

**RESOURCE –USE AND ALLOCATIVE EFFICIENCY OF PADDY RICE
PRODUCTION IN EKITI STATE, NIGERIA**

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**DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION,
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Abstract

This study examined resource-use and allocative efficiency of paddy rice production in Ekiti State Nigeria, with a view of determining the profitability, resource-productivity and allocative efficiency of inputs used in rice production in the state. Primary and secondary data were employed in the study. For the primary data, multistage random sampling technique was used in selecting 135 rice farmers. Data was collected using structured questionnaire. Secondary data sources were obtained from the Federal Office of Statistics, the state ADP's annual report, Central Bank of Nigeria (CBN), Previous research report and other relevant agencies within and outside the country. Data analysis was carried out using descriptive statistics, budgeting analysis and production function analysis using Ordinary Least Square (OLS) regression techniques.

Rice production was found to be profitable as farmers realized N219,277.41 per hectare as gross margin in the study area. Result of the productivity of inputs revealed that farmers were inefficient in the use of resources as confirmed by the return to scale (RTS) value obtained from the study. Also, estimation of allocative efficiency of input confirmed the RTS value as the result from the computation showed that variable inputs included in the regression were not optimally allocated.

Dedication

To God Almighty, the giver of life, and the Best Solution of my life.



Acknowledgement

I wish to acknowledge the Almighty God who granted me the privilege to write this project and sustained me throughout the period of my study. I sincerely appreciate the effort of my supervisor Dr. T.T. Amos and other lecturers in the Department for their devotion, guidance, assistance and encouragement throughout the period of this project work.

I appreciate my precious husband Rotarian Mike Abiodun without whose support this programme would have been impossible. You have gone a long way for me spiritually, physically, materially and financially. I say a big thanks to you.

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I also acknowledge the support, love and care showed by my friends. I pray that the Lord will duly reward your labour of love. Thank you all and God bless.

Certification

I certify that this project work was carried out by **Mrs. ABIODUN Adejoke Sherifat** of the Department of Agricultural Economics and Extension, Federal University of Technology, Akure, Ondo State, Nigeria.



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CHAPTER ONE

1. INTRODUCTION

1.1. Importance of Rice in Nigerian Economy

Rice is the staple food of more than 50% of the world's population, primarily, in India, China and a number of many other countries in Africa and Asia (Ogundele and Okoruwa, 2006). As far back as 1993, West African Rice Development Association (WARDA) reported that rice has become a staple food of considerable strategic importance in many rapidly growing African cities where its consumption among urban poor households has increased substantially.

The Nigeria rice sector is special within the West Africa context. First, rice is primarily a cash crop in Nigeria (produced primarily for the market). Therefore, in rice producing areas, the enterprise provides employment for more than 80% of the inhabitants involved in various activities along the production/distribution chain from cultivation to consumption. Secondly, some remarkable developments have also taken place in the sector particularly in the last ten years. Both production and consumption have increased during the period. Though the increased production was not sufficient to match the consumption increase, rice imports have made up for the shortfall. Since, rice is now a structural component of the Nigerian diet and rice imports make an important share of Nigerian agricultural imports, there is considerable political interest in increasing the local production and consumption of local rice. This has made rice a highly political commodity in Nigeria (Ogundele and Okoruwa, 2006). Hence, rice is now widely regarded as a superior foodstuff being consumed by a much larger population than before in Nigeria.

1.2. Rice Production Trends In Nigeria

Rice production started in Nigeria in 1500 BC with the low-yielding indigenous red grain species *Oryza glaberrima* that was widely grown in the Niger Delta area (Hardcastle, 1959). The high-yielding white grain, *O. sativa L.*, was introduced about 1890 and accounted for more than 60% of the rice grown in the country by 1960. Today, rice is cultivated in virtually all the agro-ecological zones in Nigeria, but on a relatively small scale. In 2000, out of about 25 million hectares of land cultivated to various food crops, only about 6.7% was under rice cultivation (Project Coordinating Unit, 2001).

The trend in production showed that a boom in paddy rice production was first experienced in the 1965–1970 period when average output stood at 321,000 tons (Table 1). During this period, average area cultivated to rice stood at 234,000 hectares while average national yield was 1.36 tons/ha. Another significant improvement in rice production in Nigeria was recorded in 1986–1990, when output increased to over 2 million tons while average area cultivated and yield rose to 1,069,200 hectares and 2096 tons/ha respectively. Throughout the 1980s, rice output and yield increased, but in the 1991–1995 period, while rice output increased, yield of rice declined. The increased output was a result of extensive land cultivation.

