million tonnes is again a far cry from its consumption level of 5-6 million tonnes (Ugwu, 2013). The short fall, according to Ugwu (2013), is usually filled through importation with figures oscillating between 1.7 to 3.2 million tonnes.

The massive rice importation representing 25 percent of agricultural imports and over

40 percent of domestic consumption (Federal Ministry of Agriculture and Rural Development [FMARD] 2004) no doubt takes its toll on the nation's economy. The rice importation bill rose from $259 million (₦22B) in 1999 to $756 million (₦96 Billion) in 2001-2002 (NCRI 2004). Nigeria may currently be spending a whopping and scandalous one billion naira (₦1Billion) per day on imported and smuggled rice (Ohaka *et al*., 2013).

Incidentally, the country has rich edaphic and climatic conditions traversing the various agro-ecological zones suitable for the attainment of self sufficiency and even exportation of rice. The South east agro-ecological zone with its vast low land flood plains, swampy and upland ecology has great potentials in massive rice production. This same scenario also obtains in Anambra State particularly the Aguata Agricultural Zone where network of rich alluvial flood plains and upland ecology remains underutilized for rice cultivation.

Previous governments in the country made desperate efforts to increase rice production and reverse the importation trend. The various programmes and policies, though well intentioned, were dogged with implementation flaws and instability. Another major drawback to these policies was the de-emphasis or poor attention given to the farmers' level of resource use and returns to scale. This is pertinent considering the fact that majority of rice farmers in the country are small scale operators adopting traditional production methods and grappling with poor returns to scale (Yuguda, 2003). The situation is further aggravated by the fact that most of the cultivators hardly estimate their enterprise profitability or otherwise. This study therefore sought to empirically fill this gap by specifically estimating the costs and return of rice production, ascertaining the determinants of maximum variable profit and identifying the constraints to rice production in the area.

2. Methodology

The study was conducted in Aguata Agricultural Zone - one of the four agricultural zones of Anambra State, Nigeria. The zone comprises of five extension blocks namely Aguata, Orumba North, Orumba South, Nnewi North and Nnewi South. The zone is bounded to the south by Imo and Abia States and to the north by the Awka Agricultural Zone. The vegetation is mainly rainforest with rich alluvial flood plains and seasonal swamps along the river basins. The rainy season falls between the months of April to October and the dry season November to March. The major occupations of the people are farming and trading.

The population comprised of all the rice farmers in the five extension blocks of the agricultural zone. Multistage, purposive and random sampling techniques were used in selecting respondents for the study. Stage I involved purposive selection of three blocks - Aguata, Orumba South and Orumba North blocks – identified as the major rice producing blocks of the zone by preliminary survey. From each of the three blocks, two circles were randomly selected to arrive at six circles namely Umunze, Ezira, Ufuma, Omogho, Umuchu and Umuomaku at stage II. At stage III, 15 rice farmers were selected by random method from each of the six selected circles, bringing the sample size to 90.

A pre-tested well structured questionnaire was used to elicit information on the farmers' socio-economic characteristics, inputs and output variables, and constraints to rice production. Information from journals, textbooks, periodicals e.t.c. were used to complement primary data. Data collected were analyzed by means of non-parametric statistics, enterprise budgeting technique and the normalized profit function model. The enterprise budgeting technique used to assess profitability of the enterprise is given as:

$$\text{Gross margin (GM)} = \text{TR} - \text{TVC}$$

$$\text{NFI} = \text{GM} - \text{TFC or TR} - \text{TC}$$

$$\text{NROI} = \text{NFI/TC}$$

Where:
GM=Gross margin
TR=Total revenue
TVC=Total variable cost
NFI=Net farm income
TC=Total cost
TFC=Total fixed cost
NROI=Net returns on investment.

