RESOURCE USE EFFICIENCY IN RICE PRODUCTION IN OGBOMOSO AGRICULTURAL ZONE OF OYO STATE

BY

OLATOYAN O. W.

AEE/99/3078

July, 2008.

RESOURCE USE EFFICIENCY IN RICE PRODUCTION IN OGBOMOSO AGRICULTURAL ZONE OF OYO STATE

BY

OLATOYAN O.W

B.SC (HONS) UNILORIN

AEE/99/3078

BEING A RESEARCH THESIS

SUBMITTED TO THE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

FACULTY OF AGRICULTURAL SCIENCES,

IN PARTIAL FULFILMENT OF THE REQUIREMENT

FOR THE AWARD OF MASTER OF TECHNOLOGY

(M.TECH) THE FEDERAL UNIVERSITY OF

TECHNOLOGY, AKURE, NIGERIA

July, 2008.

ABSTRACT

This study concerns with the issue of resource use efficiency in rice production in Ogbomoso, Agricultural zone, Oyo State of Nigeria. The objectives are to examine factors affecting rice production for the farmers. Primary data were collected with the use of structured questionnaire based on socio-economic characteristics of farmers.

Both descriptive statistics and econometric method using the stochastic frontier production function were used for data analysis. The result of the research showed that more male respondents who are married and fairly educated and middle age were involved in rice production in the area. The average household size of the farmers was 12 with average farm size less than one hectare. The minimum technical efficiency of the respondents was 0.70 while the maximum was 0.97; the mean technical efficiency was 0.09. This shows that technical efficiency is significant for large number of farmers who use manure; other independent variables such as operating expenses, seed planted, family labour and farm size was also significant. Contrawise, the effects of hired labour, age, farming experience, education, and extension visits had no significant effect on technical efficiency of rice farmers.

CERTIFICATION

This thesis with title, Resource use efficiency in rice production in Ogbomoso agricultural zone of Oyo State, submitted by Olatoyan O.W has satisfied the requirement for the award of degree of Master of Technology, Federal University of Technology, Akure.

Dr. I.A. Ajibefun

Supervisor

.....13/10/2008.....

Signature & Date

Professor S.O. Ewuola

Head of Department

.....

Signature & Date

DEDICATION

The research work is dedicated to the Almighty God, my dear wife and children.

ACKNOWLEDGEMENT

I give glory and honour to God for the successful completion of this programme.

I want to use this medium to express my gratitude to those who have one way or the other, contributed to the success of this research work. Firstly, I want to thank my supervisor, Dr.I.A. Ajibefun, for his contribution to the research work. I cannot but appreciate the Head of Department, Professor S.O. Ewuola for his support towards the successful completion of the programme.

My appreciation goes to my dear wife Mrs. Grace Olatoyan and children, Faith Olatoyan, Jeremiah Olatoyan and Joshua Olatoyan for their moral support during the course of the programme.

I would like to thank my Regional Overseer, Pastor A.A Adeogun and Deeper Life Bible Church Members who contributed one way or the other to the success of the programme.These include; Pastor N.A. Adeleye, Pastor Sule Omogbai, Pastor James Sangodokun, Brother J.O Fateru, Brother Akinola Segun, Bro James Ojebamigbe, Brother S.O. Afolabi, Brother Tola Ariyo, Brother Adeladun Ajala, Brother John

Oladosu, Brother Peter Ewetola, Sister Funmi Ajala, Sis Bose Ewetola and so on.

Lastly, I would like to thank the lecturers in the Department of Agricultural Economics and Extension, FUTA for their contribution to the work during the seminars such as; Dr. S.O Ojo, Dr. J.O Okunlola, Prof. I.I Ihimoudu, Prof. Daramola, Dr. J.A Afolabi, Mrs. S.F Arifalo and others, and Dr. J.O Ajetumobi, Mr. Binuomote Samuel from the Department of Agricultural Economics and Extension of Ladoke Akintola University of Technology, Ogbomoso, Oyo State. My appreciation goes to Dr. (Mrs.) N.N. Nwankpa, Pastor A. Adeleye of Federal Polytechnic Ede for their contributions.

Thank you very much.

TABLE OF CONTENT

LIST OF TABLES

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Food production is a crucial phenomenon for man's continual existence on the planet. The quantity and quality of food produced will determine the quality of lives of the people. The importance of rice production to the national economy cannot be overemphasized. Rice is used in various ways as food and as the main ingredient in the production of several products such as wine, alcohol, starch and livestock feeds. Rice is also used as a source of organic fertilizer. In Nigeria, rice is being increasingly demanded by both household consumers as well as institutions (such as schools, hospitals, etc) and at social gatherings. However, production of rice has not kept pace with the demand for it. This has led to the importation of rice into the country (Afolabi, 1984)

Therefore, the National Agricultural Policy meant to boost Agricultural production in Nigeria does not leave out rice production among other crops. The policy focus on small-scale farming and medium / large scale farming, since small scale farmers cultivate up to 90 % of land meant for agricultural production in Nigeria (Project Co-ordinating Unit, 2002).

The focus of the policy is on the evolvement of programmes, which will ensure that agricultural resources and services are directed to small-scale farmers with a view to improving their resource productivity and increasing their agricultural output. It is believed that Nigeria will witness a steady decline of small-scale farmers and a gradual increase in the average size of farms in the coming decades.

In order to aid food production in Nigeria including rice, National agricultural policy make a provision for:

a. Supply of seed through the production of foundation seeds of improved crop varieties and their subsequent multiplication as commercial seed. This will be funded by National and State Seed Multiplication Agency.

b. Supply of water for food such as rice production through the construction of irrigation structures, dams and boreholes.

c. Supply of fertilizers to farmers at affordable and subsidized rate

It is believed that if these policies are implemented there will be significant increase in food production which rice production is an important aspect.

1.2 Statement of Problems

As Nigeria struggles to provide adequate food supply for her population which grows at a rate of about 3.2% per annum, prime objective of agricultural and economic development is the production of sufficient quantity of food items, which has been the major concern of Nigerians. It is equally true that most food crops serve as raw materials for agro-based industries thus increasing the overall demand for this crop Obwona (2000).

Rice is a major food crop widely grown and massively consumed in Nigeria since the mid 1980's. Rice consumption in Nigeria has increased on an average rate of 11% of which only 3% can be explained by population growth. The remainder represents a shift in diet towards rice at the expense of other coarse grains (Millet & Sorghum) and Wheat. An estimate of 2.1 Million tonnes of rice is consumed annually in Nigeria. (IRRI, 1997).

The improvement of rice production will certainly expand its total output and hence alleviate problems arising from domestic

demand for rice. The production could however be improved mainly by improving the pattern of resource-use in the production and adoption of new technology disseminated to the rice farmer. (Macauley,1995). Schmidt et al (1964) said that the introduction of new technologies has been used as a standard for distinguishing a modern agricultural system from a traditional system. But in developing countries like Nigeria, some new agricultural technologies have been only partially successful in improving efficiency. This could be attributed to differences in the use of resource endowments, which are also due to different farm sizes and different tenure systems in the particular area.

Furthermore, lack of ability and unwillingness to adjust input level on the part of producers could be a contributing factor as well as producers familiarity with the traditional systems with their inability to adjust to new methods of technical efficiency of production. Against the above background, this study intends to explore the following questions: -

(i) What are the socio-economic characteristics of the respondents?

(ii) What are the factors affecting rice production in the area?

(iii) What is the economic efficiency of rice farmers in the study area?

(iv) What is the technical efficiency of the rice farmers?

(v) What are the sources of inefficiency in rice production?

Objectives of the Study.

The main objective of this study is to analyse the resource use efficiency in Rice Production in Ogbomoso area of Oyo State.

The specific objectives are to:

i. examine the socio-economic characteristics of Rice farmers,

ii. examine the factors affecting Rice Production in the study area,

iii. determine the economic Efficiency of the rice farmers,

iv. estimate the technical efficiency of rice farmers, and

v. identify sources of inefficiency in rice production.

Justification of the study.

It is generally believed that increasing productivity is an essential goal to ensure a high standard of living for all citizens. As development, growth and change become the phenomena, which economic theory has to explain and economic policy has to manage, interest in national productivity becomes increasingly central.