There was also great disparity among the states of the federation in rice production in terms of both output and yield. In 2000, Kaduna State was the largest producer of rice, accounting for about 22% of the country's rice output. This was followed by Niger State (16%), Benue State (10%) and Taraba State (7%) (Federal Ministry of Agriculture and Rural Development, 2001). Great variations also existed in terms of yield. The average national rice yield during the dry season of 3.05 tons/ ha was higher than that of the wet season of 1.85 ton/ha.

Table 1.1: Rice Production Trends in Nigeria (1961–2005)

Period	Average area cultivated (hectare)	Average output (tons)	Average yield (Tons/ha)
1961-1965	179,200	207,200	1.147
1966-1970	234,000	321,000	1.360
1971-1975	288,800	470,200	1.670
1976-1980	332,000	596,200	1.710
1981-1985	630,000	1,300,200	2.063
1986-1990	106,200	2,216,064	2.090
1991-1995	1,678,000	2,979,600	1.783
1996-2000	1,742,582	3,011,028	1.733
2001-2005	1,972,081	3,545,548	1.798

Source:PCU,FMARD,Nigeria (2006).

1.3. Problem Statement

Nigeria is a country blessed with abundant agricultural and human resources to become one of the leading agricultural economies in Africa and the world in general (Nyako,2002).However, the saddening story is that poor performance of the country's agricultural sector most especially the food sub-sector had made the country dependent on food importation as a means to solving the country's food problem. Nigeria's food production could not match the food demand rate and this had led to the problem of food deficit currently experienced in the country which has constituted a major drain on the nation's foreign reserves (CBN, 2002).Grains like maize, rice, sorghum and millet form significant portion of food consumed in Nigeria. Rice especially has become a staple food in most homes today and unfortunately the domestic production of this grain has not met the demand. In a bid to address the demand/supply gap, governments have at various times come up with various policies and programmes. It is observed that these policies have not been consistent. The erratic policies reflect the dilemma of securing cheap rice for consumers and a fair

price for the producers. Thus, the fluctuations in policy and the limited capacity of the Nigerian rice sector to match domestic demand with supply has raised a number of pertinent questions both in policy circles and among researchers. For example, what are the factors explaining why domestic rice production lags behind the demand for the commodity in Nigeria? Central to this explanation is the issue of efficiency of the rice farmers in the use of resources. Average yield of rain-fed rice in Nigeria is 1.8 ton per hectare, while that of the irrigation system is 3.0 ton/ha (PCU, 2002). This is very low when compared with 3.0 ton/ha from upland and lowland systems and 7.0 ton/ha from irrigation systems in places like Côte d'Ivoire and Senegal (WARDA and NISER, 2001). It therefore appears that rice farmers in Nigeria are not getting maximum return from the resources committed to the enterprise. Thus, one approach to solving Nigeria's rice production problem (and by extension food given in general) is to simultaneously investigate the resource-use and allocative efficiency of input used in rice production in order to increase the yield of rice produced by the farmers in the long run.

This study intended to answer the following research questions:

- i. is rice production profitable in the study area?
- ii. how efficient are farmers in the use resources?
- iii. how allocatively efficient are farmers in the use of resources?
- iv. what policy measures are needed for enhanced rice production in the study area?

The answers to these questions would provide useful information to policy makers on how to improve the efficiency of input used in rice production and hence increased food production in Nigeria.

1.4. Objective of The Study

The general objective of the study is to quantitatively analyze the resource-use and allocative efficiency in rice production by farmers in Ekiti State.

The specific objectives are to:

- i. examine the socio-economic characteristics of the farmers;
- ii. estimate the cost and return structure and hence the profitability of rice production in the study area;
- iii. determine the factors affecting the level of rice output in the area;
- iv. determine the resource-use efficiency of inputs used by the farmers;
- v. determine the allocative efficiency of inputs used by the farmers;

1.5. Hypotheses to be Tested

The following null hypotheses (H_{0i}) were tested:

$$H_{01}: NR = 0$$

Where, the null hypothesis specifies that rice production is not profitable

$$H_{02}: \beta = 0 \text{ (for coefficients of production function)}$$

Where, the null hypothesis specifies that the estimated coefficients of production functions are not significantly different from zero i.e. the exogenous variables do not affect the level of rice output.

$$H_{03}: 0.1 < \sum \epsilon_p \leq 0.9 \text{ (}\sum \epsilon_p \text{ = return -to-scale of factor input)}$$

Where the null hypothesis specifies that the rice farmers are operating in the efficient region of production surface that is stage II.

$$H_{04}: MVP_x = p_x$$

Where the null hypothesis specifies that the rice farmers are allocatively efficient in input use.

