

ESTIMATION OF EFFICIENCY CONSTRAINTS IN SMALL SCALE UPLAND RICE PRODUCTION IN BIDA AGRICULTURAL ZONE, NIGER STATE, NIGERIA

*Sadiq, M.S. and **Yakasai, M. T.

*Department of Agric. Economics and Extension Tech., Federal University of Tech., Minna, Niger State, Nigeria.

**Department of Agric. Economics and Extension, Kano University of Science and Tech., Wudil, Nigeria

*Correspondence author: sadiq.sanus@gmail.com

ABSTRACT

The study was conducted to determine the allocation efficiency of resources used in small scale upland rice production in Bida Agricultural zone,,Niger Sate, Nigeria. Multi stage random sampling technique was used in selecting one hundred and fifty (150) respondents for the study. Pre-tested questionnaires, interview schedules and field observations were used to obtained information from the respondents with respects to their inputs and outputs. Double logarithmic function gave the best fit out of the four (4) functional forms tested. Result of the study shows that, farmers were not optimally efficient in the use of resources, such as farm size, labour, fertilizer, improved seeds, herbicides, and other capital inputs. This suggests that for the farmers to increase rice output in the study area, they should make little adjustment in the use of their productive resources.

KEYWORDS: Upland-Rice, Resources, Allocation, Efficiency

INTRODUCTION

World Bank (2009b), reported that consumers are exhibiting a shift in preference from traditional staples (such as cassava, maize, and yam) to rice, especially in the urban areas where rice consumption is increasing most rapidly. Statistics from a 2003 rice consumption survey showed that people in large cities like Lagos, Abuja and Makurdi (per capita consumption of 64, 64 and 72kg per annum) consume significantly more rice than people in the rural areas, and the vast majority of this rice consumed in cities is imported (WARDA,2003).

NRDS (2009), call for private investment in domestic processing capacity, and hopes to incentivize the development of up to 50 new industrial rice mills through subsidies. Furthermore, it anticipates that demand projections for 2009, 2010, 2013 and 2018 will steadily increase to 5.7, 5.9, 6.2 and 6.9 metric tons. Estimation indicates that over 90 percent of domestic rice production comes from resource poor and weakly organized smallholder (FMANR, 2008); a key fact when considering the wide-ranging constraints that continue to impede significant progress in Nigeria's farm-level productivity and international competitiveness in rice. More than half of all Nigerians live on less than one dollar per day, and the poverty incidence exceeds 60 percent in rural areas (NFOS, 2003); where people overwhelmingly depend on agricultural activities for their livelihoods.

World Bank (2009a) opined that government's goal of achieving self-sufficiency in rice production to a large extent will depend on the level of farmers' productivity which can be determined by their rates of adoption of improved technologies and efficiency of resource use (World Bank and IFDC,2008); the low rates of

adoption of rice technologies by farmers as a result of resource poverty among other reasons, efficiency improvement becomes an important and significant factor in increasing productivity (Idiong, 2007).

The low agricultural productivity in Nigeria is revealed by the actual yields of major crops such as rice compared with potential yields (USAID, 2009a); the implication is that there is scope for additional increases of output from existing hectares of rice, if resources are properly harnessed and efficiently allocated (IITA, 2010). Hence, this study becomes crucial in examining the resource use efficiency of farmers in rice production, since increased output and productivity are directly related to production efficiency (David and Terwase, 2011). The choice of Bida Agricultural zone in Niger state was premised on the fact that Niger state is one of the states that enjoy comparative advantage in the production of rice in the country (USAID, 2009b); the zone is the leading rice producer in the state. Thus, the objective of this study is to determine the productivity and efficiency of resource-use in rice farming in the study area.

METHODOLOGY

The study was conducted in Northern Agricultural Development zone of Niger state, Nigeria. A multi-stage random sampling technique was employed for the study. Firstly, leading upland rice producing areas, namely Bida, lavun, Gbako local government areas respectively, were purposively selected. Secondly, five (5) villages in each local government area were randomly selected, and lastly, ten (10) respondents from each village were randomly selected, thus, given a total sample size of 150 respondents. Primary data were collected during the 2011 production season. Data collected were analyzed using multiple regression model.