The profit function analysis was also used to test the effect of prices of individual resource inputs and output, and socio-economic variables on maximum variable profit (Arene, 2002). The profit function model is explicitly specified as follows:

$$II^* = \beta_0 + \beta_1 PPO + \beta_2 PPS + \beta_3 PPF + \beta_4 PPL + \beta_5 PPA + \beta_6 AGE + \beta_7 EDU + \beta_8 EXP + \beta_9 HOS + \beta_{10} FAS + ei$$

Where:
II* =Amount of maximum variable profit (₦)
PPO=Price of output (₦)
PPS=Per unit price of rice seed (₦)
PPF=Per unit price of fertilizer (₦)
PPL=Per unit price of labour (₦)
PPA=Per unit price of agrochemical (₦)
AGE=Farmer's age in years
EDU=Farmer's educational level in years
EXP=Farmer's farming experience in years
HOS=Farmer's household size in units
FAS=Farm size
$\beta_0, \beta_1, \beta_2, \ldots\ldots \beta_{10}$= Parameters to the determined
ei =Stochastic error term.

3. Results and Discussion

3.1. Cost Structure of Rice Production

The cost structure of rice production in the area is shown

in Table I. From the table, the total cost of production for all the farms amounted to ₦10,567,234. The total variable cost (TVC) amounted to ₦10,147,059 representing 96.02% of the total cost while the total fixed cost (TFC) stood at ₦420,175 (3.98%). Labour was the highest cost item, amounting to ₦8,010,230 representing 75.80% of total cost of production. The finding is in line with Omotesho *et al*. (2010) who in their study of rice production in Kwara State reported that labour accounted for 73.78% of total cost. It was however far higher than the 19.72% human labour cost reported by Nirmala and Muthuram (2009) in Kaithal District of Haryana India where machine labour constituted the major variable cost of rice production. The high labour cost in the study area is therefore attributable to low level of mechanization and scarcity of labourers.

Table I. *Estimated costs and return of rice production*

Item	Amount (₦)	Percentage of TC
Total Revenue (TR)	14, 425, 750	
Variable Cost:		
Seed	542,821	5.14
Fertilizer	444,307	4.21
Agrochemical	540,913	5.12
Labour	8,010,230	75.80
Transportation	398,555	3.77
Miscellaneous	210,233	1.99
Total Variable Cost (TVC)	10,147,059	96.02
Total Fixed Cost (TFC)	420,175	3.98
Total Cost (TC = TVC + TFC)	10,567,234	100
GM (TR-TVC)	4,278,691	
NFI (GM – TFC)	3,858,516	
NROI (NFI/TC)	0.37	

Source: Field survey, 2014.

Other cost items included planting materials (seed) ₦542,821 (5.14%); fertilizer 4.21%; agro-chemicals 5.12%. Transportation and miscellaneous expenses were the least cost items representing 3.77% and 1.99% of total cost of production respectively. The above figures were also similar to 6.81% for seed, 10.66% for fertilizers and 3.13% for agrochemicals reported by (Ohaka *et al.*, 2013)

3.2. Enterprise Budgeting Analysis

To determine the profitability of rice production in the area, the enterprise budgeting analysis was used as shown in Table 1.The total revenue from rice cultivation in the area was ₦14,425,750 while total variable cost was ₦10,147,059, leaving a gross margin of ₦4,278,691 and net farm income of ₦3,858,516. The positive gross margin (GM) and net farm income (NFI) values obtained by the farmers indicated that rice cultivation in the area was profitable. Again, a net return on investment value of 0.37 was computed for the enterprise. This implied that for every ₦1.00 invested in rice production in the area, ₦0.37 was returned, thus further confirming the profitability of the enterprise.

3.3. Determinants of Maximum Variable Profit

To estimate the contributions of prices of individual factors (inputs) and output as well as the effect of socio-economic factors on maximum variable profit (MVP), the profit function analysis is often used (Sankhayan, 1998; Ugwumba and Chukwuji, 2010).The study used the following variables – per unit price of output (PPO), per unit price of seeds (PPS), per unit price of fertilizer (PPF), per unit price of agrochemicals (PPA), and per unit price of labour (PPL). Others are socio-economic variables namely, age (AGE), educational level (EDU), farming experience (EXP), household size (HOS), and farm size (FAS). The result of the analysis is presented in Table II.