1.6. Justification for The Study

The increase in agricultural production is an important step for an appreciable development to be achieved in the Nigerian agricultural sector. For this to be achievable, there is need to ensure that the available scarce agricultural resources among the small scale farmers in the country are efficiently used.

Thus, the study of efficiency in agricultural production at the farm level needs to be carried out from the stand point of the important information which may be gained from the study. First, by carrying out micro-study on farm and conditions confronting the farmers, such that one may be able to indicate the course of action profitable to farmers and efficient utilization of resources. Secondly, such efficiency of agricultural production study will provide basis for predicting the consequences of changes in economic conditions of production of the farmer. Increasing the production of individual farmer from specified amount of resources could made the society to gain more because a greater quantity of product will be available for distribution among the people.

However, this study will benefit the Nigerian economy by determining the extent to which it is possible to raise productivity rice farmers with the existing resources base and the available technology. If efficiency of rice production is improved,

resources can be made available to non-agricultural development and other needs beyond the essentials of food and fibre. This study will also contribute to existing information on rice production in Ekiti State.



CHAPTER TWO

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1. LITERATURE REVIEW

2.1.1. An Overview of Rice Production Performance in the West Africa Sub-Region

In Africa, particularly in the 1980s, Egypt and Madagascar Republic accounted for 62% of all rice produced (Chuta, 1984). Recently, important and major changes have led to structural increases in rice consumption in the West African sub-region. Since 1973, regional demand has grown at an annual rate of 6%, driven by a combination of population growth and substitution away from traditional coarse grains. The consumption of traditional cereals, mainly sorghum and millet, has fallen by 12kg per capita, and their share in cereals used as food dropped from 61% in the early 1970s to 49% in the early 1990s. In contrast, the share of rice in cereals consumed grew from 15% to 26% over the same period (Akpokodge *et al.*, 2002). Growth in regional rice consumption remains high. The FAO projects the annual growth rate to be about 4.55 % beyond the year 2000. This means that the total volume of rice consumed in West Africa is likely to increase by 70% over this decade. In Nigeria, the demand for rice has been increasing at a much faster rate than in any other African country since the mid 1970s (FAO, 2002).

2.1.2. Efforts to meet rice production needs in Nigeria

Active and systematic rice research started in the country in 1953 with the establishment of the Federal Rice Station at Badeggi in Niger State, now the headquarters of the National Cereals Research Institute (NCRI). The focus for rice

research at the station was the development of varieties with improved grain quality, uniform shape and sizes appropriate for minimal breakage during milling.

Between 1954 and 1970, thirteen improved rice varieties, comprising two upland, eight shallow swamps and three deep-flooded rice, were released to Nigerian farmers. From 1971 onwards, research activities on rice focused on developing high-yielding and disease resistant varieties, the efficient use of nutrients, and good soil management. Efforts resulted in the release of sixteen rice varieties, with the desired traits for pest and disease resistance, nutrition and yield, to Nigerian rice farmers between 1971 and 1984. The 16 varieties comprised one upland, 12 lowland and three deep-water ecology rice. From 1985 to 1989, an additional 14 high-yielding blast-resistant varieties, including six upland and three lowland varieties, were released. From 1990 to 2000, 11 more rice varieties, comprising eight uplands and three shallow swamp varieties, have been released (FAO, 2002).

Thus, from 1954 to 2002 a total of 54 rice varieties have been released to serve the different ecologies and other specific needs in Nigeria. A remarkable effort to develop suitable rice varieties for Nigerian farmers was made in 1997 with the release of FARO 51, a variety that is resistant to the African rice gall midge (ARGM) (World Bank, 1997). When grown in Abakaliki in present Anambra state, the variety exceeded the yields from farmers who do not have the varieties by 26% (FAO, 2000). Recently, WARDA has developed an improved variety mainly for upland farmers. The variety is known as NERICA (New rice for African countries) and it is observed that the yield could be as high as 3 tons/hectare or more with strict compliance with recommendations. This variety has just been released, however, and some time is

required for adoption before the technology can be evaluated. Increased rice production is expected to be achieved effectively when Nigerian farmers in all the ecological zones of the country utilize improved rice varieties, along with appropriate cultural and management practices.