However, productivity growth has not generally been a major priority in Nigeria's national economic policy formulation. Public and Private Policies have not been strongly or systematically aimed at achieving better competitive capabilities in terms of relative unit cost. For instance, farmers' income determination processes have not been consistent with well functioning labour markets.

During the last fifty years, economic analysis has endeavoured to clarify the measurement of productivity, and to provide information about its growth. The research questions of interest will centre on the following: can it be said that the rice farmers in the study area are more efficient in their use of production resources? If yes, what are the determinants of the capability of these farmers to allocate resources more efficiently? Answers to these questions will provide an insight into the contribution of the resources use efficiency in rice production and food production in general.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Rice Production

Much of the studies that have been carried out on rice focused attention on varietals development, production, marketing, processing and storage. Some of these works are reviewed and presented as follows: Huang and Liu (1994) revealed that the substantial increase in grain production in India, Pakistan and Philippines was the due to an improved package of inputs which include high yielding varieties of crops, increased fertilizer use, irrigation and improved cultural practices.

Filani (1980) revealed that rice can be produced in all States of Nigeria. Although the bulk of rice produced in Nigeria is produced in the swamp and upland areas, potential exist for increased output through irrigation. Adeniyi, (1988),Olayemi (2004), Adeniyi (1976) and Ajibefun et al, (1996) observed that most Nigerian farmers who cultivate rice as a major crop also cultivate a number of other crops. Adeniyi (1978), revealed that rice cropping system in Nigeria is beset with problems associated with yield, relative high production costs, relatively poor producer prices, and poor marketing. Hence, this leads to decline in the local production of rice.

Adeniyi (1978) observed that the natural average yield of rice per hectare ranged between 1.3 and 1.9 tonnes. These estimates, he pointed out, are low compared with experimental yield obtained in research fields. He revealed that this yield is about half of what obtains in some rice producing countries such as Egypt, Japan and China. Perez (1976) also attributed low yield to the problem associated with the available rice varieties. Joshua and Singh (1978) revealed that the effectiveness of all other inputs such as fertilizers, and chemicals depends on the availability of high quality seeds to farmers at the right time and in required quantities.

Onwueme and Sinha (1991) observed that some farmers that were supplied with improved seeds still relied heavily on project farmers for the information on prices and the supply of the inputs. The result obtained by Adeniyi (1978) indicated a decreasing return to scale in rice production, while Olayemi and Oni (1974) revealed an increasing return to scale in rice farming in Kwara State. Adekanye (1974) revealed that the evidence of market inefficiency of rice grain in Western States was due to high costs of providing marketing services and inadequate marketing facilities in grading and standardization. Osuntogun and Adeyemo (1985) revealed that

the most important constraints to higher efficiency in rice milling is inadequate and high seasonal supply of paddy.

Barau (1985) reported other problems such as lack of storage facilities and non-utilisation of by-products. Shobowale (1992) identified the inability of the states seed multiplication unit to produce enough certified seeds to meet national demand was due to inadequate funding, uncertainty of the amount of available funds and late release of funds to buy back contracted seeds from growers; lack of processing and storage facilities in some new states; inability to operate on semi-commercial lines; non-revolvement of the substantial revenue generated from sales of seed.

2.2 Methodological Literature

The efficiency measurement was first undertaken by Farrell (1957). He distinguished between technical and allocative efficiency. Technical efficiency refers to the ability of producing a given level of output with minimum quantity of inputs with given technology; while allocative efficiency refers to the choice of the optimal input proportions given relative prices. Economic efficiency is the Product of technical and allocative efficiency.

Farrell (1957) developed a model known as a deterministic, non-parametric frontier which attributes any deviation from frontier to inefficiency but does not impose any functional form on the data. Aigner, et al(1985) developed another approach for measuring efficiency. This model seeks to ameliorate the extreme observed problem, which was the characteristic of deterministic model. Apart from Stochastic frontier model there are other models being used to measure resource use efficiency. Fagade (1985) noted that the use of high quality seeds of improved varieties is one of the cheapest, simplest and most effective way of increasing agricultural production. He observed that farmers all over the world know that seeds with inferior quality or of low yielding varieties lead to futile production efforts.

Afolabi (1984) revealed that the best control of rice input is to increase local production of rice. He mentioned that tariff rate increase was similarly effective. Alimi (2000) identified the problem of increased use of improved seed varieties as the high prices of inputs that goes along with the use of improved varieties. He however, noted that this problem was as a result of farmers failure to realize that the high prices of inputs is to be offset by higher yield per hectare and increased returns.

Falusi (1992) revealed that there is high complementary between improved seeds, fertilizer and agro chemicals, the yield increases expected may not materialise. He identified six basic factors that tend to influence demand for improved seeds, namely; farmers perception of the yield or quantity advantages of commercial seed to farmers saved seeds, price of other inputs relative price of crops, weather condition and costs of reaching distribution/retail outlet.

FAO (1999) highlighted major constraints to rice production as bird scaring, non availability of good seeds and fertilizer.

Huang and Liu (1994) used model which deals with time series data to estimate data for Indian rice and the farm effects were found to be a highly significant component of the variability of rice output, and the individual farmer technical efficiencies were estimated to range from 0.64 to 0.91 with average of 0.70. It indicated that the farming experience, level of education, access to credit and extension contacts had significant influences on the variation of the farmers' efficiencies.

Kumbhakar (1994) used flexible (translog) production function to estimate efficiency of 227 farmers from West Bengal, Indian .It

was discovered that the mean level of technical efficiency is 75.46% while the best farm is 85.87% efficient.

Imolehin and Wada (2000) developed utility efficient programming which he used to estimate the farmers revenue curve through the non linear discrete Stochastic programming method in the analysis of the economic efficiency of a sample farmers in Iran. He says that it would be feasible to increase substantially farmers' total net revenue by increasing their economic efficiency in terms of technical and allocative efficiencies.

Flin (1995) used farm specific profit inefficiencies among Basmati rice producers to estimate variable coefficient profit functions and drew a conclusion that the mean level of inefficiency was low. Then, average loss or profit per hectare was notable and he discovered that socio economic factors related to profit or loss were the farm households' education, non-agricultural employment, credit constraint and water constraint, late application of fertilizer were the determinant factors for profit or loss. And they suggested that that if the benefits of increasing farmers profit efficiency are large by making improvement on factors which were causing the profit or loss, then the Basmati rice producer may generate appreciable amount as extra profits in each season.

Similarly, Lau and Yotopolous (1973) in their formulation of the test of equal relative economic efficiency by using M'C Fadden's profit function, to express farm's maximized profit as a function of the prices of output and variable inputs of production and of the quantities of the fixed factors. They found out that the relative economic efficiency is in favour of the small firms and it was discovered that within the observed prices of output and variable inputs (labour), the small farms have higher levels of price efficiency (i.e. of optimal price behavior) and they operate at higher levels of price efficiency. It was finally, deduced that in agriculture, the supervisory role of the owner and manager of the farm may be crucial for attaining high levels of economic efficiency.

Meeusen and Van den Broeck (1977) had a contrary view when they used the stochastic production frontier Cobb-Douglas function model to determine whether there were any differences in the technical efficiencies of small and large crop and mixed enterprise farms in the West Tennesse. They discovered that there were no significant differences according to acreage or value of farm sales. Similarly, they used the same data set to investigate whether there were any significant differences in the mean technical

efficiencies of part time and fulltime farmers engaged in the mixed farming.

Rahman (2003) conducted a research which revealed that the efficiency is gender biased while he used profit function method to test for efficiency differences between men and women farmers in African Agriculture which necessitate their review of literatures on gender and farm efficiency. It was found out that generalisation on efficiency is often dependent on the location and context of the Agricultural system. Among other things, deduction from their findings revealed that there was relative degree of economic efficiency of women farmers They have absolute allocative efficiency in the use of inputs at their disposal; although this did not translate into higher economic efficiency, due to possibly lack of better technical options. In turn, men farmers are able to get higher prices for their rice than women due to better organisation of men farmers in cooperative societies. Lovell et al, (1990) found out that parametric statistical approach is good for assessing technical efficiency of firms exploiting renewable resources due to the inherent stochastic nature. In similar manner, Aigner et al, (1985) identified that the statistical approach should be considered superior to non parametric approaches.