Table II. *Profit function analysis*

Predictors	Coefficient	SD	T	P
Constant	24.37	9.20	0.47	0.64
RPO	0.4212	0.20	3.24	0.000*
PPS	0.4177	0.09	0.52	0.068
PPF	0.3333	0.48	0.83	0.80
PPA	0.3014	0.04	0.79	0.10
PPL	- 0.5619	0.09	3.77	0.00*
AGE	0.1831	0.46	1.00	0.30
EDU	- 0.1994	0.63	1.35	0.41
EXP	- 0.2036	0.49	0.99	0.211
HOS	- 02641	0.48	0.82	0.03
FAS	0.4112	0.39	2.58	0.000*

Source: Field survey, 2014.
R – Sq = 76%.
R – Sq (adj) = 72.5%
F – statistic= 10.28 (P = 0.000)
Durbin-Watson statistic= 1.89
*Significant at 5% level of probability.

As shown in the table, the coefficient of output price was positive in accordance with *apriori* expectations. It was also statistically significant at 5% level of probability. This implies that high output prices would increase the enterprise profitability.

The coefficient of per unit price of labour (PPL) was statistically significant at 5% level and negative. This finding is in line with *apriori* expectations and implied that the farmers who were more economical in labour use might have realized higher profit. The costs and return analysis of the study as presented in Table 1 also indicated that labour cost accounted for 75.80% of total cost of production, hence any rice farmer who minimized the cost of production would earn better profit.

Farm size on the other hand had positive relationship with MVP and was significant at 5% level. This implied that as the rice farmers' farm size increased, output and net farm income also increased. The finding corroborates Ohaka *et al.* (2013) that farm size has a positive and significant relationship with output and net farm income.

The per unit price of seeds, fertilizer, agrochemicals and age of farmers (AGE), had positive relationship with

maximum variable profit (MVP) as expected. Their effects on it however were not significant implying that though these resources had positive effect on MVP, they should be engaged at a level that is cost effective. Ohaka *et al*. (2013) reported a positive and significant coefficient for agrochemicals at 5% level. On the other hand, socio-economic variables such as education, household size and farming experience had negative but not significant relationship with MVP at 5% level contrary to *apriori* expectations. Some previous studies however showed that education, household size and farming experience have positive relationship with output and profit level (Chukwuji, 2006; Giro & Adebayo, 2007).

The F-ratio was statistically significant at 5% level of probability. This implied that the independent variables had good impact on the dependent variable. The significant Durbin-Watson statistic value of 1.89 showed evidence of absence of autocorrelation. The R^2 value of 76% was high indicating that changes in the explanatory variables highly accounted for changes in the dependent variable, hence the model is a good fit as error was only 24%.

3.4. Constraints to Rice Production

The major rice production constraint faced by the farmers was high cost of labour with mean value of 4.95 (Table III). The same situation was observed in the costs and return analysis (profitability) where cost of labour was the highest cost item, accounting for 75.80% of total cost of production. The reason for the very high labour cost averaging ₦1000 per man-day was attributed to scarcity of labourers. The rural-urban drift by young able bodied men and women in search of white collar job was found to be responsible for the dearth and high cost of labour in the area. The finding is in consonance with Muhammed-lawal *et al*. (2013). Ugwu (2013) also reported high cost of human labour as part of the limitations to rice production in Nigeria.

Table III. *Constraints to rice production*

Constraint	Calculated Mean	Rank
High cost of labour	4.95	1st
Lack of capital	4.36	2nd
Pest and Diseases	3.01	3rd
Scarcity of improved seeds	3.00	4th
Poor technology base	2.83	5th
Lack of machineries	2.77	6th
Poor product price	2.68	7th
High cost of fertilizer and Agrochemicals	2.24	8th
Scarcity of land	1.70	9th
Poor road network	1.57	10th
Poor storage facility	1.52	11th

Source: Field survey, 2014. Note: Multiple responses recorded.

The second major problem of rice production was lack of capital for farm operations. The problem was compounded by inaccessibility to formal loan sources due to lack of collaterals. Yuguda (2003) and Ugwu (2003) both corroborated the finding that dearth of capital remains a major constraint to sustainable rice production in Nigeria.

