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Resource Use Efficiency of Rice Production in Mubi North Local Government Area of Adamawa State, Nigeria

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Abstract: ***This study examines the resources use efficiency of rice production with particular emphasis on Mubi North local Government Area, Adamawa State, Nigeria. The aim of this study is to estimate the relationship between inputs and output in rice production in the study area. In carrying out this study questionnaires were used to collect data from respondents and a research design was adopted with a sample size of 89. The statistical tool used was stochastic frontier. Based on the analysis the result revealed that quantity of land and fertilizer were significant at 1% level each while seed and labour were significant at 10% and 5% level respectively, this means that any increase in the quantity of these variables increases outputs and hence profitability of the farmers. Pesticides herbicides were not significance.***

From the study it was revealed that the farmers in the study area has technical efficiency of 38% in rice production resulting from inability or difficult in accessing farmland, farm credit and processing facilities, this might be the result why Nigerian till date still involved in importation of rice from other countries

Introduction

Rice is a staple food for about 2.6 billion people in the world (CTA, 2005).The global output shows that the Asian continent account for about 92 percent, while America and the Caribbean account for 5 percent and 3 percent for Africa (CTA, 2005). Rice as a cereal grain is the most important staple food for large part of the world human population. It is also the second highest worldwide production after maize (FAO, 2010).

Vol.3 Issue.5, October- 2016, pg. 19-31 **ISSN: 2348-1358**

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Since a large portion of maize crops are grown for purposes other than human consumption, rice is the most important grain with regard to human nutrition and calorie intake. Rice provides more than one fifth of the calorie consumed worldwide by human beings (Smith, 1998).

Thus, rice is the most important cereals in the world after wheat and more than half of the human race needs it as source of calories, it is the leading cereal crop (Marri*et al.* 2007).

The Nigeria rice sub-sector has witnessed some remarkable improvement in output thereby attaining a position of prominence (Akande, 2001). Since the mid1970s, the rice consumption in Nigeria has risen tremendously at about 10 percent per annum due to changing in consumer preferences. However, production has never been able to meet demand, leading to considerable imports which today stand at about one million metric tons yearly. The imports are procured in the world market with Nigeria spending about 356 billion naira in 2010 on rice import alone (IITA, 2011). In an attempt to address the nation rice demand-supply gap, the Nigerian government has intervened in the rice sub-sector over the past few decades. However, the public policy has neither been consistent nor appropriate and domestic production has continued to lag behind demand (Akande, 2001). For instance, from 1986 to mid1990s import was illegal, in 1995 import was allowed at 100 percent tariff and in 1996 the tariff was reduced to 50 percent but it was later increased to 85 percent in 2001 (Akpokodje*et al.*, 2001). Even during the rice ban period, Nigeria was still importing several hundred thousands of tones of rice annually through illegal trade.

Vol.3 Issue.5, October- 2016, pg. 19-31 **ISSN: 2348-1358**

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Notwithstanding the various policy measures, the domestic rice production has not increased sufficiently to meet the increased demand (Akpokodje*et al.*, 2001). The inability of Nigeria rice sub-sector to meet the domestic demand could be attributed to weak and inefficient producer-market linkages due to poor infrastructure including lack of improved processing facilities, low rice productivity, poor post- harvest handling and storage expensive and poor access to inputs (High quality seed, fertilizing and crop protection products), inadequate market information, lack of transparency among the marketers, low capacity to meet quality standards, and limited efficiency distribution networks. This has declined the rice productivity and low income for the rice farmers in Nigeria, especially in Mubi North Local Government Area of Adamawa State, it has resulted massive loss of man power through the abandonment of the farmers and the migration of rural youths to cities in search of white collar jobs.

However, there seems to exist a gap in the rice production in Mubi North LGA of Adamawa which has been also declining the income level of the farmers. High use of inputs and low output per area which no doubt lead to low profitability.

Methodology

Study Area

The Study was conducted in Mubi North Local Government Area of Adamawa State, Nigeria. Mubi is the capital of Mubi North Local Government Area of Adamawa State in Nigeria. Mubi north local government area consists of four

Vol.3 Issue.5, October- 2016, pg. 19-31 **ISSN: 2348-1358**

Impact Factor: 6.057

districts namely; Mubi, Bahuli, Muchalla and Mayo-bani. (Adebayo 2004). The local government has an estimated land area of 871.9km and an estimated population of 177.785. The major economic activities of the people are farming. The major crops cultivated in the area are rice, sorghum, maize, cowpea, groundnut and sugar-cane. A combination of random and purposive sampling techniques was used to select the respondents for the study. These were conducted in the following manner.

Stage 1: The first stage of the level was randomly sampling of the district in Mubi North Local Government areas of Adamawa State. This gives a total of four (4) districts in the Local Government Area but (3) district were purposively sample because of their level of involvement in rice production, which are Mubi, Bahuli and Muchalla.