A stochastic parametric decomposition and neoclassical duality model to measure the technical, allocative and economic efficiencies of hybrid and conventional rice production in China was employed. Bravo-Ureata and Evenson (1994) used the same model to measure the efficiency of peasant farmers from Eastern Paraguay. They found out that there is an average economic efficiency of 40.1% for cotton and 52.3% for cassava. This result suggests a considerable room for productivity gains for farms in the sample through better use of available resources given the state of technology. The stochastic production function is a tool that has been used by many authors to measure efficiency in the production of rice and other staple crops.

Bravo-Ureata and Evenson (1994) used stochastic frontier to measure efficiency in agricultural production. The case of peasant farmer in eastern Paraguay suggests that Paraguay peasants are yet to reach such a high level of productivity. Hence, improvement in educational and extension services would be needed. Battese and Coelli (1995) used the same frontier production function in measuring technical efficiency of Philippine rice farmers in irrigated, rainfed, lowland and upland environments. The frontier production

function analysis revealed that most efficient farmers use lesser cash inputs than the average farmers.

Coelli (1996) used frontier production function to test technical and allocative efficiency in rice production. A case from one village in Ngawi regency, East Java where he discovered that large number of farmers and owners operating farms did not appear to be less efficient than small farmers and tenants respectively.

Bravo-Ureata and Rieger (1991) in Dairy Farm Efficiency Measurement using stochastic frontiers and neoclassical duality efficiency for the farmers in the sample is about 70% and that on average, there is little difference between technical (83.0%) and allocative (84.6%) efficiency. Also, analysis of the relationship between efficiency and socio economic variables reveals that despite some statistical significant associations, efficiency levels are not markedly affected by these variables.

Osuntogun and Adeyemo (1985) studying resource productivity in cooperative group farming in Imo State of Nigeria also adopted the production function approach. They fitted the linear and Cobb-Douglas function. They observed that labour, land and capital are the three main input factors that influenced production in the cooperative groups. However, they did not

measure the effects of fertilizer and chemicals since they were sparingly used while mechanical and animal power were not used at all by the group farmers during the period of the study.

Osuntogun and Adeyemo (1985) showed that the land and the capital are under-utilized by cooperative farmers while labour input is excessively utilized. Hence, the suggestion that to attain economic optimum, the societies should reduce the use of labour input and increase that of land and capital inputs to the point where the marginal value product of the resources would be equal to their acquisition costs.

Fan (1997) used an accounting approach to separate the relative contribution of institutional change, technological progress and increases in inputs to the rapid Chinese agricultural production growth in the early 1980's.He found that about 63 percent of total production growth was attributed to efficiency improvement (institutional change) and 37 percent to technological changes. Increase in inputs played an important role to Chinese agricultural growth. Total input growth accounted for about 57.7 percent of the total production growth. However technological change only accounted for 15.7 percent of total production growth in China,

indicating that the potential of production growth can be achieved by stimulating technological progress in Chinese agriculture.

Yao and Liu (1998) used a Cobb-Douglas production for agricultural outputs with a farm household survey data to test the hypotheses on economies of scale, diseconomies of multiple plots and multiple crops, and estimated their impacts on total productivity and the marginal products of labour and other inputs.

2.3 Productivity, Production Efficiency and their Measurements.

Productivity is used to measure rate of technical change in production (Farell, 1957) Productivity can be conceptualised as two main components: Partial factor productivity and total factor productivity. Partial factor productivity also called average product is defined as the ratio of output to a specific input. Let Y be denoted as output. Then Xi as an individual input factor. Then, partial productivity of input of Xi (Api) is

(1) $APi = Y/Xi$

Partial factor productivity only measures the contributions of one particular input to technical change ignoring the effect from other input factors. Total Factor Productivity (TFP) is defined as the

average product of all input factors. It is the ratio of output to an index of input. Let X denote the index of all input then TFP is

(2) TFP= Y/X =Y/ iXi

where i is the weight of input Xi.

TFP can be calculated by estimating aggregate production functions or cost function with limited functional forms and imposed restrictions on econometric parameters. TFP can also be measured using indexes such as laspeyres, paasche, fisher or tornquist-tneil indexes. Index approach imposes restrictions on production technology by putting weight on input and output.

Two types of production efficiencies were defined by Farrell (1957) technical efficiency and allocative efficiency. Technical efficiency evaluates a firm's ability to obtain the maximum possible output from a given set of input, while allocative efficiency measures the firm's ability to maximize its profit. Traditionally, Stochastic production frontier approach was used to measure technical efficiency and allocative efficiency given the technology and prices. However, this econometric approach requires the specification of production technology. Recently a mathematical programming approach such as Data Envelopment Analysis (DEA) was developed

to measure technical efficiency by comparing the individual firm's production to the best practice frontier Seiford and Thrall, (1990). Conclusively, from the literature review, diver methods used in different places were gathered with the technical efficient measure that can be applied in evaluating resource use efficiency in rice production in Ogbomoso Agricultural zone of Oyo State.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY.

3.1 The Study Area.

The study was carried out in Ogbomoso Agricultural Zone of Oyo State. The zone under study comprises five local governments namely: Ogbomoso North, Ogbomoso South, Ogo Oluwa, Surulere and Orire Local Government. The study area falls within latitude 80° North of the equator. About 70% of the population engages in the production of both staple and cash crops.

3.2 Data Collection and Analysis.

Primary data were used in this study. The primary data were collected with the use of structured questionnaire. The questions were centered mainly on socio-economic characteristics of the farmers, their use of some factors of production and their production constraints. The socio-economic characteristics considered include age, education, family size, non-farming activities, nature of farming, record keeping habit, farming experience while the factors of production considered includes land, labour, fertilizer, insecticides, herbicides and management related variables.

Stratified sampling technique was employed in the selection of the respondents. Twenty five respondents were selected from each of the four local governments and twenty-nine respondents from Orire local government. This makes a total of one hundred and twenty nine.

3.3 Analytical Techniques

Tables and frequency distributions were used to analyze socio-economic characteristics of the respondents while stochastic frontier analysis was used to examine the Technical Efficiency level of the rice farmers in the study area. Marginal analysis principle was used to examine the resource-use efficiency of rice production in Ogbomoso agricultural zone of Oyo state.

Stochastic Frontier Efficiency Model for Rice Farmers

The stochastic frontier production function model, which was specified for the farming operations of rice farmers in Ogbomoso Agricultural zone of Oyo State in given by:

$$\text{InY} = L_n\beta_0 + \beta_1 L_n X_1 + \beta_2 L_n X_2 + \beta_3 L_n X_3 + \beta_4 L_n X_4 + \beta_5 L_n X_5 + \beta_6 L_n X_6 + V_{it} - U_{it}$$

Where ln represent the natural logarithm

(base e) the subscripts, i and t, refers to the i sample farmers in year t.

Y = Output

X_1 - Farm size

X_2 - Family Labour

X_3 - Hired Labour

X_4 - Seed used

X_5 - Operating expenses

X_6 - Manure

The Vits are assumed to be identically and independently distributed N (0, σv^2) random errors, independently distributed of the U_{its}; which are assumed to be independently distributed non-negative functions of the normal distributions with some variance, σ^2 such that the mean, μ_{it}, is defined by:

$$\mu_{it} = \delta_0 + \delta_1 l_n Z_1 + \delta_2 l_n Z_2 + - - - \delta_4 l_n Z_4$$

where Z_1 = Age

Z_2 = Years of farming experiences

Z_3 = Education

Z_4 = Extension

The parameters of the model are estimated by maximum-likelihood methods using computer program, FRONTIER VERSION

4.1 Written by Coelli (1996) in which the variance of parameters are expressed in terms of

$$\delta_s^2 = \delta^2 + \delta_v^2 \quad \text{and}$$

$$= \delta^2/\delta_s^2$$

The technical efficiency of the i-th farmer and the t-th year is defined as the ratio of the observed output to the frontier output. Given the specification of the stochastic frontier model equation, the technical efficiency of the i-th farmer in t-time period is given by:

$$TE_{iE} = \exp(-\mu_{it})$$

Its value lies between zero and one, and are inversely related to the technical inefficiency effect.

CHAPTER FOUR

4.O RESULT AND DISCUSSION

4.1 Analysis of Socio-Economic Characteristics of The Respondents

4.1 Distribution of Marital Status of the Respondents

Table 4.1 shows that 37.2% of the rice farmers interviewed are single while 62.8 % are married. This implies that majority of rice farmers in Ogbomoso Agricultural Zone are married. It could be clearly seen that more married people engage in rice production in the study area than the singles. Married farmers have the advantage of using family labour in rice production.

