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Returns on investment and technical efficiency in ofada rice production system in obafemi-owode local government area of Ogun state, Nigeria

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ABSTRACT

The paper examined the technical efficiency of ofada rice production system in the prominent rice producing area of Obafemi –Owode Local Government Area in Ogun State, Nigeria. The data used for the study were elicited from 100 ofada rice farmers who were selected using two stage sampling technique. The first stage was the random selection of ten rice producing villages from two rice blocks of Someke and Obafemi in Obafemi Local Government Area, while the second stage was the random selection of ten ofada rice farmers each from the ten villages to make the sample of one hundred ofada rice farmers. The analytical techniques used were descriptive statistics of rice producers, the determination of the rate of return on capital invested (RORCI) on the enterprise after analyzing enterprise profitability and the stochastic production frontier model. The results revealed that an average rice farmer in the study area is a married male of 51 years of age, with farming experience of 19 years, cultivated 3.34 hectares of rice and had little access to credit, extension services and tractor services considered essential for hectarage expansion. The production cost per hectare of rice was estimated as N64,565 with a revenue of N119,222 per hectare. The rate of return on invested capital (RORCI) was 85 percent and this favourably exceeded the prevailing capital lending rate of 18.38 percent. This indicated that on every naira invested in ofada rice production, there was a return of ₦0.85. It thus buttressed the fact that ofada rice production is a profitable venture in the study area. There was low technical inefficiency in ofada rice production in the study area during the 2008 cropping season which was investigated. Technical efficiency of the farmers varied between 0.52 and 0.98 with a mean of 0.89 and about 85% of the sampled farmers had technical efficiency above 0.80. The finding suggested that there is room for improvement in the production system. The variables that influenced ofada rice output included farm size which was significant at the probability level of $P\alpha < 0.01$, pesticide $P\alpha < 0.05$ and seed at $P\alpha < 0.01$ level .The variables were all positively related to ofada rice output level. It was therefore recommended among others that the rice farmers are old and thus need a succession plan of new generation farmers which should be organized into rice farmers association for easy access to credit facilities, extension services and provided tractor services to increase their farm size which is essential for their economic improvement.

Introduction

Food insecurity is a global phenomenon but the Sub-Saharan Africa has been reported to be the worst hit with 31percent of the population (203.5 million people) classified as being under-nourished (FMAWR,2008). The Nigerian food situation is vulnerable to global trends given its being a net importer of major food items. To solve the protracted problems, many countries including Nigeria have embarked on increasing food production. Various governments in Nigeria have been spending a lot on agriculture in order to have abundant food supply and counter the effect of food insecurity, mal-nourishment and other conditions arising from inadequate supply of staple foods. The staple food crops in Nigeria are cassava, yam, maize and rice. FAO (2002) stated that rice is the main source of food energy in Nigeria and that it provides substantial amount of the recommended nutrient uptake of zinc and niacin. It is very low in calcium, iron, thiamine and riboflavin. However, there appears to be some genetic variation for iron and zinc content in rice which may offer an opportunity for improving its nutritional value.

The rapid urbanization in Nigeria has led to an increase in the demand for rice. However, the preference for white milled foreign rice by urban consumers has led to increased importation, inclusive of smuggling. Rice thus constitutes an important staple food in Nigeria. Annual milled rice demand in the country is put at five million tonnes while domestic production is just 2.21 million tonnes, with a deficit of 2.79 million tonnes. The Federal Government has been making considerable efforts to make the nation self-sufficient in rice supply. Apart from rice being one of the preferred food items for most urban dwellers, it has become one of the major cash or economic crops for the growers because of its relatively high price.

The high demand for rice in Nigeria led to high rate of adoption of the locally cultivated rice called 'ofada'. One expected its price to be considerably cheaper but this is otherwise. Ofada rice which is named after the area of

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production in Ogun State is expensive and the peoples' demand is not met. Further-more, a rice processing company in Ogun State named Ofada Veetee rice Limited in Ewekoro Local Government Area has an installed capacity of 75 thousand metric tonnes of rice per annum besides other small processing mills installed by the state government and private initiatives while the area currently is only able to produce about four thousand metric tonnes of paddy rice per annum.