A second part of the research effort is germplasm collection and conservation. The idea is to ensure the preservation of diverse genetic information that can be tapped in a variety of ways and used to evolve varieties with desirable characters. The rice breeding programme started to collect rice germplasm from Nigeria and the rest of the world, an activity made possible by the active collaboration of international and national institutes working on rice, including the International Rice Research Institute (IRRI), the International Network for Genetic Evaluation of Rice for Africa (INGER-Africa), the West Africa Rice Development Association (WARDA), the International Institute of Tropical Agriculture (IITA), and the Institute for Agricultural Research and Training (IAR&T) in Ibadan. Some of the rice germplasm collected is conserved at the institute in freezers, but the bulk is stored in IITA's more efficient cold rooms (Imolehin, 1991a).

Since the establishment of the National Centre for Genetic Research and Biotechnology (NAGRAB) at Ibadan, rice germplasm materials have always been conserved there, and it is from there that genetic information is being sourced for routine breeding work. The breeding or adaptation of various types to suit the diverse ecological zones of the country has been possible because of nationally coordinated rice evaluation trials in which newly bred varieties are evaluated for at least three years for desired characteristics. Promising varieties are evaluated further for yield

performance in multi location on-farm adaptive research trials across the country before being released to Nigerian farmers (Imolehin, 1991b). Released varieties also have properties that satisfy different consumer preferences in terms of grain type, swelling capacity, amylose content, protein and cooking time.

2.1.3. Policy environment and rice sector development in Nigeria

From an historical perspective, Nigeria's rice policy can be discussed in reference to three important periods. These are the pre-ban, ban and the post-ban periods. These periods reflect the kind of policies put in place that had profound impact on the rice sector.

The pre-ban period, the era prior to the introduction of absolute quantitative restriction on rice imports (1971–1985), can also be classified into two: the pre-crisis (1971–1980) and the crisis (1981–1985) periods. The pre-crisis period was largely characterized by liberal policies on rice imports, with some adhoc policies put in place during times of interim shortages. It corresponds to the launching of various programmes and projects aimed at developing rice production. While more stringent policies were put in place during the crisis period, outright ban was not a major feature. That changed in the ban period (1986–1995), when it was illegal to import rice into the country, although illegal importation of the commodity was going on across the country's borders.

During the post-ban period (1995–2000), quantitative restrictions on rice importation were lifted and the country moved into a more liberal trade policy in respect of rice. From 2000 to date, the Federal Government has resorted to constant

and upward adjustment of the import tariff on rice, from 50% in 2000 through 75% in 2001 to 100% in 2002. From the beginning of 2003, the tariff was adjusted to 150%.

2.2.0. CONCEPTUAL FRAMEWORK

2.2.1. The Theory of Production and Production Function

The theory of production provides the analytical framework for most empirical research in productivity and efficiency studies. Production is the process by which variable and fixed factors are combined to produce output. Factors of production used in agriculture include land, labour, capital, management and water (irrigation). The basic thrust of economics of agricultural production at the micro-level is to assist individual farmers or group of farmers to attain stated objectives through efficient intra farm allocation of resources over a period of time. Economics of agricultural production is achieved either by maximizing output from given resources or minimizing the resources required for producing a given output.

The technical relationship between the input used and maximum possible output produced are expressed by the production function. Production function thus stipulates the technical relationship between inputs and output in any production process (Olayide and Heady, 1982). It is a mathematical way of describing the input-output relationship or quantitative relationship between input and output (Dillion and Hardaker 1993).

However, micro-economic production function has usually been the tool for examining the problem of resource productivity and resource use efficiency of farm enterprise (Olayide and Heady, 1982). Attention is usually focused on estimation of production

coefficient under the assumption that the production unit is mainly interested in organising and utilizing available resources for profit maximization purpose or cost minimization with both resources and output allowed to vary (Olayemi and Olayide 1981). One of the advantages of production function technique is that, the estimated coefficient can be tested statistically for significance. Production function could be expressed as linear, quadratic, polynomials, square root polynomials, semi-log, double-log (Cobb-Douglas), exponential and transcendental functions. The Cobb-Douglas function is commonly used for its simplicity and flexibility coupled with the empirical support it has received from data from various industries and countries (Desai, 1976).