Table 4.1: Distribution of Marital Status of the Respondents

Status	Frequency	Percentage	Cumulative %
Single	48	37.2	37.2
Married	81	62.8	100
Total	**129**	**100.0**	

Source: Field Survey, 2006

4.2 Gender Distribution of the Respondents

Table 4.2 shows that 67% of the rice farmers interviewed are males, while 32% are females. This shows that the majority of the rice farmers are males. This is because rice farming is a tedious job. It involves rigorous activities such as bush clearing, stumping, ridging, weeding, pest control, harvesting and processing. Few females who are agile and who have capitals to hire labourers are into rice growing in the area.

Table 4.2: Gender distribution of the respondents

Sex	Frequency	Percentages	Cumulative %
Male	87	67.4	67.4
Female	42	32.6	100
Total	**129**	**100.0**	

Source: Field Survey, 2006

4.3 Manure Usage of the Respondents

Table 4.3 shows that 48.8% of the respondents did not use manure while 51.2% use organic manure to improve the soil condition for the production of rice. This implies that roughly half of

the respondents spend less money on inorganic fertilizer, thereby reducing their cost of production, which will eventually increase rice production. For resources to be more efficiently utilized, there is need to orientate the farmers to make use of organic manure, it is natural without much side effects and it is also cheap and can be affordable by the farmers.

Table 4.3: Manure Use Distribution of the Respondents.

Response	Frequency	Percentages	Cumulative %
Didn't use Manure	63	48.8	48.8
Used Manure	66	51.2	100.0
Total	**129**	**100.0**	

Source: Field Survey, 2006

4.4. Educational Level of the Respondents

Table 4.4 shows that 19.4 percent of the respondents had no formal education at all. Also 19.4% of them had primary education. 31.0% had secondary education while 30.2% had tertiary education. The population of the respondents with tertiary education implies that a good number of rice farmers in Ogbomoso Agricultural zone are educated and will be able to adopt the latest improved rice production technology and resources in their farming activities.

Table 4.4: Educational Level of the respondents.

Educational Level	Frequency	Percentages	Cumulative %
No Education	25	19.4	19.4
Primary Education	25	19.4	38.8
Secondary Education	40	31.0	69.8
Tertiary Education	39	30.2	100
Total	**129**	**100.0**	

Source: Field Survey, 2006

4.5 Extension Agents visit to rice farmers

The table 4.5 shows that 53.5% of the respondents were not visited at all by the Extension Agent, while 46.5% of the respondents had been visited by Extension Agents. This shows that extension outreach is yet to reach more than 50% of the rice farmers in the study area. If more Extension Agents are employed for the area and they are faithful and diligent in discharging their responsibilities, there will be increase in efficient use of available resources for rice production.

Table 4.5: Extension Agent Visit to Rice Farmers.

Extension Visits	Frequency	Percentages	Cumulative %
No	69	53.5	53.5
Yes	60	46.5	100.0
Total	**129**	**100.0**	

Source: Field Survey, 2006

4.6 Age distribution of rice farmers

Table 4.6 shows that only 12.4 % of the respondents are between 21-30 years old, 35.7% are between 31-40 years old, 36.4% are between 41-50 years old, while only 15.5 % are between 51-60 years old. The table shows that majority of rice farmers in Ogbomoso Agricultural zone falls between ages 31 and 50.

The majority still falls around the middle age. This is the state of economic buoyancy of the farmers. Also, it is a period in which the rice farmers are strong and energetic. Above fifty, the participation of the respondent in rice production decline due to loss of vigour, strength and vitality which sets in at that stage of life. From the table, it could seen that young people below 20 years old

do not participate at all in rice production. This may be due to the fact that they are under their parents' tutelage.

Table 4.6: Age Distribution of rice farmers

Age	Frequency	Percentages	Cumulative %
21-30	16	12.4%	12.4
31-40	46	35.7%	48.1
41-50	47	36.4%	84.5
51-60	20	15.5%	100
Total	**129**	**100**	

Source: Field Survey, 2006

4.7: Farm size of rice Farmers

Table 4.7 shows that 72.9 % of rice farmers in Ogbomoso Agricultural zone cultivate less than 1 hectare of land. Hence, rice farming in Ogbomoso Agricultural zone is predominantly at subsistence level. Lack of enough capital, land, and labour could have accounted for this for the observation.

To improve rice production in Ogbomoso Agricultural zone, the above mentioned production constraints should be solved. All the factors responsible for them should be critically looked into and

solution proffered to them around the domain of land, labour and capital which directly affects production.

Table 4.7: Farm size of rice farmers in Hectares

Farm size	Frequency	Percentages	Cumulative %
0 – 0.99	94	72.9%	72.9
1.00 – 1.99	15	11.6%	84.5
2.00 – 2.99	17	13.2%	97.7
3.00 – 3.99	3	2.3%	100.00
Total	**129**	**100.0**	

Source: Field Survey, 2006

4.8 Distribution of rice farmers by their household size

Table 4.8 shows that majority of the respondents have a household size of 11-15 people which constitute 31% of the rice farmers interviewed. This is followed by household size of 6-10, which is 29.5% and followed by household size of 1-5, which constitutes 16.3%. Only few of the respondents' had households of between 16-40. This implies only few rice farmers have very large family size. Large household size implies that there will be

advantages of the use of family labour and small household size will depend on hired labour in addition to the family labour so as to meet up with the labour requirement of the farm. The implication of this is that the larger the household size the higher the efficiency of resources use, provided strong men dominate the large family.

Table 4.8: Household size of the rice farmers

Household size	Frequency	Percentages	Cumulative %
1-5	21	16.3%	16.3
6-10	38	29.5%	45.8
11-15	40	31.0%	76.8
16-20	9	7.0%	83.8
21-25	15	11.6%	95.4
26-30	1	0.8%	96.2
31-35	3	2.3%	98.5
36-40	2	1.5%	100.0
Total	**129**	**100.0**	

Source: Field Survey, 2006

4.9 Family labour being used by the rice farmers

Table 4.9 shows that 9.3% of the respondents do not use family labour at all. 24.8% spend between 1 to 10 mandays, 26.4% make use of family labour of 11-20 mandays, 15.5% make use of 21 to 30 mandays, and 10.1% used 31 to 40 mandays. An aggregate of 13.9% made use of more than 40 mandays per annum. Majority of the respondents in the study area utilized family labour. The labour usage is still very low and limits their production of rice to subsistence level. There is a sharp decrease in the frequency of the respondents as labour use increase from 31 mandays to 100 mandays.

Table 4.9: Family Labour used by the rice farmers

Family Labour (man days)	Frequency	Percentages	Cumulative %
0	12	9.3%	9.3
1-10	32	24.8%	34.1
11-20	34	26.4%	60.5
21-30	20	15.5%	76.0
31-40	13	10.1%	86.1
41-50	4	3.1%	89.2
51-60	7	5.4%	94.6
61-70	5	3.9%	98.5
71-80	0	0.0%	98.5
81-90	1	0.77%	99.27
91-100	1	0.77%	100.09
Total	**129**	**100.0**	**100.0**

Source: Field Survey, 2006

4.10 Amount spent on rice production

Table 4.10 shows that 66.7% of the respondents did not spend anything on pesticide. Only 23.3% spent between ₦100 to ₦2,000 on pesticide. Only few farmers between 3% to 4% spent ₦3,000 and above on pesticide. Since majority are not using pesticides, a lot of

rice gram, seedling and stands would be lost to pest attack which may consequently reduce the overall output at the end of the day. Also, the result on the table shows that farmers need to be orientated on the use of pesticide. It is also the role of government to aid importation of effective pesticides into the country so that it would be made available to farmers at a subsidized price.

Table 4.10: Distribution of the Respondents based on Pesticide cost

Pesticide Cost	Frequency	Percentages (%)	Cumulative %
0 – 100	86	66.7	66.7
101 – 1000	21	16.3	83.0
1001 – 2000	9	7.0	90.0
2001 – 3000	4	3.1	93.1
3001 – 4000	4	3.1	96.2
Above 4000	5	3.8	100.0
Total	**129**	**100**	

Source: Field Survey, 2006

4.11 Respondents use of Urea Fertilizer

In Table 4.11, 51.9% of the respondents spent no money on urea fertilizers, 20.9% spent between ₦1 to ₦100, and 15.5% spent between ₦101 to ₦200 respectively. Only few rice farmers of 3.9%,

3.1%, 3.1% and 1.6% spent above ₦200 on urea fertilizers. The output of the respondents is affected due to large percentage of the respondents who are not using Urea fertilizer which has the potential of boosting agriculture production most especially in lands that are not all that productive as a result of continuous cropping

Therefore there is need for Government to make fertilizer available in a subsidized affordable price. The farmers also need to be enlightened on the benefits of using fertilizer to boost their production.