The problem of demand-supply gap in rice production in Nigeria and the attendant heavy import bill, prompts that Nigeria should improve its rice output. One important thing to note is that most of the policies, projects and programmes put in place to increase productivity, have been concentrating efforts on the ecological condition of production area to the detriment of efficiency of use of factors of production in the production system.

The premium accorded ofada rice by consumers as reflected in the relative higher price and demand, suggests that an increase in the level of its production could be a way of bridging the demand-supply gap in rice production. This study therefore focuses on investigating the technical efficiency in ofada rice production system. The need for increased productivity in agriculture is essential as it contributes to the wellbeing of the economy as a whole (Olayide, 1982). Technical efficiency helps to measure the efficient utilization of inputs in producing output. Increased production efficiency implies creating high input-output management which will bring about the maximum potential of output for any particular input used. Knowledge of technical efficiency in production is therefore vital for sound decision making by policy makers.

Ogun State has been identified as one of the thirteen states with comparative advantage in rice production in Nigeria (FMAWR, 2008).Other states are Anambra, Balyelsa, Benue, Delta, Ebonyi, Edo, Kebbi, Kogi, Kwara, Niger, Rivers and Taraba. In Ogun State and specifically in Obafemi-Owode Local Government Area, the state possesses great potential for ofada rice production. This study therefore assesses the technical efficiency of ofada rice farmers and examines the influence of some socio-economic variables on technical inefficiency with a view to increase productivity in order to bridge or reduce the demand-supply gap in rice production in Nigeria. Another objective is to estimate the costs and returns in ofada rice production in the study area, so as to investigate the returns on enterprise investment.

Materials and Methods

Data and Model

Data for the study were collected from a field survey of one hundred rice farmers in Obafemi-Owode Local Government Area(LGA) in Ogun State. Obafemi-Owode Local Government Area was purposively chosen being a prominent ofada rice producing area. Two stage sampling technique was employed in selecting the sampled farmers.

Ogun State Agricultural Development Programme (OGADEP) delineated Ogun State into four agricultural zones, namely Abeokuta, Ijebu-Ode, Ilaro and Ikenne. The various zones are divided into blocks, while the blocks are further divided into cells, (Afolami, 2002).

Obafemi-Owode Local Government Area is under Ikenne zone. Ikenne zone has four blocks which are Isara, Simawa, Someke and Obafemi. Two of these blocks namely Someke and Obafemi are in Obafemi-Owode Local Government Area where rice production is prominent thus they served as the blocks focused on for sampling.

Someke has eight cells, which include Owode, Ajura, Kobape, Oba, Mokoloki, Iro, Ibafo, and Ofada while Obafemi has six cells, which include Obafemi, Kajola, Ajebo, Aiyerose, Ogunmakin, and Adigbe. This implies that there are altogether 14 cells in Obafemi-Owode LGA.

The study covered ten villages in the two blocks of Someke and Obafemi in Obafemi-Owode Local Government Area. The five villages each, randomly selected from Someke block are Owode, Mokoloki, Ofada, Ibafo and Kobape while those randomly selected from Obafemi block are Obafemi, Kajola, Ogunmakin, Aiyerose and Ajebo. This represents the first stage of sampling.

Within the ten villages, ten rice farmers were randomly selected constituting the second stage of the sampling. The total population of rice farmers selected for interview to elicit data for the study was thus 100 respondents.

Analytical Techniques

Some of the data collected were analyzed using descriptive statistics which were used to describe the socio-economic characteristics of the respondent rice farmers as well as investigate their rating of constraints in rice production.

Enterprise profit analysis per hectare which is the difference between total revenue per hectare and the total cost per hectare was estimated after the determination of costs and returns of the enterprise per hectare.

Further, using the rate of return on capital investment (RORCI) which is the ratio of profit to total cost of production, the enterprise profitability level was determined.

Stochastic production frontier model for rice production was estimated to generate measures of technical efficiency of the ofada rice farmers based on the premise that production is bounded by a set of smooth and continuously differentiable concave production transformation function for the production frontier which offers the limit to the range of all production possibilities (Sharma et al, 1999). It has the advantage of allowing simultaneous estimation of individual technical efficiency of the respondent farmers as well as determining technical efficiency (Battese and Coelli, 1995).

The study utilized stochastic production frontier which built hypothesized efficiency determinants into the inefficiency error components (Battese and Coelli, 1995).