Pest and disease attack and scarcity of improved seeds with means of 3.01 and 3.00 were the third and fourth constraints to rice production in the area. Scarcity of improved seeds was attributable to farmers' lack of access to improved seed distributors and extension outfits resulting in continuous use of local poor yielding varieties by the farmers. This finding is similar to Chandler (1979) and Babafada (2003) who identified pest and disease attack and paucity of quality planting materials as problems of rice production in the tropics.

Other factors identified as seriously constraining to rice production were poor technology base (2.83); lack of machineries (2.77) and poor product price (2.68). However, high cost of fertilizer and agro-chemicals (2.24), scarcity of land (1.70), poor road network (1.57) and poor storage facilities posed no serious problem to rice farming in the area.

4. Conclusion and Recommendations

Rice production in Aguata Agricultural Zone of Anambra State was profitable considering the positive values of net farm income and net return on investment. Profitability level would have been higher but for very high labour cost (which constituted over three quarter of the total production cost) and other constraints such as dearth of capital, pest and disease problem, lack of improved seeds, poor technology base, lack of machineries and poor product price.

Government interventions through the supply of modern rice production technologies, subsidization of inputs, easy access to credit facilities, and enhanced extension services would mitigate the problems and improve the rice farmers' productivity and income.

References

[1] Adeyo, G.O (2003).*Rice revolution in practice: Lessons from other countries*. Paper presented at a seminar on sustainable rice production in Nigeria. Organized by Central Bank of Nigeria. Held at Hamdala Hotel, Kaduna, Jan. 14-15 (pp.2-11).

[2] Arene, C.J. (2002). Profit function analysis of small ruminant enterprises in Nsukka Local Government Area of Enugu State, Nigeria. *Economic Affairs,* 47, 209-214.

[3] Babafada, M. (2003). *Integrated rice production and export in Nigeria.* Paper presented at a seminar on sustainable rice production in Nigeria organized by Central Bank of Nigeria at Hamadala Hotel, Kaduna, Jan. 14-15(pp.1- 4).

[4] Chandler, R.F. (1979).*Rice production in the tropics: A guide to development of national programme*. Ibadan, Nigeria: Macmillan Publishers Ltd.

[5] Chukwuji, C.O. (2006). Resource use efficiency in cassava based food crop production systems in Delta State, Nigeria *Ph.D dissertation*, Delta State University, Asaba, Nigeria).

[6] Federal Ministry of Agriculture and Rural Development (FMARD) (2004). State of Nigeria agriculture*:* Ministerial press briefing by Minister of Agriculture and Rural Development, Niger State, Nigeria.

[7] Giroh, D.Y. & Adebayo, E.F. (2007). Comparative analysis of permanent and non-permanent rubber tappers in State rubber farms of Nigeria. Retrieved from http://www.fspublishers.org

[8] National Cereals Research Institute (n.d).Training manual on rice production: For the presidential initiative on rice production, South East Zone of Nigeria. Minna, Nigeria: NCRI Publication.

[9] Nirmala, B. & Muthuram, P. (2009). Economic and constraint analysis of rice cultivation in Kaithal District of Haryana. *India Research Journal of Extension Education,*9 (1) xx-xx.

[10] Ohaka, C.C., Adiaha, M.M & Amanze, P.C. (2013). Economic analysis of small holder rice production in Ihite-Uboma L.G.A of Imo State. *Nigeria Journal of Agriculture Food and Environment.* 9(2), 37-41.

[11] Omotesho, A. O., Muammad-Lawal, A. & Yusuf, Y.K. (2010). Economics of small scale rice production in Patigi and Edu Local Government Areas of Kwara State, Nigeria. *African Journal of Agricultural Research*, 5(4) xx-xx.

[12] Ugwu, C. (2013). Challenges of rice production in Nigeria. *Punch Newspaper, January, 2013,P*p 8.

[13] Ugwumba, C. O.. A. & Chukwuji, C.O. (2010). The economics of catfish production in Anambra State, Nigeria: A profit function approach. *Journal of Agriculture and Social Sci*ences, 6, 105-109.

[14] Yuguda, U. (2003). Towards a sustainable rice production in Nigeria. Paper presented at a seminar on sustainable rice production in Nigeria organized by Central Bank of Nigeria at Hamadala Hotel, Kaduna, Jan. 14-15 (pp.16-22).