Stage II: At the second stage, two autonomous communities were randomly sampled form each of the three (3) districts in the local Government Areas. This gave a total of six (6). Finally, 15 rice farmers were administered the questionnaires for the study. That is a total of 90 respondents were sampled. But only 89 questionnaires were filled appropriately and received for the study. The data were analyzed using stochastic frontier production function

The stochastic frontier production function was used to examine input – output relationship and inefficiency model was also used to determine resource use efficiency.

The stochastic frontier production function that was used is specified as;

$\text{Log } Y_1 = B_0 + B_1 \text{ Log } X_1 + B_2 \text{ Log } X_2 \ldots B_6 \log X_6$

$+ V_1 - U_1$

Y= Output of rice in Kg

Vol.3 Issue.5, October- 2016, pg. 19-31 **ISSN: 2348-1358**

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X_1 = Farm size in hectare

X_2 = Quantity of fertilizer in Kg

X_3 = Quantity of rice seeds planted in Kg

X_4 = Quantity of herbicide used in liters

X_5 = Amount of family labour used in man-day

X_6 = Amount of hired labour used in man-day

V_1 = Random noise (White noise) which are N(0,δ2, V)

U_1 = Inefficiency effect which are non-negative half normal distinguish N(0,δ_2, U)

The inefficiency model defined by

$U_1 = d_0 + dZ_1 + d2Z2 \ldots\ldots\ldots\ldots\ldots d7Z7$

Where

U_o = Inefficiency effect

Z_1 = Age of the farmer (in years)

Z_2 =literacy level (in years)

Z_3 = Farmer experience (in years)

Z_4 = Extension contact (1 – contacted, 0 – otherwise)

Z_5 = Gender of the farmer

Z_6 = Family size (total number of person in household)

Z_7 = Access to formal credit

Vol.3 Issue.5, October- 2016, pg. 19-31 **ISSN: 2348-1358**

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RESULTS AND DISCUSSION

Stochastic Frontier Production Function and Inefficiency Model Result

The maximum likelihood estimates of the stochastic frontier production function and inefficiency model results are presented in Table 4.12, 4.13 and 4.14. The estimate for parameters of the stochastic frontier production function indicates that the elasticity of output with farm size was positive and approximately 0.203 for riceand it was statistically significant at 1 % level. This implies that a one percent increase in area under rice production will raise output of rice by 0.203 % for rice production. This shows that land is a very important factor in Rice production. This finding is at tandem with the findings of Eyo and Igben (2002); Maurice *et al.* (2005); Udoh and Folake (2006) that land has positive sign and statistically significant.

The production elasticity of fertilizer was -0.107 for sole rice cultivation. For the rice cultivation, fertilizer ratio is statistically significant at 10 %. The negative ratio of fertilizer use is in contrary to the apriori expectation signs. Access to fertilizer may be difficult and over doze use of fertilizer mighty have contributed to the negativity of the ratio.

Vol.3 Issue.5, October- 2016, pg. 19-31 **ISSN: 2348-1358**

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The production elasticity of seed is 0.225 for rice production and it was statistically significant at 1% level, this also, implies that a one kg increase in seed under rice production will raise the output of rice production by 0.225%. So seed is a very important factor of production. The significant and positive sign of seed variable also indicated that a moderate increase in population of rice on the field will increase the yield provided that, the farm is not over populated beyond the recommended riceration or mixture ratio capacity that will lead to competition for nutrients which will lower the yield. This finding is in consonance with the work of Shehu*et al.* (2007) and Ogundari (2008), who found that seed is an important factor in production.

The production elasticity for herbicide was -0.606 for rice cultivation and was significant for rice at 10 % level. The coefficient for family labour (-0.961) and hired labour (-0.386) were negative and is insignificant. The negative effect and the insignificance of family and hired labour may be attributed to the over dependence of respondents on manual labour as well as over use of the variable inputs. This is a common feature of agricultural production in the developing countries like Nigeria. A unit increase in labour tends to increase the cost of rice production and consequently reduces the output. This findings therefore is an

indication that family labour particularly is the most critical variable input in rice production in the study area which reduce the output of rice farmers.

The final MLE of the farmers in the study area.

Table 4.12 was derived from MLE result of the stochastic production function. The result shows that the TE of the respondents was less than 1 (100 %) hence the variation in TE exits among respondents. This shows that, all the respondents produced below average technical efficiency at 50%. The maximum mean efficiency in was found to be 0.53622264 which is 53% while the minimum mean efficiency was found to be 0.29646205 which is 29%. The respondents' farm mean efficiency was found to be 0.38108076 which is 38%.

The distribution of the farm efficiency in rice production shows that, majority (70 %) of them operated above 30 % of their maximum efficiency and 25.8% operated between 41–50 %. This indicates that the respondents were not technically in their production as a result over use of resources which does not increase their output or because of the law of diminishing returns setting up.