Following Zaibet and Dharmapala (1999), the multiplicative stochastic production function is of the form: $Q_i = f(X_{ki}, \beta)\, e\, \varepsilon_i$, $i = 1,\ldots, k$ ………… (1)

where Q_i is the output of the i^{th} farm, X_{ki} is a vector of k inputs used by the ith farm; β is a vector of parameters to be estimated, ε_i is the farm specific composite residual term comprising of a random error term V_i and an inefficiency component U_i,, that is,

$\varepsilon_i = V_i + U_i$ $i = 1,\ldots, n.$ .... (2)

The two dependent components V_i and U_i are assumed to be independent of each other, where V_i is the two-sided, normally distributed random error i.e ($V_i \sim N(0,\sigma_v^2)$, and U_i is one-sided efficiency component with a half-normal distribution, i.e $U_i \sim N(0,\sigma_u^2$ (Dawson 1990, Sharma *et. al*. 1999).

It follows that the maximum likelihood estimation of equation (1) would yield estimates for β and λ, where β was defined earlier, $\lambda=\sigma_u/\sigma_v$, and $\sigma^2 = \sigma^2_v + \sigma^2_u$. Battese and Corra (1977) defined $\gamma = \sigma^2_v / \sigma^2_u$ so that $0 \leq \gamma \leq 1$ and represents the total variation in output from the frontier attributable to technical efficiency.

Empirical Model

For this study, the production technology of the rice farmers in the area was assumed to be specified by the Cobb-Douglas function given by:

$LnQ_i = \beta_0 + \beta_1 \text{ InFZ} + \beta_2 \text{ InLb} + \beta_3\text{InTrct} + \beta_4 \text{ InPstc} + \beta_5\text{InHerb} + \beta_6\text{InSd} + \beta_7\text{In Fert} + V_i - U_i$ ...(3)

Where:

Ln=Natural logarithm (i.e. logarithm to base e)
Q_i = Total output of rice produced in (kg)
FZ= Size of rice farm (ha)
Lb= Total input of labour (both hired and family in mandays)
Trct. = Number of hours of tractor used in rice production
Pstc. = Quantity of pesticides used (litres)
Herb. = Quantity of herbicides used (litres)
Sd = Quantity of seed planted (kg)
Fert. = Quantity of fertilizer used (kg)
V_i = Symmetric random error assumed to account for measurement error and other factors beyond the control of the farmers.
U_i = Accounts for inefficiency in production

A Cobb-Douglas production function was estimated for the rice farms. In addition to determining farmers' technical efficiency in rice production, an inefficiency model was also specified to identify the determinants of farmers' technical inefficiency. The inefficiency model which assumed that the inefficiency effects are normally and independently distributed i.e $U_i \sim N(0,\sigma_u^2)$ (Coelli and Battese, 1996;Okoruwa and Bashaasha,2006;Awotide and Adejobi, 2006) is of the form:

$U_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5$ (4)

Where:

U_i= Farmers technical inefficiency
Z_1= Sex of the farmers (1=male, 0=female)
Z_2= Years of education
Z_3= Household size of the farmers
Z_4= Years of farming experience of the farmers
Z_5= Age of individual farmers (years) and,
δ_i are parameters of the independent variables, i= 1,2…..5

Results and discussion

Table 1 gives the schedule of some of the farmers' socio-economic variables. It shows the mean, minimum, maximum and the coefficients of variation values for farmers age, years of farming experience, farm size, house-hold size and actual house-hold size engaged in rice production.

The results showed that the mean age of farmers in the study area was 51 years with a coefficient of variation of 0.19 . This implies that there was variation among the farmers' age and based on WHO (1991) which gave the average life span of 49 years for Nigerians, the 51 years average age showed that the farmers are relatively old. The average age of the rice farmers is skewed in favor of the high ages. This could have serious implications on the future of ofada rice cultivation in the study area and demands encouragement of new generation of young rice farmers.

The average of farming experience of the farmers is 19 years. The farmers can be said to be quite experienced in ofada rice production, implying that the farmers have gained some experiences overtime. Farming experience coefficient of variation is 0.59 and this shows moderate dispersion of farming experience among ofada rice farmers.