Table 4.11: Use of Urea Fertilizer by rice farmers

Use of Urea Fertilizer	**Frequency**	**Percentages (%)**	**Cumulative %**
Not used	67	51.9	51.9
1 -100	27	20.9	72.8
101 – 200	20	15.5	88.3
201 – 300	5	3.9	92.2
301 – 400	4	3.1	95.2
401 – 500	4	3.1	98.4
Above 500	2	1.6	100.0
Total	**129**	**100**	**100.0**

Source: Field Survey, 2006.

4.12 Operating Expenses of the Respondents on Rice Production

Table 4.13 Shows that the operating expenses of 55% of the respondents was between ₦1,000 and ₦5,000. 13.2% spent between ₦6,000 and ₦10,000 while 7.8% spent between ₦11,000 to ₦15,000. This shows that the capital invested by rice farmers on production is low, only few who are practicing at commercial level are able to afford much capital for rice production. There is therefore need to make loans and capital available for rice production in Nigeria. This will enable the farmers to increase their farmland and afford all the necessary farm inputs, thereby leading to increased rice production.

Table 4.12: Operating Expenses.

Operating Expenses ₦	Frequency	Percentages (%)	Cumulative %
1000 – 5999	71	55.0	55.0
6000 – 10,999	17	13.2	68.2
11000 – 15,999	10	7.8	76.0
16000 – 20,999	15	11.6	87.6
21000 – 30,999	8	6.2	93.8
31000 – 40,999	5	3.9	97.7
41000 – 50,999	-	-	97.7
50000 and above	3	2.3	100.0
Total	**129**	**100.0**	

Source: Field Survey, 2006

4.13 Respondents cost of hired labour on rice production

Table 4.13 shows that 34.1% of the respondents did not hire labour at all. About 46.5% hired labour at low cost of between ₦1,000 and ₦10,000. Only few farmers (10.9%) could afford to hire labour with a cost ranging between ₦11,000 to ₦20,000. 5.4% of the respondents spent between ₦21,000 and #30,000 on hired labour. Very few farmers (3.4%) could afford more than ₦30,000 for

hired labour. This finding is still in support of the previous findings that only few farmers practice commercial agriculture in the area. This is because there is a sharp drop in the frequency of the farmers as the cost of hired labour increases from ₦21,000 to ₦60,000. For rice production to experience a significant increase in the area, there is need to increase labour usage right from the first stage to the last stage of rice production. Tractors and other implement need to be available to the farmers at a cheap price to reduce the demand for human labour.

Table 4.13: Cost of hired Labour on rice production.

Cost of Hired Labour (₦)	**Frequency**	**Percentages (%)**	**Cumulative %**
0 – 999	44	34.1	34.1
1000 – 10000	60	46.5	80.6
11000 – 20000	14	10.9	91.5
21000 – 30000	7	5.4	96.9
31000 – 40000	1	0.8	97.7
41000 – 50000	1	0.8	98.5
51000 – 60000	2	1.5	100.0
Total	**129**	**100.0**	

Source: Field Survey, 2006

4.14 Distribution of Farming Experience of the Respondent

Table 4.14 shows that 34.9 % the rice farmers had 1-5years farming experience, while 48.1% had an experience of 6-10 years in rice production. Only few farmers had long time experience of above 15 years in rice farming. The farming experience recorded in Table 4.14 shows that the rice farmers in Ogbomoso Agricultural zone had enough rice farming experience for optimum production of rice. However, there is still need for extension arm to help convey updated production technology to the farmers in the area.

Table 4.14: Farming Experience of the Respondents

Farming Experience (yrs)	Frequency	Percentages (%)	Cumulative %
1-5	45	34.9	34.9
6-10	62	48.1	83.0
11 – 15	12	9.3	92.3
16 – 20	7	5.4	97.7
21 - 25	3	2.3	100
Total	**129**	**100.0**	

Source: Field Survey, 2006

4.15 Farm yields of the respondents

Table 4.15 shows the farm yield of the rice farmers' in bag\ per hectare. Most of the farmers have a yield of 1-20bags\hectare; the number of farmers continues to reduce as yield in bags \ hectare increases. Subsistence nature of production account for the low yield of the farmers'.

Table 4.15: Farm Yield of the Respondents

Farm Yield (Bags)	Frequency	Percentages (%)	Cumulative %
1 – 10	53	41.1	41.1
11 – 20	50	38.8	79.9
21 – 30	10	7.8	87.7
31 – 40	9	7.0	94.7
41 – 50	5	3.8	98.5
51 - 60	2	1.5	100.0
Total	**129**	**100.0**	

Source: Field Survey, 2006

household size of the rice farmers interviewed is 12. This accounts for the frequent usage of family labour by the rice farmers in the study area.

The table also shows that the average farm size of rice farmers in Ogbomoso Agricultural zone is 0.9 hectare.

Another information on the table shows an average of 22 mandays is used by the farmers per annum in the production of rice, while an average of 16 mandays of hired labour are used per annum by the farmers. The average cost of hired labour per farmer is ₦6,648.00 per annum. Other operating expenses for rice production is ₦10,532.17 per annum. It shows further that a rice farmer in Ogbomoso Agricultural zone plants an average of 44kg of rice per annum and applies a fertilizer of an average of 78kg per annum.

Furthermore, a farmer spends an average of ₦636 on chemicals per annum. At the harvesting seasons, the data collected shows that a farmer harvests and average of 729kg of rice (or 14bags of rice) as output and yields respectively.

The summary of the socioeconomic characteristics of the rice farmers shows that the mean of their age and the mean of their farming experience are 41 years and 7 years respectively.

Table 4.16: Socio-Economic and Production Characteristics of the Respondents.

	Minimum	Maximum	Mean	Std. Deviation
Household Size	1.00	38.00	12.3333	7.6212
Farm size (ha)	0.13	2.65	0.9026	0.6242
Family Labour mandays	1.00	108.00	22.0465	19.2662
Hired labour mandays	0.25	149.50	16.6201	24.8927
Cost of Hired labour	100.00	59800.00	6648.0233	9957.0940
Seed planted kg	5.00	1000.00	44.5349	89.1921
Operating Expenses	235.00	79800.00	10532.17	13283.4884
Fertilizer applied kg	0.00	800.00	78.2791	136.1359
Cost of Agro chemical	0.00	9000.00	636.8295	1431.2263
Rice yield bags	1.00	53.00	14.5865	10.8561
Total Output kg	50.00	2650.00	729.3256	542.8027
Age of Respondents	23.00	61.00	41.4961	8.8725
Farming Experience	1.00	23.00	7.5039	4.1460

Source: Field Survey, 2006

4.2. Ordinary Least Square Estimation

OLS Estimates of average performance using Cobb-Douglass Production function.

Table 4.2.1: Ordinary Least Square Estimation

Variables	Coefficient	Parameter	t-ratio	SE
Const.	-0.163	β_0	-0.231	0.703
Farm size	0.123	β_1	1.529***	0.803
Family Labour	0.063	β_2	1.945***	3.247
Hired Labour	0.040	β_3	2.036**	1.944
Seed	0.570	β_4	8.037*	7.085
Operating Exp.	0.716	β_5	1.777***	4.027
Manure	0.170	β_6	2.373**	7.150

Source: Data Analysis, 2006

σ^2 = 0.021

log likelihood lnxn = 68.57

N = 129

NB

*** Significant at 10%

** Significant at 5%

* Significant at 1%

4.2.2 Maximum Likelihood Estimates of Parameter of the Stochastic Frontier Production Function.

The ordinary least square estimates (above) of the parameters which show the average performance of the rice production function in the study shows that all the six independent variables of the Ordinary Least Square (OLS) are statistically significant. Hence, the suitability of the estimates to be used in estimation of the Maximum Likelihood Estimates (MLE) function, estimates the Technical efficiency of the rice farmers.

