Gender and Resource Productivity in Rice Production n Ebonyi State, Nigeria

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Abstract: The inadequacy of information on resource productivity and their differentials by gender in rice production has prevented rice farmers from knowing the resources they are yet to realize their full potentials. This study analyzed resource productivity by gender in rice production in Ebonyi State of Nigeria. Multi-stage random sampling techniques were used to select a sample of 130 rice farmers comprised of 65 males and 65 females from the 13 Local government areas of Ebonyi State. Data were collected with structured and validated questionnaire and analyzed using descriptive statistics and productivity model. Results showed that marginal productivity of labour, capital and land for male farmers were higher than those of female farmers, while the marginal productivity of fertilizer and seed for female farmers were higher than those of male farmers. Rice farmers should be encouraged to use more of the resource imputs since a unit change in their use increases rice output.
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1. Introduction

Rice, one of the food crops which has assumed great significance as a major staple food is widely consumed in Nigeria (Okereke, 1988, Mgbada 1996). FAO (2003) observed that rice production in Nigeria is at about 3.8 percent per annum while rice demand is growing at the rate of 9.7 percent per annum. This excess demand of 5.9 percent per annum portrays the problem of rice scarcity, which is a consequence of low productivity of rice farmers. Moreover, Nigerian Agriculture has been variously described as being characterized by low farm incomes, low levels of capacity to satisfy the food needs of the population and low productivity because primitive techniques of production are still being used by the farmers (Adesimi 1990, Obasi 2005, Ohajianya and Onyenweaku 2001, Mgbada 2000).

Given that the importation of rice has been banned in Nigeria, and about 90 percent of rice consumed is expected to be produced locally, there is need to increase the productivity of rice farmers in Ebonyi State which is one of the largest producers of rice in Nigeria.

Previous studies on rice production in Ebonyi State analyzed; costs and returns in rice production (Ohajianya and Onyenweaku 2002, Nwagbo and Onwuchekwa 1988, Njoku 1988, Odii and Nwosu 1996) and resource use efficiency in rice production (Ohajianya and Onyenweaku 2001 and 2002). None of these studies analyzed the productivity of rice farmers in Ebonyi State, thereby leaving an information gap which this study was designed to fill.

Rice as a gender insensitive crop in Ebonyi State was chosen to analyze resource use productivity so as to know the level of productivity of each resource employed by men and women farmers and the resource productivity differentials between male and female rice farmers. The inadequacy of information on productivity of resource inputs and productivity differentials by gender in rice production has prevented rice farmers from knowing the resources they are yet to realize their full potentials.

Rice production involves the use of resource inputs in the production of outputs. Land, labour, capital, seeds, fertilizer and management are the inputs used in rice production.

The productivity of these inputs depends on the farm inputs used in conjunction with them. Productivity of agricultural resources is the index of the ratio of the value of total inputs used in farm production (Olayide and Heady 1982, Onyenweaku 1986). Resource productivity is equally definable in terms of individual resource inputs or in terms of a combination of them. Thus, we shall define land, capital, labour, seed and fertilizer productivity as the ratio of total output to input of land, capital, labour, seed and fertilizer respectively (Quisumbing 1994). It is very difficult, if not impossible, to measure the quantity of management available or in use. Clearly,

the number of man-hours spent on managerial activity is not a very meaningful guide because the quality of management decisions is all important. One may spend much longer time than his neighbour thinking and planning the future, but it does not necessarily follow that his decisions will be any different from his neighbour's. The objective of this study is to analyze resource productivity of rice farmers by gender.

2. Materials And Methods

This study was conducted in the 13 Local Government Areas (LGAs) of Ebonyi State, Nigeria. Ebonyi State was purposively selected for this study on the basis of intensity of its rice production and the availability of male and female rice farmers. The 13 LGAs were then stratified according to male and female rice farmers. One community was randomly selected from each LGA, making a total of 13 communities. The sampling frame was the list of male and female rice farmers in the 13 communities, compiled with the assistance of the resident extension agents and key informants. From this list, five male and five female rice farmers were randomly selected from each community, making a sample size of 130 respondents comprising 65 male and 65 female rice farmers.

The cost-route approach was used in the gender disaggregated and micro-level data collection. One enumerator was assigned to each community. Data were collected from each farmer once fortnightly by means of pre-tested structured questionnaire and observation technique between February and November 2005. The data covered land, labour, capital, fertilizer and seed use as well as output and prices.

2.1 Analytical Techniques

Data were analyzed using least squares (OLS) multiple regression analysis, production function model and marginal productivity model. The production function model is implicitly specified as follows:

$$Y_i = f(L_b, c_p, f_t, s_d, L_d, u) \quad \ldots (1)$$

Where

Y_i = value of rice output per farmer (₦); i = 1 for male Farmers and 2 for female farmers.