The average rice farm size cultivated by the farmers was 3.34 hectares and farm size has a coefficient of variation value of 0.6087 which can be said to be of wide dispersion. Some farmers thus have very low hectarages of about 0.5 while others cultivated as much as over 10 hectares. The farm size dispersion showed that it is skewed in favour of the small farms.

The mean house-hold size of farmers engaged in rice production was 2.97 and the coefficient of variation for household size engaged in rice production was 0.88 implying high variation in the number of household size engaged in rice production. The mean of household members irrespective of whether or not they engaged in rice production was 8.05 people and the variable had a coefficient of variation value of 0.4966 implying moderate dispersion. When these two means are compared, it suggests that a large number of the household members of the respondent farmers are mostly not available for rice farming activities.

In addition to these, Table 1 gives the low values of volume of credit the farmers were able to access and the few number of people (19 out of 100 respondents) who had access. Similar observations were made in respect of extension services(46 out of 100) and tractor services(15 out of 100). The production constraints viz access to land, credit facilities, extension services, tractor services and marketing, which the farmers were asked to rank regarding the most limiting as 5 while the least limiting is 1, gave the results which showed that the average rank for the first four factors (of land, credit, extension services and tractor services) ranged between 3.5 and 4.5 while marketing had an average of 1. The implication of this is that production constraints of land, credit, extension services and tractor services militate greatly against increasing rice output by the farmers. Marketing as perceived by the rice farmers did not seem to pose much problem.

Costs and Returns

The farm size of an average rice farmer in the area was 3.34 hectares. The costs and returns per hectare of farm is presented in Table 2. Awotide and Adejobi, (2006) defined the rate of return (ROR) on an enterprise as the ratio of the total revenue to total cost of production. It was noted to be similar or identical to the undiscounted benefit cost ratio of a project. Using this approach the study found the enterprise rate of return to be 1.85. This implies that for every N1 invested in ofada rice production, N 1.85 was made as revenue. The rate of return on capital invested (RORCI) defined as the ratio of profit to total cost of production, was estimated as 0.85. This indicated what is earned by the business per capital outlay. The RORCI expressed as percentage which translated to 85 percent was compared with the prevailing prime lending rate which stood at 18.38 percent (CBN, 2009), to determine the desirability of the venture. The result showed that the RORCI of 85 percent is far greater than the bank lending rate of 18.38 percent, thus implying that the business is profitable. The study thus supported both viability and profitability of the venture.

The frequency distribution of the predicted technical efficiency of the farmers is presented in Table 3. The minimum and maximum values are 0.52 and 0.98 respectively and the mean technical efficiency is of the value of 0.89.

Table 3 revealed that the estimated technical efficiency is skewed heavily in favor of those in the above 0.90 range which constituted 63.0% of the sampled farmers. Some 85% of the farmers had technical efficiency above 0.80 while 15% had technical efficiency of below 0.80 value.

This implies that there is high technical efficiency among the ofada rice producers in the study area. There however exists opportunities for improving their current level of technical efficiency. Ofada rice production in the study area could be increased by 11% through better use of available resources given the current state of technology.

Results of maximum likelihood estimates of the Cobb-Douglas stochastic frontier production model which represent the elasticities of the inputs are given in Table 4. Table 4 revealed that the variable inputs such as farm size, pesticide and seed are significant factors influencing the quantity of outputs of ofada rice. The estimated coefficient of farm size is positive, implying that rice output increases with farm size. This factor - farm size is significant at one percent probability level (i.e. $P\alpha < 0.01$).

The positive significant value of the coefficient of seed at $P\alpha < 0.01$, implies that with an increase in seed rate, the quantity of output of ofada rice produced will also increase. The estimated positive coefficient for pesticide variable which is another significant factor at 5% probability level ($P\alpha < 0.05$) implies that an increase in the quantity of pesticide used by the ofada rice farmers will lead to increase in the quantity of output of ofada rice produced by the farmers.

The estimated coefficients for labour, tractor hours and herbicides in the production function though not significantly different from zero have positive values implying that increasing these variable factors will also increase the quantity of ofada rice produced. Fertilizer has a negative estimated coefficient implying a negative influence on the quantity of output i.e. increasing the quantity of fertilizers will lead to decrease in the quantity of output of ofada rice produced by farmers. The coefficient of fertilizer was however not significantly different from zero at 5% probability level. This may be interpreted to mean that the level of use of fertilizer in the rice production system does not affect the level of rice output. It may be due to the high cost of fertilizer which inhibited fertilizer application on ofada rice farms at the recommended rates.