4.2.3 Technical Efficiency of Rice Production

Parameters of the stochastic frontier function are estimated by the method of maximum likelihood using the computer program FRONTIER version 4.1 (Coeli, 1994).

Table 4.2.2: Maximum Likelihood Estimate of the Parameters of the stochastic frontier Production function (Technical Efficiency Model)

Production factor	Parameter	Coefficient	t-ratio	SE
Constant	β_0	-0. 392	0.055	0.712
Farm size	β_1	0.135	1.788***	0.076
Family Labour	β_2	0.044	1.40	0.031
Hired Labour	β_3	0.021	1.113	0.020
Seed	β_4	0.537	6.34*	0.085
Operating Exp.	β_5	0.083	2.25**	0.037
Manure	β_6	1.719	2.36**	0.730
Inefficiency factors				
Constant	δ_0	-0.181	-0.533	0.340
Age	δ_1	0.005	1.273	0.004
Years of farming exp.	δ_2	0.0008	0.108	0.007
Education	δ_3	0.074	0.738	0.101
Ext. Visit	δ_4	0.271	-1.01	0.269

Log likelihood function = 77.41

	δ^2	=	0.0282	2.10	0.013
	X	=	0.578	2.10	0.276

NB *** Significant at 10%

** Significant at 5%

* Significant at 1%

The estimated coefficient of farm size in the table is 0.135 and it is significant at 10% level. This is in line with a-priori expectation, since output is expected to increase as farm size increases. A coefficient of 0.135 suggest that a 10% increase in size of land used in rice cultivation significantly increases rice output by 0.135%.

Family labour as a production factor has a coefficient of 0.044 which is not significant statistically. This might be due to the fact that, the family members were not too active in farm operations.

Coefficient for Hired Labour (β_3) is 0.021, even though it is positive with the a-priori expectation, it is however not significant statistically. It will in no doubt increase rice output, farmers should however be careful in its use since it's not found to increase the rice production statistically.

The quantity of rice seed planted (for rice planted) is found to be statistically significant at 1% with an assumptotic t-value of 6.34. The coefficient of 0.537, which implies that 1% increase in

quantity of rice planted significantly increases rice output by 0.537. This is in line with theoretical expectation. This highly positive significance of rice seed could be due to the fact that, the rice seeds used are an improved variety which thrives very well in the study area. Rice farmers in the study area should use more of this rice variety as there is a good chance of increased productivity. The quantity of seeds used is also found to be fairly elastic.

Operating expenses is used in the cause of rice production in the study area in line with a-priori expectation has a coefficient of 0.083 and it is statistically significant at 5% level with an asymptotic t-value of 2.25. This suggests that a unit increase in the amount expended in various farm operations also increases the rice output by 0.083 units. This could be as a result judicious and economical use of fund.

Quantity of manure used, as a factor of production in rice farms in the study area has a positive and significant coefficient value of 1.719. It is significant at 5% probability level with an asymptotic t-value of 2.36. A unit increase in quantity of manure used increases the rice output by 1.719 units. This shows that the elasticity of production of manure is 1.719 which is greater than 1. The farmers should be encouraged to use more manure as it

appears to be the most important factor positively affecting rice production. This result also suggests that, if the use of organic fertilizer is properly exploited, it could replace the use of inorganic fertilizer, which is usually cost burdensome to the farmers.

4.3 Estimates of Parameters of Inefficiency Factors

The coefficient of the Age of farmers is positive with a value of 0.005. This suggests that a unit increase in the age of respondents increases technical inefficiency by 0.005 units. This is contrary to a priori expectation but it could be understand if we consider the fact that, the respondents could be getting over aged with their efficiency/production capacity getting reduced with true inefficiency. The factor (Age) is however insignificant statistically.

Years of farming experience of respondents has a coefficient of 0.0008 and is not significant statistically. Even though this inefficiency factor is expected to be negative in line with a-priori expectation. The fact that the coefficient is insignificant negligible suggests that it is not really affecting rice productivity.

Education and extension visit to respondents also have positive, negligible and insignificant coefficients. Education level has a coefficient of 0.074, while extension has a coefficient of 0.271.

Table 4.3 shows that none of the respondents operate between Technical Efficiency level of 0.5 – 0.69. However, 64.34 of the respondents have Technical Efficiency level of between 0.9 – 0.99 while none of the respondents has Technical Efficiency level of 1 (i.e Technically efficient).

The mean Technical Efficiency of the respondents is 0.90, which is close to 1.

Table 4.2.3: Technical Efficiency of the Respondents

Efficiency Score	Frequency	Percentage
0.70 – 0.79	9	6.98
0.80 – 0.89	37	28.68
0.9 – 0.99	83	64.34
1.0	0	0
Total	**129**	**100**

Source: Field Survey, 2006

4.2.4 Resource – Use Efficiency

The resource use efficiency of respondents which is a measure of the ability of each of the resources employed in the production process to produce a stipulated output.

It is obtained by using the ratio

MVP = MIC or MVP ÷ MIC = 1

The marginal value product which is the additional or marginal income received from using an additional unit of input is given symbolically as

$$MVP = \frac{TVP}{\text{Input Level}}$$

Meanwhile in order to determine optimum input level, we take cognizance of input price and output price mathematically

$MVP = MPP_{xi} \cdot P_{xi}$

Where MPPi = Marginal Physical product of input Xi

P_{xi} = Unit output price

MIC or MFC is defined as the change in total output cost or the addition to the total input cost caused by using an additional unit of input.

$$\text{Symbolically MIC or MFC} = \frac{TIC}{\text{Input Level}}$$

Where TIC (Total Input Cost) = Quantity of input x Price of Input

When MFC_{xi} = MVP_{xi} then the respondents is judged to be efficient in the use of resource X_i

From Table 4.2.4, it can be seen that the efficiency ratio i.e the ratio of MVP to MIC for farm size is 0.997. This shows that, the farmers are underutilizing their farmlands; more profits can be made by making use of more farm lands.

Family labour has an efficiency ratio of 2.09, which shows that family labour is also being underutilized. Rice farmers in the study area should make more use of family labour as there exists room for increased profitability here.

Hired labour likewise has an efficiency ratio of 1.76 farmers are inefficient in the use of this resource too. They should also make more use of hired labour.

Meanwhile all of seed (kg), Operating expenses and manure have efficiency ratios of 9.38, 1.95 and 1.65 respectively. Hence we see that rice farmers, in the study are grossly inefficient in the use of these resources. The result suggested by a unit increase in the amount of seed, operating expenses and manure use in rice cultivation in the study area will increase the returns by 9.38, 1.95 and 1.65 units.

Rice farmers in the study area from the result of this study have shown that they are inefficiency in the use of all their resources. However, it is a case of underutilization in all and not over utilization of resources. These rice farmers should therefore be encouraged to use more of these inputs as their still exist more room for increased productivity.

Table 4. 2.4: Efficiency of Resource – Use

Production factor	Input	MVP	MIC	MVP:MIC
Farm size	X_1	33221	333.3	99.67
Family Labour	X_2	835	400	2.09
Hired Labour	X_3	702	400	1.76
Seed	X_4	938	100	9.38
Operating Exp.	X_5	1.95	1	1.95
Manure	X_6	39.6	24	1.65

Source: Data Analysis 2006.

CHAPTER FIVE

5.0 SUMMARY CONCLUSION AND RECOMMENDATION

5.1 SUMMARY

This research was carried out primarily to determine the resource use efficiency in rice production in Ogbomoso area of Oyo state. Rice farmers were selected randomly from the five local governments in Ogbomoso. This includes: Surulere, Ogo Oluwa, Orire, Ogbomoso North and Ogbomoso South Local Government of Oyo State.

Stratified random sampling techniques were used to select twenty-five respondents from each of the four Local governments and twenty–nine respondents from Orire local government. Thus a total of one hundred and twenty –nine respondents constitute the sample. Findings revealed that greater proportions of the respondents are male, married with an average level of education. (Secondary and post secondary). The research further revealed that none of the respondents is less than 20 years old. Majority are between 31 and 50 years old. It shows that majority of the respondents cultivate less than one hectare of land for rice production. Hence, the production is at the subsistence level. The household size is evenly distributed between 1-25 and 31-35, a

negligible number of farmers have a family size of between 26-30 and 36-60.