L_b = labour use per farmer (mandays)

C_p = depreciated value of capital implements per farmer (₦)

F_t = fertilizer use per farmer (kg)

S_d = cost of rice paddy used per farmers (₦)

L_d = size of land cultivated per farmer (Ha)

μ = Stochastic error term.

Four functional forms of the model linear, semi-log double-log and exponential were fitted to determine the functional form that fits best to the data based on statistical and econometric criteria. Marginal productivity of resource inputs employed by male rice farmers is expressed as:

$$Mp_{xim} = b_{im} \frac{y_m}{X_{im}} \quad \ldots\ldots (2)$$

Where;

Mp_{xim} = marginal productivity of resource inputs employed by male rice farmers.

b_{im} = regression coefficients for the resource inputs employed by male rice farmers.

Y_m = value of rice output produced by male farmers (₦)

X_{im} = amount of each resource input employed by male rice farmer.

Marginal Productivity of resource inputs employed by female rice farmers is expressed as;

$$MP_{xif} = b_{if} \frac{Y_f}{X_{if}} \quad \ldots\ldots (3)$$

Where,

MP_{xif} = marginal productivity of resource inputs employed by female rice farmers.

b_{if} = regression coefficients for the resource inputs employed by female rice farmers.

Y_f = value of rice output produced by female farmers (₦).

X_{if} = amount of each resource input employed by female rice farmers.

Gender Resource Productivity differentials (GRPD) were estimated as follows: GRPD = $Mp_{xim} - Mp_{xif} = b_{im}\, y_m - b_{if}\, y_f$……(4)

X_{im} x_{if}

Where, The variables in equation (4) are as defined in equations 2 and 3.

3. Results And Discussion

The results of regression analysis in table 1 show that the double-log functional form produced the best fit as it has the highest coefficient of multiple determinations (R^2) and the highest number of significant variables. Therefore the regression results for the double-log function are used for further discussion. The R^2 values of 0.873 and 0.894 for the male and female farmers respectively indicated that about 87% and 89% of the variation in the outputs of male and female rice farmers respectively is accounted for by the joint action of the independent variables investigated. The multiple regression coefficients for labour, fertilizer, seed, and land were positive and Significant at 0.01 level for both male and female rice farmers. This result implies that increases in the magnitude of these variables lead to increases in rice output by male and female rice farmers in Ebonyi State of Nigeria.

Table1. Results of Regression analysis showing the Gender-resource effects on rice production in Ebonyi State of Nigeria.

	Male Farmers				Female Farmers			
Variable and important statistics	Linear,	Semi-log	Double-log	Exponential	Linear	Semi-log	Double-log	Exponential
Labour (L_b)	16.115	7.413	0.096	0.009	14.143	5.033	0.094	0.005
	(2.065)*	(1.605)	(3.108)**	(2.014)*	(3.164)**	(1.887)	(2.813)**	(2.316)*
Capital (C_p)	14.906	5.119	0.802	0.002	13.097	2.067	0.059	0.007
	(1.043)	(0.944)	(1.302)	(0.814)	(0.617)	(1.065)	(1.597)	(1.022)
Fertilizer (f_t)	(15.033	8.059	0.067	0.009	19.033	4.902	0.093	0.007
	(1.038)	(2.043)*	(2.629)**	(1.213)	(1.091)	(3.073)**	(3.022)**	(1.613)
Seed (S_d) 14.319	3.055	0.059	0.009	13.817	1.809	0.097	0.007	
	(0.913)	(3.042)**	(3.503)**	(2.103)*	(2.416)*	(2.108)*	(2.316)	(2.415)*
Land (L_d) 8.923	1.603	0.011	0.006	9.113	1.507	0.013	0.008	
	(1.604)	(1.337)	(2.813)**		(1.113)	(1.028)	(0.913)	(3.164)** (1.619)
Intercept	17.502	10.213	6.204		5.227	19.216	8.143	7.313 5.643
R^2	0.391	0.512	0.873		0.503	0.527	0.514	0.894 0.541
F	7.576	12.381	81.113	11.942	13.147	12.481	99.521	13.908
N	65	65	65		65	65	65	65 65

Figures in parentheses are t-ratios
* t-ratios significant at 0.05 level
** t-ratios significant at 0.01 level
Source: Survey data, 2005.

3.1 Derivation of productivity.

Agricultural productivity is referred to as the ratio of farm output to farm inputs used in production (Adesimi 1990). Marginal productivity measures the extra output produced as a result of a unit increase in the farm input (Rahman, 2005). Productivity could be assessed in physical or monetary terms (Rahman et al, 2004).