Technical Inefficiency Sources

The results of the estimated coefficients in the technical inefficiency model with variables such as sex of the farmers, their level of education, household size, farming experience and age of individual farmers are also presented in Table 4. The coefficients of most of the explanatory variables viz sex, years of farming experience and age of farmers though not significant are negative, implying technical inefficiency decreases with increasing values of these variables. Put in another way, it implies that efficiency increases with increasing levels of these variables. Thus male farmers, farmers with more years of farming experience and older farmers have lower levels of technical inefficiency, presumably because greater experience and technical knowledge increase technical efficiency.

The negative coefficient of age indicates that increase in age, tends to reduce the level of technical inefficiency and consequently increase the level of the farmers' efficiency. Thus the older the farmers, the higher their level of technical efficiency. Age of farmers can be a proxy for farming experience as farmers may have started farming from tender age and would gain experience over time as they grow, thereby increasing their level of technical capability.

Male farmers are also able to dedicate their time and energy to farming which also contributed to their level of technical efficiency and rice production could be increased if more males are encouraged to go into production.

On the other hand, the coefficients of educational qualification and house-hold size are positive, implying that increasing their values would increase technical inefficiency. They are however not significantly different from zero at 5% probability level ($P\alpha < 0.05$).

Household size can be a proxy for labour supply thus one expected an increase in household size should increase technical efficiency and thus reduce technical inefficiency. Similarly, household size could be a pointer to the fact that large family size may not ordinarily be a direct indication of availability of hands for farm work especially when such children are of age and prefer to be engaged on their own farm or be engaged in a completely different vocation. They may be youths who are not ready to go into farming activities. This is buttressed by the result in Table 1 of the actual average house-hold size of 8.05 as compared with the average house-hold size engaged in rice production which was obtained to be 2.97 people. The direct relationship between household size and technical inefficiency could be the result of high consumption of farm produce by the households which is not commensurate to the work done to support farm operations. Labour capacity can be improved through training to mitigate this. Further-more, in most cases where the large family is available for the farming activities, farm size may be too small for all the members to work effectively and this may lead to under utilization of labour, therefore making the law of diminishing returns come into operation and thus explaining the observed result.

The estimated coefficient of educational qualification though not significantly different from zero had a positive value implying an increase in its value may lead to greater technical inefficiency. This may be explained by the need for a minimum threshold of educational attainment for it to impart significantly on the managerial capabilities of the farmers and when such is not met, the impact might not be significant in increasing rice output.

The equation estimated for the stochastic production model which incorporates the inefficiency factors can be written explicitly as:

$$\ln Q_i = \underset{(18.00)}{5.13} + \underset{(5.66)}{0.3637^{***}} \ln Fz + \underset{(1.04)}{0.07387} \ln Lb + \underset{(0.57)}{0.0218} \ln Trct + \underset{(2.46)}{0.06018^{**}} \ln Pstc + \underset{(0.89)}{0.02487} \ln Herb + \underset{(6.76)}{0.4889^{***}} \ln Sd - \underset{(-0.76)}{0.01548} \ln Fert + V_i - U_i$$

Where

$$U_i = \underset{(1.16)}{0.5534} - \underset{(-1.24)}{0.4966} Z_1 + \underset{(1.36)}{0.0729} Z_2 + \underset{(1.16)}{0.0696} Z_3 - \underset{(-0.92)}{0.01288} Z_4 - \underset{(-1.33)}{0.0648} Z_5$$

Note that the values in parenthesis are t – values.

The maximum likelihood estimators (MLE), provide estimators which are variance parameters sigma squared (σ^2) and gamma (γ). It is evident from Table 4 that sigma squared (σ^2) value is 0.20 while gamma is 0.98 and log likelihood function is 67.92. The estimated sigma squared (σ^2) is significantly different from zero at 10% probability level. This indicates a good fit of the estimated model and the correctness of the specified distributional assumptions of the composite error term.