The research shows that 9.3 % of the respondents do not make use of family labour, while the percentages of the farmers decline with increase in family labour. The study showed that majority of the farmers (67%) did not incur any cost on pesticide, while 50 % of the farmers did not use fertilizer. About 55 % of the respondents spent between ₦1000- ₦5000, 13.2% spent between ₦6000- ₦10000 and 31.8% of the respondents spent above ₦11000 on rice production. This also follows the same pattern as the amount spent by farmers on the hired labour.

The farming experience shows that majority of the rice farmers have between 1-10 years farming experience in rice production.

In summary, Table 4.16 shows that the average farm size of the farmers is 0.9 hectare, an average of 16 mandays hired labour are spent, this costs ₦6,648.00 per annum. The average output of 729.33kg of rice is produced with an average yield of 14.6 bags of rice. The result of the stochastic frontier analysis used to determine the efficiency of the farmers shows that the minimum technical efficiency of rice farmers is 0.70 and maximum technical efficiency is 0.97. The mean technical efficiency is 0.90. This implies that

there is technical efficiency in rice production among farmers in Ogbomoso Agricultural zone.

The t-value shows that out of the independent variables considered, use of manure, operating expenses, seed planted and farm size have significant effect on rice production while hired labour, age, experience, education and extension visit have no significant effect.

5.2 CONCLUSION

Efficient usage of resources is inevitable for the optimum production of rice. The major factors identified in the research which affect resource use efficiency in rice production in the study area include;

- There is major underutilization of certain input, such as family labour, and hired labour.
- The farmers spend less on pesticide and fertilizer
- Extension has not made significant impact on rice production. More than half of the respondents are not visited by Extension Agents. The potential of extension has not been fully exploited by the farmers who were not being visited.
- The results of the research shows that farm size, seed planted, operating expenses and manure use have a positive effect on

technical efficiency of rice production while age, farming experience, hired and family labour, education and extension visit do not have significant impact on technical efficiency of rice production in Ogbomoso area.

5.3 RECOMMENDATION

Based on the findings of this research work, the followings are recommended;

Government should subsidize the price of fertilizer, and pesticides, so that it will be available at affordable price to the farmers.

Farmers should be encouraged to cultivate larger area of land so as to increase rice productivity.

Loans should be made available to the farmers so that they can invest more on rice production.

More extension agents should be trained to visit the farmers with relevant and up to date information and aids on rice production.

Farmers should be encouraged to increase the use of hired and family labour in rice production.

Farmers should be encouraged to make use of manure, and increase the area of their farmland as well as increasing the amount spent on rice production. This is because they all have significant effect on rice production.

REFERENCES

Adekanye, T.O (1974) 'Spatial Price analysis for Rice in western state of Nigeria Report Series No 6 Department of Agricultural Economics, University of Ife.

Adeniyi J.P (1976). "A Cost Analysis of Farming Enterprises in Nigeria: The case of Rice Farming in Kwara State" Paper Presented at the Annual Conference of Farm Management Association of Nigeria.

Adeniyi, J.P (1978) Rice Industry in Kwara State of Nigeria: An Economic Analysis, Unpublished ph. D Thesis, University of Ibadan.

Adeniyi J.P (1988) "On-farm Research Results in Nigeria's Rice cropping systems: A review proceeding of the National Farming Systems Research Network pp.129.

Afolabi S.O (1984) "An Economics Evaluation of Rice input policies on the welfare of Nigerians". Unpublished M.SC. Thesis University of Ibadan.

Aigner D.J., Lovell C.A.K., Schmidt P. (1985): Formulation and estimation of stochastic frontier production models. *Journal of Econometrics*, *6*: 21–32.

Ajibefun I.A; G.E. Battese and A.G. Daramola (1996): .Investigation of Factors Influencing Technical Efficiency of Smallholder Croppers in Nigeria. *CEPA Working Papers*, No 10/ 96, Department of Econometrics, University of New England.

Alimi, T. (2000). Resource Use Efficiency in Food Crop Production in Oyo State of Nigeria. *Journal of Agriculture and Environment* **1** (1): 1-7.

Battese G.E., Coelli T.J. (1995): Prediction of farm – level technical efficiencies with a generalized frontier production function and panel data. *Journal of Econometric, 38*: 387–399.

Barau, A. (1985),"Economic Analysis of Rice Processing in Gongola State" I.A.R Miscellaneous Paper, A.B.U. Zaria .

Bravo-Ureata B. E. and Rieger L (1991) Dairy farm efficiency measurement using stochastic frontiers and neoclassical duality. *American Journal of Agricultural Economics,* 73 pp.421-428.

Bravo-Ureata, B.E. and R.E. Evenson (1994) Efficiency in Agricultural Production: The case study of peasant farmers in Eastern Paraguay. *The Journal of the International Association of Agric Econs.* 14: 23-30.

Coelli T.J. (1996): A Guide to Frontier Version 4.1c: A Computer Program for Stochastic Frontier production and Cost Function Estimation. Working Paper, Department of Econometrics, University of New England, Armidele, Australia.

Fagade, S.O (1985)"Improved Seed Production Practises for Rice" Lecture Delivered at the First FAO/Nigerian Seed Technology Course , University of Ibadan , May, 1985.

Falusi, A. O. (1992) "Seed Production Profiles for Nigeria's Agricultural Development". Paper Presented at the National Seed Workshop, Kaduna. November, 1992.

Fan S (1997), Research, Productivity and Outputs Growth in *Chinese Agriculture Journal of Development Economics* 53:115-137.

FAO (1999), Food and Agricultural Organization. FAO-agrostat. Available online at www.fao.org.

Farell M.J (1957), "The Measurement of Productive Efficiency "*Journal of the Royal Statistical Society* 120 253-8, 2.

Filani, M.O (1980)"Rice in Nigeria Economy" A Geo-Economic Analysis *Nigeria journal of Economic and Social Studies* 22, **1**:145-175.

Flin(1995), Determinants of profit efficiency among small scale rice farmers in Nigeria. A profit function approach. Research *Journal of Applied Sciences*, *1* (1–4): 116–22.

Huang C.J and J.T. Liu (1994): .Estimation of a Non-neutral Stochastic Frontier Production Function. *Journal of Productivity Analysis*, 4:171-180.

Imolehin, E.D. and A.C Wada. (2000). Meeting the Rice Production and Consumption Demand of Nigeria with Improved Technologies. *International Rice Commission Newsletter* 53: 2000.

IRRI (1997): World Rice Statistics. International Rice Research Institute Metro Manila, Philippine, 34–42.

Kumbhakar, S.C. (1994). Efficiency estimation in a profit maximizing model using flexible production. *Journal of Agricultural Economics* **10**:143-152.

Lau L.J and P.A Yotopolous (1973), a test for relative efficiency and on Application to Indian agriculture. *America Economic Review* 61:94-109.

Lewin, A.Y and C, A.K. Lovell (1990): Editors Introduction, *Journal of Econometrics*, 46, 3-5.

Macauley (1995): Prediction of farm – level technical efficiencies with a generalized frontier production function and panel data. *Journal of Econometric, 38*: 387–399.

Meeusen W., Van den Broeck J. (1977): Efficiency estimation from Cobb- Douglas production functions with composed error. *International Economic Review, 18*: 435–444.

Obwona, M (2000) .Determinants of Technical efficiency Among Small and Medium Scale Farmers in Uganda a Case of Tobacco Growers. *A Final Report Presented at AERC Bi-annual Workshop at Nairobi, Kenya.*

Olayemi, J.K and Oni, S.A (1974), "A Comparative Economics Study of Small Scale Rice milling Industries in Kwara and Northern States of Nigeria", *Agricultural Economic Bulletin for Africa*, **15**:15-71.

Olayemi, J.K. (2004). *Principles of Micro-economics for Applied Economics Analysis.* SicoPublishers, 36 Adelabu Street, Mokola-Ibadan, Nigeria. 67.

Onwueme, I.C and T.D. Sinha (1991). *Field Crop Production in Tropical Africa.* Technical Centre for Agriculture and Rural Cooperation (CTA), Netherlands.

Osuntogun A.O and Adeyemo, R. (1985), "An Economic Analysis of Cooperative Small- Scale Rice Milling Industries in Anambra

State", *Nigeria Journal of Rural Development and Cooperatives* 1, **2**:58-68.