The estimated gamma parameter (γ) is 0.999 for rice and also significant at 1% level, indicating that 99% of the variation in the total output of production among the sampled farmers is due to differences in their technical efficiencies

Vol.3 Issue.5, October- 2016, pg. 19-31 **ISSN: 2348-1358**

Impact Factor: 6.057

in the study area. The estimated sigma square (δ^2) for the respondents were (0.104) and significantly different from zero at 1% level, this indicates a good fit and the correctness of the specified distributional assumption of the composite error term.

Table 4.12: the final MLE estimates are:

Variable Inputs	**Coefficient**	**Standard Error**	**T-ratio**
Farm Size	0.203*	0.995	0.204
Fertilizer	-0.107***	0.819	-0.131
Rice Seed	0.225*	0.697	0.323
Herbicides	-0.606***	0.681	-0.890
Family Labour	-0.961***	0.927	-0.103
Hired Labour	-0.386*	0.109	-0.351
Sigma (d^2)	0.104***	0.156	0.667
Gamma (Υ)	0.999***	0.139	0.719

***Estimates are significant at1% level,
** Estimates are significant at 5% level.
*Estimates are significant at 10% level.

Vol.3 Issue.5, October- 2016, pg. 19-31 **ISSN: 2348-1358**

Impact Factor: 6.057

Determinants of Technical Inefficiency

Table 4.13 presents the coefficients of inefficiency function which explain levels of technical inefficiency among the respondents. It should be noted that the signs of the coefficient in the inefficiency model are interpreted in the opposite way and such a negative sign means that, the variable increase efficiency and positive sign mean that it decreases efficiency (Adebayo, 2007). The coefficient of age (0.531) hadpositive sign and is not inconsonance with apriori expectation. It was not statistically significant and different from zero at 1%. This implies that increase in the age of the farmers by one unit (year) will not increase the efficiency of the farmers i.e an increased in the age of the farmer will not add to their output but will decrease the efficiency of the farmers due to fatigue other related old age factors.

The estimated coefficient for years of farming experience was (0.464), it was statistically significant at 1% rice cultivation. The rice production has a positive coefficient, implying that, respondents with high years of farming experience are not more efficient than those with lower years of farming experience. This is an indication that years of farming experience was not a critical factor of inefficiency among respondents who cultivated rice under in the study area. The coefficient of family size was (0.247), the positive sign

which implies that an increase in family size decrease the efficiency of the rice farmer and significantly different from zero at 1% for rice production.

The coefficient of education was found to be (0.602) and was statistically significant from zero at 1% level of significance; the technical inefficiency which is positive indicates that increase in the respondents' level of education has no implication on the output or profitability of rice production in the study area.

The estimated coefficient for extension contact (-0.216) for respondents involved in rice production in the study area. The negative sign in the rice production implies that an increase in frequency of extension contacts by one contact will increase the efficiency of the farmers by the stated coefficient. This finding is contrary to Dzarma(2011) who reported that extension contact reduces efficiency in sugarcane production in Adamawa State.

The estimated coefficient for years in rice farming (-0.427) and it is statistically significant from zero at 5% level of significance for all the respondents involved in the production rice in the study area. The negative sign implies that years of rice farming is a critical factor in rice farming. This will

make the producer to be aware of the procedures for planting and the natures of problems that are likely to affect the production.

The estimated coefficient for land in rice farming in the study area was found to be (-0.153) which is statistically significant at 1% level of significance. The negative sign implies that the means of land acquisition adopted in the study area has the efficiency and potentials to increase the outputs of the rice farmers in the study area.

Table 4:13 Inefficiency Model

Variable	Coefficient	Standard Error	T-ratio
Sex	-0.531	0.258	-0.205
Age	0.464	0.141	0.327
Family Size	0.247	0.247	0.996
Education	0.602	0.279	0.215
Extension Visit	-0.216	0.376	-0.575
Years in Rice Farming	-0.427	0.434	-0.984
Means of Land Acqisition	-0.153	0.182	-0.841
TOTAL			

Source: Field Survey,2016

Vol.3 Issue.5, October- 2016, pg. 19-31 **ISSN: 2348-1358**

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CONCLUSION

Quality of land and fertilizer were significant at 1% level each while seed and labour were significant at 10% and 5% level respectively, this means that any increase in the quantity of these variables increases outputs and hence profitability of the farmers. Pesticides herbicides were not significance. profit maximization can be achieved if the productive resources such as farm size, credit etc. are provided and mainly if farmers efficiently use the amount of pesticides and herbicides required per hectare because the study reveals overdose use of pesticides and herbicides constituted high variable cost of production.

From the study it was revealed that the farmers in the study area has technical efficiency of 38% in rice production resulting from inability or difficult in accessing farmland, farm credit and processing facilities, this might be the result why Nigerian till date still involved in importation of rice from other countries