Model specification

The implicit form is specified as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6) \quad (1)$$

Where;

Y = Output of paddy rice (Kg)

X₁ = Farm size (ha)

X₂ = Labour (mandays)

X₃ = Fertilizer (Kg)

X₄ = Improved seeds (Kg)

X₅ = Herbicides (litres)

X₆ = Capital (₦); Depreciation on equipment and other capital, interest on loan

Four functional forms (linear, semi-log, exponential and double-log) were fitted into the production function model, and the lead equation was chosen on the basis of economic, econometric and statistical criteria. The estimates of production function were further used to determine the allocation efficiency of resource used in the study area.

Double-log gave the best fit and was chosen as the lead equation. It is specified as follows:

$$\log Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + \dots + b_n \log X_n + U \quad (2)$$

Where;

Y, X_{1-n} are as stated

b₀ = intercept

b_{1-n} = regression co-efficient

U = noise.

Efficiency of resource-use was determined by the ratio of Marginal value product (MVP) to unit factor cost of inputs. It is given as:

$$r = MVP/UFC \quad (3)$$

Where;

MVP = MPP, P_y

MPP = b_i. Y/X

UFC = P_{x_i}

Where

MVP = Marginal value product

MPP = Marginal physical product

UFC = Unit factor cost

Y = Mean of output

X = Mean of input

P_{x_i} = Unit price of input x_i

P_y = Unit price of output

Decision Rule:

If r = 1, optimization

If r > 1, under utilization

If r < 1, over-utilization

RESULTS AND DISCUSSION

The influence of the production inputs on rice output was determined with the aid of production function analysis. On the basis of *a priori* expectations, statistical significance of the co-efficient and the co-efficient of multiple determination, double- log functional form was chosen as lead equation. The result in Table 1 shows that the co-efficient of all the parameters estimated were positively signed, except the labour which was negatively signed. However, the co-efficient of farm size(X₁) and improved seeds(X₄) were significant at 1%; fertilizer (X₃) is significant at 5%, while labour (X₂) and herbicides (X₅) were significant at 10%. Capital (X₆) was not statistical significant and need no further explanation.

The value of the R² reveals that approximately 65% of the variation in the output of paddy rice is jointly explained by the explanatory variables included in the model. The

F-ratio (54.89) is significant at 1%, thus, indicating the overall significance of the model.

The elasticity's of production with respect to the inputs were, 0.74, -0.19, 0.02, 0.021, 0.09, and 0.01 for farm size, labour, fertilizer, improved seeds, herbicides and capital respectively. Farm size is found to be the most important determinant of rice output in the area. The sum of elasticities (0.88) indicates decreasing returns to scale, which suggests that they are in stage II of production (rational stage) process.

Table 2 shows the estimates of allocation efficiency of inputs used. The results indicates that the resources were inefficiently utilized, as Marginal value products (MVPs) for farm size(X₁),fertilizer(X₃) and herbicides(X₅) were greater than their respective Unit factor costs (UFC); MVPs for labour (X₂) and improved seeds (X₄) were less than their respective Unit factor costs (UFC).

This means that rice output was likely to increase and hence revenue if more of such inputs (farm size, fertilizer, herbicides) and less of such inputs (labour, and improved seeds) had

been utilized. Except for improved seeds (AEI<1), these result agrees with the findings of Goni *et al.*, (2007).

Table 1: Estimated Double-log function for Rice Production

Factor Inputs	Regression Co-efficient	t- values
Constant	6.178 ^x	10.02
Farm size (ha)	0.74 ^{xxx}	3.41
Labour (manday)	-0.19 ^x	2.01
Fertilizer (kg)	0.02 ^{xx}	6.07
Improved seeds (kg)	0.21 ^{xxx}	0.21
Herbicides (litres)	0.09 ^x	1.50
Capital (₦)	0.1 ^{ns}	2.12
R ²	0.65	
F-cal	54.89 ^{xxx}	
Ep	0.88	

Source: Field survey, 2011

Table 2: Estimated Efficiency Ratio

Resources	MPP	MVP	UFC	AEI
Farm size	111.8	6708	5000	1.3
Labour	-6.1	-366	500	-0.73
Fertilizer	4.1	246	125	1.97
Seed	3.6	216	400	0.5
Herbicides	24.1	1446	950	1.5

Source: Field survey, 2011

CONCLUSION AND RECOMMENDATION

The study concludes that the farmers were inefficient in the allocation of resources in rice production in the study area which may be due to high costs of inputs used. Efficiency could be enhanced through better input use. The study

recommends little adjustment in the use of their productive resources, since they are at the rational stage of production process (stage II). Concerted efforts from government, non-governmental organizations, and extension delivery agencies are imperative.

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