PCU (2002) Project Co-ordinating Unit: Crop Area Yield Survey (CAY). Federal Ministry of Agriculture and Rural Development, Abuja.

Perez, A.T (1976) "The Rice Programme of the National Rice/Maize Centre" Paper Presented at the Second NAFFP" National Rice and Maize Workshop, Moor Plantation, Ibadan.

Rahman S. (2003): Profit efficiency among Bangladeshi rice farmers. Food Policy, *28*: (5–6): 487– 503.

Schmidt P.Jondrow J., Lovell C.A K., Materov I., (1982): On the estimation of technical inefficiency in the stochastic frontier production function model. *Journal of Econometrics, 19*: 233–238.

Seiford, L.M. and R.M. Thrall (1990): Recent Development in DEA: The Mathematical Programming Approach to Frontier Analysis, *Journal of Econometrics, 46, 7-38.*

Shobowale, O.J (1992) Strategy for Fulfilling Foundation and Certified Seed Requirements Paper Presented at National Seed Workshop ,Kaduna, November,1992.

Singh, B.N., Fagade, S., Ukwungwu, M.N., William, C., Jagtap, S.S., Oladimeji, O., Effisue, A. and O. Okhidievbie, (1997). Rice growing Environments and Biophysical Constraints in Different Agroecological Zones of Nigeria.

Yao,S and Z. Liu (1998): Determinant of Grain Production and Technical Efficiency in China.. *Journal of Agricultural Economics*. 49, **2**:171-184.

APPENDIX

S/N	Year	Efficiency
1.	1	0.8804
2.	1	0.9709
3.	1	0.9673
4	1	0.8973
5.	1	0.6760
6.	1	0.9668
7.	1	0.9165
8.	1	0.7739
9.	1	0.8983
10.	1	0.9526
11.	1	0.8541
12.	1	0.8850
13.	1	0.9328
14.	1	0.8785
15.	1	0.8600
16.	1	0.8320
17.	1	0.8791
18.	1	0.8436

19.	1	0.7531
20.	1	0.8890
21.	1	0.7607
22.	1	0.8534
23.	1	0.8910
24.	1	0.8387
25.	1	0.9116
26.	1	0.9443
27.	1	0.9461
28.	1	0.8958
29.	1	0.8161
30.	1	0.9391
31.	1	0.9444
32.	1	0.9551
33.	1	0.8752
34.	1	0.9360
35.	1	0.9509
36.	1	0.9262
37.	1	0.8258
38.	1	0.8806
39.	1	0.8545

40.	1	0.8065
41.	1	0.9061
42.	1	0.8992
43.	1	0.8586
44.	1	0.8108
45.	1	0.9210
46.	1	0.7924
47.	1	0.8715
48.	1	0.7935
49.	1	0.9329
50.	1	0.9462
51.	1	0.9443
52.	1	0.9535
53.	1	0.9432
54.	1	0.9594
55.	1	0.9165
56.	1	0.8665
57.	1	0.9680
58.	1	0.7978
59.	1	0.9613
60.	1	0.8292

61.	1	0.9388
62.	1	0.8932
63.	1	0.9030
64.	1	0.9139
65.	1	0.8699
66.	1	0.9005
67.	1	0.9085
68.	1	0.9350
69.	1	0.9558
70.	1	0.9621
71.	1	0.9366
72.	1	0.8293
73.	1	0.9315
74.	1	0.9521
75.	1	0.9068
76.	1	0.8869
77.	1	0.9179
78.	1	0.9353
79.	1	0.9107
80.	1	0.9003
81.	1	0.9499

82.	1	0.8402
83.	1	0.9246
84.	1	0.9502
85.	1	0.9611
86.	1	0.9488
87.	1	0.9542
88.	1	0.9548
89.	1	0.9650
90.	1	0.8554
91.	1	0.9504
92.	1	0.9003
93.	1	0.9170
94.	1	0.9293
95.	1	0.9366
96.	1	0.9633
97.	1	0.9649
98.	1	0.9340
99.	1	0.8308
100.	1	0.8527
101.	1	0.7887
102.	1	0.9606

103.	1	0.9359
104.	1	0.9681
105.	1	0.9628
106.	1	0.9489
107.	1	0.9253
108.	1	0.9332
109.	1	0.9499
110.	1	0.9635
111.	1	0.9147
112.	1	0.9636
113.	1	0.9439
114.	1	0.9496
115.	1	0.9397
116.	1	0.9448
117.	1	0.8137
118.	1	0.9261
119.	1	0.9171
120.	1	0.7007
121.	1	0.9168
122.	1	0.9573
123.	1	0.9171

124.	1	0.9440
125.	1	0.8091
126.	1	0.8860
127.	1	0.9598
128.	1	0.9566
129.	1	0.7714

Mean efficiency = 0.902194E+00

FEDERAL UNIVERSITY OF TECHNLOLOGY AKURE, DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

RESEARCH QUESTIONAIRE ON EFFICIENCY OF RICE PRODUCTION IN OGBOMOSO AGRICULTURAL ZONE OF OYO STATE.

Indicate by ticking ( ) the right boxes where appropriate

1. Name of village ..... Date of interview.....
2. What is your sex (i) Male [ ] (ii) Married [ ]
3. What is the marital status? (i) Single [ ] (ii) Married [ ]
4. What is your religion? (i) Christianity [ ] (ii) Muslim [ ]

   (iii) Traditional [ ]
5. If you are married, how many wives do you have?

   (i) One wife [ ] (ii) Two wives [ ] (iii) More than two wives [ ]
6. How many children do you have?

   (i) 2 children [ ] (ii) 3 or 4 children [ ]

   (iii) More than four children [ ]
7. How many of your children live with you?
8. How many dependants live with you?
9. How did you get fund? (i) Personal savings

   (ii) From friends (iii) Cooperative societies

   (iv) Other special funds

10. Have you ever obtained a bank loan for your farm business?

Yes ... No ...

(a) If yes how much .....

(b) If yes in (i) above, what is the interest rate .....

11. How did you get the land? (i) Rentage (ii) Purchased

(iii) Family land (iv) others

12. If purchased, how much did you pay?

13. Beside planting of rice, what other crop(s) did you plant?

(i) Yams (ii) Beans (iii) Maize (iv) Groundnut (v) Cassava

(vi) Soya beans (vii) Guinea corn

14. How many acres of land did you cultivate for rice last year? ...

15. How did you get the labour you use? (i) Personal efforts

(ii) Family labour (iii) Machines (iv) Hiring of labour

16. What is your level of education?

Level of Education	No. of years spent
Primary [ ]	.....
Secondary [ ]	.....
Tertiary [ ]	.....
Adult Education [ ]	.....

17. Kindly provide information on labour-use in the last cropping Season.

Operation	Family Labour Used (Mandays)Adult			Hired Labour used (Mandays)Adult		
	Male	Female	Children	Male	Female	Children
Land clearing						
Planting						
Weeding						
Fertilizer						
Scaring of bird						
Harvesting						

18. How much does it cost you to plow an acre of land?

19. Kindly indicate the number of hours your labour normally Spend on farm?

(i) Male .....

(ii) Adult Female .....

(iii) Children .....

20. What are the actual quantities used during your last planting Season? (i) 0-5kg [ ] (ii) 10-20kg [ ] (iii) 25-30kg [ ]

(iv) 100kg [ ] (v) more than 1000kg [ ]

21. Kindly tell us the price of inputs used?

(i) Rice Planting .....

(ii) Fertilizer .....

(iii) Farm implements .....

(iv) Hire labour .....

(v) Weeding .....

(vi) Seeding .....

22. Simply the information on your farm output

Quantity of Rice harvested	Quantity processed kg or bag	Quantity consumed kg or bag	Quantity as gifts kg or bag	Quantity sold kg or bag	Price per Unit bag or ₦/kg

23. What quantity of inputs used during the last cropping Season?

Inputs	Quantity	Unit Price	Total Cost
Ploughing (Mandays)			
Seed (kg)			
Fertilizer (kg)			
Herbicides (Vol. or kg)			
Fungicides (Vol. or kg)			
Cutlass (Nos.)			
Hoes (Nos.)			
Other implements			

24. Do you sell your rice unprocessed? Yes [ ] No [ ]

25. How much did you sell a bag of unprocessed rice?

26. Do you have any suggestion on how you can be efficient in rice production? .....

.....

27. What problems did you face during the last year cropping?

.....

.....