To derive the productivity of resource inputs used by male and female farmers in rice production, the average characteristics of the resource inputs were first calculated and the results are shown in Table 2. The result indicates that the male and female farmers used 139.5 and 102.6 mandays of labour; N207.8 and N186.3 worth of capital items; 367 kg and 297.3 kg of fertilizers; 145.5 kg and 132.5 kg of seeds; 3.97 Ha and 3.06 Ha of land and produced rice outputs valued at N181746.6 and N127586.7 respectively. In accessing productivity in monetary terms, table 3 shows that the marginal product of labour is 125.07 for the male farmers. This means that a unit changes in labour input use will result to an approximate change of 125 units in their output. The marginal product of female labour use is 116.89. This implies that a unit change in labour input use will result to an approximate change of 117 units in their output.

Therefore comparing the male and the female rice farmers use of labour input, the male farmers would produce more rice than the female farmers per unit.

This could be attributed to the fact that the male farmers devote more labour time to rice farming than the female farmers who spend greater part of their labour time attending to domestic activities. Thus, labour input has more positive effect on the male farmers rice production.

The marginal product of capital is 71.72 for the male farmers and 40.41 for the female farmers. This implies that a unit change in capital input use will result to an approximate change of 72 units and 40 units in the outputs of male and female rice farmers respectively.

Therefore comparing the male and female rice farmers use of capital input, the male farmers would produce more output than the female farmers per unit. This could be attributed to the fact that the male farmers have more capital implements than the female farmers. Therefore, capital input has more positive effect on the male farmers rice production.

The marginal product of fertilizer use is 33.18 and 31.33 for the male and female farmers respectively. This suggests that a unit change in fertilizer use will result to an approximate change of 33 units and 40 units in the output of male and female rice farmers respectively. Thus, comparing the male and female rice farmers use of fertilizer input, the female farmers would produce more output than the male farmers per unit. This could be attributed to the fact that the female farmers use fertilizer input more than the male farmers in a more efficient manner. Thus, fertilizer input has more positive effect on the female farmers rice production. This finding is consistent with that of Odii (2003).

Comparing the marginal product of seed input use, the marginal product of the male, farmers is 73.7 while the marginal product of the female farmers is 93.4, which means that a unit change in the use of rice seed will result to an approximate 74 units and 93 units change in male and female farmers output. Seed input use will therefore produce more output for the female farmers. Than the male farmers per unit. This could be attributed to the fact that the female rice farmers perform the rice planting operation better than the male farmers. Thus, rice seed use had more positive effect on the female farmers output than the male farmers.

The marginal product of land use is 824.04 and 524.04 for the male and female farmers respectively. This implies that a unit change in Land use will result to an approximate change of 824 units and 524 units in the outputs of male and female rice farmers respectively. Hence, comparing the male and female rice farmers use of land input, the male farmers would produce more output. This could be attributed to the fact that the male farmers have more access and rights to land than the female farmers. Thus, land input has more positive effect on the male farmers rice production.

The findings on labour, capital, seed and land are similar to those of Rahman et al (2004).

The marginal productivity differentials were 8.18, 31.31, -6.73, - 19.70 and 300 for labour, fertilizer, seed and land inputs respectively. This implies that a unit change in the use of labour, capital and land by male farmers produced more extra output compared to the case of female farmers, while a unit change in the use of fertilizer and seed by female farmers produced more extra output compared to the case of male farmers.

Table 2. Average Characteristics of resources used by male and female farmers in rice production

Resource	Male Farmers Mean Value	Female Farmers Mean Value
Labour (Mandays)	139.5	102.6
Capital (₦)	207.8	186.3
Fertilizer (kg)	367	297.3
Seeds (kg)	145.5	132.5
Land (Ha)	3.97	3.06
Output (₦)	181746.6	127586.7

Source: Survey data, 2005.

Table 3. Productivity of resources used by male and female farmers in rice production.

Resource	Male Farmers	Female Farmers	Differential
Labour (₦/manday)	125.07	116.89	8.18
Capital (₦/₦)	71.72	40.41	31.31
Fertilizer (₦/kg)	33.18	39.91	-6.73
Seed (₦/kg)	73.70	93.40	-19.70

Land (₦/Ha)	824.04	524.04	300

Source: Survey data, 2005.

4. Conclusion

This study has revealed that a unit change in the resources used in rice production by male and female farmers leads to an increase in rice output. Also there were considerable differentials in resource productivity between male and female rice farmers in Ebonyi State of Nigeria. There is need, therefore, to encourage the male rice farmers to increase their use of labour; capital and land while the female farmers should be encouraged to increase their use of fertilizer and seed in rice production. This could be done through provision of subsidies and granting of soft loans to the farmers to enable them procure the needed inputs and hire labour for rice production operations.

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