The gamma (γ) value of 0.9772 implies that 97.72% technical efficiency level was attained by the farmers. Gamma represents the total output made on the frontier production function attributed to technical efficiency. That is, 97.72% of the variation in ofada rice output among the farmers was due to differences in their technical efficiencies. The estimate of technical inefficiency is thus 2.28% and represents the largest proportional reduction in inputs that can be achieved in the production of ofada rice without the output being reduced or affected.

The generalized log likelihood function value of 67.92 suggests the presence of one sided error component. This means that the inefficient factors are significant in the stochastic frontier model and that a classical regression model of production function based on ordinary least squares estimation technique with no technical inefficiency effect is not an adequate representation of the data.

Conclusion

Based on the findings of this study, it is concluded that ofada rice farming is profitable as indicated by the rate of return on capital invested value of 85 percent and the profit of N54, 656.98 per hectare. This translated to the sum of N182, 718.28 profit per cropping season for an average farmer with farm size of 3.34 hectares in the study area.

Ofada rice farmers in the study area have a high level of technical efficiency which ranges between 0.52 and 0.98 efficiency level for the sampled farmers. Since efficiency measurement ranges between 0 and 100 percent, it can be concluded that the technical efficiency is tending towards 100 percent. This result is probably due to the fact that farmers are quite old and are experienced.

Land acquisition, access to credit, extension services and tractor services appeared to constitute problems to the enterprise in the study area. Furthermore, the problem of bird attack on rice fields appeared to be one of the most dreaded factor militating against ofada rice production in the study area. Some farmers reported complete loss of output arising from bird invasion and this threatened their confidence to embark on the enterprise.

Overall, management improvement measures such as education and training of the farmers are required to improve ofada rice production in the study area. Of great importance is the need to have a succession plan of youths to replace the aged farmers as new generation farmers who should be well trained in the rudiments of rice production. Being youths with little or no capital for production, the importance of their having access to credit facilities cannot be over emphasized as it would provide the essential and attractive incentives to make them take to rice farming. Studies have shown that large expanse area of rice could militate against the problem of bird invasion. Setting up of large contiguous farms may be promoted through government intervention in providing land and encouraging youths who like to make carrier in rice production.

References

Afolami,C.A.(2002).An empirical analysis of variety price premium, spatial and temporal pricing patterns for cowpeas in Ogun State, Nigeria. African Crop Science Journal. Vol10 ,No 3 :263-270.

Awotide , D.O and Adejobi A.O. (2006). Technical efficiency and costs of production among plantain farmers in Oyo state, Nigeria. Moor Journal of Agricultural Research, Vol.7, No.2: 107-113.

Battese G.E. and Corra G.S. (1977): Estimation of a production frontier model" with application to the pastoral zone of Eastern Australia. Australian Journal of Agricultural Economics. 20:167-179.

Battese G.E. and Coelli T.J. (1995): A model for technical inefficiency effects in stochastic frontier production function for panel data. Journal of Empirical Economics, 20: 325 – 332.

Coelli T.J and Battese G.E. (1996): Identification of factors which influence the technical inefficiency of Indian farmers. American Journal of Agricultural Economics, Vol 40: 103 – 128.

CBN (2009): CBN Statistical Bulletin. Central Bank of Nigeria, Abuja, Nigeria. Website; www.Cenbank.org

Dawson P.J., (1990). Farm efficiency in England and Wales dairy sector. Oxford Agrarian Studies, 18:35-42.

FAO(2002). ESN Nutrition Profile: Nigeria, Rome, Italy.

FMAWR(2008).National Food Security Programme, 108pp.

Okoruwa, V.O and Bashaasha, B (2006).Technical efficiency of upland and lowland rice production systems in Niger State, Nigeria. Moor Journal of Agricultural Research, Vol.7, No.2: 93-99.

Olayide,S.O. (1982), The focus on small-holder agricultural productivity in West Africa. West Africa Journal of Agricultural Economics .Vol.III, No1:62.

Sharma K.R., Leung P. and Zaleski H.M. (1999): Technical and allocative efficiencies in swine production in Hawaii: A comparison of parametric and non parametric approaches. Journal of Agricultural Economics 20:23 – 25.

WHO, (1991). World Health Organization, News Reports,1991.

Zaibet L. and Dharmapala P.S. (1999). Efficiency of government-supported horticulture: the case of Oman. Journal of Agricultural Systems, 62: 159 – 168.

Table 1: Summary Statistics of Some Socio-economic Variables of the Respondent Farmers

Variable	Mean (μ)	Standard deviation(σ)	Coefficient of variation(σ/μ)	Minimum	Maximum
Age (yrs)	51.26	9.74	19.00	30.00	80.00
Farming experience (yrs)	18.94	11.18	59.03	2.00	50.00
Farm size (ha)	3.343	2.035	60.87	0.5	10.00
Household size	8.05	3.998	49.66	1.00	20.00
Household size engaged in rice farming	2.97	2.611	87.91	0.00	14.00
Access to credit	Yes=19 out of 100		No=81 out of 100		
Volume of credit during the cropping season(N)	20,250	49,728.43	2.46	0	100,000
Farmers visited by extension agent	Yes=46 out of 100;		No=54 out of 100		
Frequency of extension visits during the cropping season/farmer	0.76	0.89	1.17	0	2
Access to Tractor Service	Yes= 15 out of 100		No=85 out of 100		
Tractor Service hour/season	0.52	0.374	0.72	0	2.0

Source: Field survey, 2009.

Table 2: Costs and Returns per Hectare for Ofada Rice Production In the Study Area During 2008 Cropping Season

Revenue/Inputs	Amount in Naira (₦)/ Hectare)	Cost category as percent of Total Cost (%)
Revenue /Ha	119221.96	NA
Cost of preparation of Land	7166.32	11.1
Cost of seed	3364.49	5.21
Cost of land	2500.00	3.87
Cost of labour	36733.47	56.89
Cost of fertilizer	3866.14	5.99
Cost of agrochemicals	6010.96	9.31
Cost of bird scaring	4923.60	7.63
Total Cost/Ha	64564.98	
Profit/Ha	54656.98	
RORCI	0.85	

Source: Field Survey, 2009. N.A. means not applicable

Table 3: Distribution of Respondents By Range of Technical Efficiency

Technical Efficiency (T.E) Range	Frequency	Percent	Cumulative Percent
< 0.60	3	3.0	3.0
0.61 – 0.70	1	1.0	4.0
0.71 – 0.80	11	11.0	15.0
0.81 – 0.90	22	22.0	37.0
>0.90	63	63.0	100.0
Total	100	100.0	
Mean Technical	Efficiency	0.89	

Source: Field Survey, 2009

Table 4: Results of MLE of the Cobb-Douglas Frontier Stochastic Production Function for Ofada Rice Farmers in Obafemi- Owode Local Government Area, Ogun State

Variables	Stochastic Frontier Parameter	Estimated Coefficient	t – value	Std error
Constant	β_o	5.1316	18.0001	0.28508
Farm size (ha)	β_1	0.3637***	5.66	0.06424
Labour (man days)	β_2	0.07387	1.04	0.07054
Tractor (hrs)	β_3	0.0218	0.57	0.03841
Pesticide (litres)	β_4	0.06018**	2.46	0.02446
Herbicides (litres)	β_5	0.02487	0.89	0.027901
Seed (kg)	β_6	0.4889***	6.76	0.072323
Fertilizer (kg)	β_7	-0.01548	-0.76	0.020263
Inefficiency sources				
Variables	Parameter	Estimated Coefficient	t – value	
Constant	σ_0	0.5534	1.16	0.457186
Sex (male = 1, female = 0)	σ_1	-0.4966	-1.24	0.399956
Educational qualification (yrs)	σ_2	0.0729	1.36	0.053647
Household size (number of people)	σ_3	0.0696	1.16	0.059917
Experience (yrs)	σ_4	-0.01288	-0.92	0.014041
Age of farmers (yrs)	σ_5	-0.0648	-1.33	0.0487149
Sigma squared ($\sigma^2 = \sigma^2_u + \sigma_v^2$)		0.20149*	1.51	0.13355
Gamma		0.97721***	54.45	0.017948
Log likelihood function		67.92		
Mean technical efficiency		0.89		

Source: Field Survey Data analysis, 2009

Note: *** - estimated parameters significant at 1% probability level

** - estimated parameter significant at 5% probability level, * - estimated parameter significant at 10% probability level.