Production function therefore, provides a direct measurement of the parameters of resources productivity such as; Total Product (TP), Average Product (AP), Marginal Product (MP), Marginal Rate of Substitution (MRS), Elasticity of Production (EP) and Return To Scale (RTS). There are short run and long run production functions when time perspective is considered. In the short run production function, one or more inputs are held constant and others allowed to vary while all inputs could be varied in the long run production function. Assuming a one product-one input production function ($Y = f(X)$). There are three stages in such a production function. Stage I represents the zone of increasing marginal productivity that is positive increasing returns to scale (RTS). The RTS is greater than unity ($RTS > 1$) and the stage is considered as irrational zone of production. Production is inefficient at this stage. Therefore, the economic decision at this stage is that, if the product being produced has any value at all, input used once started should be continued until stage II is reached where the productivity of such input would reach its peak. Stage II is the zone

of diminishing marginal productivity i.e. is positive decreasing Returns to Scale (RTS) is less than unity, but greater than zero ($0 < \text{RTS} < 1$). It is a rational zone of production. It is the economic relevant stage in the production function analysis because it is there that such issues as output and profit maximization, optimization of input level combination and cost minimization are addressed. The exact point of optimal input combination and output production is determined when the choice indicator (input and output prices) are known together with the physical concept underlying the production function analysis (Adegeye and Dittoh 1985). In stage III, the production surface has no economic relevance, it is an irrational zone and production is not advisable at this stage, and the RTS exhibits negative decreasing returns to scale ($\text{RTS} < 0$) which is an attribute of the negative marginal product in the production surface (Adegeye and Dittoh 1985).

2.2.2. Resource-productivity of input used in agricultural production process

Agricultural productivity is definable in terms of the ratio of total farm output to total inputs used in farm production process. It can also be defined in terms of individual resources such as labour productivity defined as the ratio of total output to labour input (which can be expressed in man-days, man-hour, days e.t.c. (Ogundari, 2005)

Micro-economic production function has usually been the tool for examining the problem of resource productivity at the farm enterprise levels (Olayide and Heady, 1992). Attention is usually focused on estimation of production coefficient under the assumption that the production unit is mainly interested in organizing and utilizing available resources for profit maximization purpose.

Besides, the production function, using other techniques can also carry out empirical estimation of resource productivity. One of such techniques involves calculating input-output ratios. This means that individual resource productivity in any production process is measured in terms of the ratio, which the total enterprise output bears to the amount of input used.

A much more powerful technique from which resource productivity can be derived than input-output ratio is linear programming while another powerful tool for investigating the resource-use efficiency on the farm is the stochastic production and cost frontier.

However, it should be noted that each of the tool itemized is not without disadvantage while the choice of technique is largely determined by the data availability requirement. For example, the linear programming and input-output ratio results cannot be tested statistically to know the degree of their reliability unlike production function technique of Ordinary Least Square, Maximum Likelihood estimate and Stochastic Frontier Production and Cost model. The parameters of each of the tools serve as basis for computing Marginal Value Product (MVP) of each input used in the analysis provided the average price of output is known.

2.2.2.1. Measurement of input allocative efficiency in theory and practice

Marginal Value Product (MVP_x) for a given level of technology serves as the yard stick for judging the efficiency of resource-use allocatively when related to the input price (opportunity cost).

The MVP_x of a particular resource represented the expected addition to the gross returns caused by an addition of one unit of that resource while other inputs are held constant. The price used is the prevailing average market price (P_x) over the entire production season. The magnitude of MVP has to be compared with the input price to determine the worthwhileness of increasing the level of resource-use allocatively.

Economic theory states that a firm maximizes its profit with respect to an input, if the ratio of its MVP is one (Kay, 1981). However, if the MVP_x is greater than P_x , it implies underutilization of such resources, hence there is hope for raising output by increasing the use of that particular resources. On the other hand, when MVP_x is less than P_x , it shows over utilization of the resources, hence output can be increased by reducing the use of such resources. The differential between MVP_x and P_x indicates economic efficiency, (Alimi, 2001).

In line with the above, this study uses the estimates of MVP and the prevailing market price (P_x) of individual resource to find out if such resource is allocated efficiently or otherwise.

2.3. Review of Past Studies on Resource –use and Allocative Efficiency

In Nigeria, past studies on resource-use efficiency using production function has come up with various conclusions. For example, a study conducted by Olagoke (1991) on efficiency of resource use in rice production systems analyzed the activity of forty five randomly selected rice farmers in Uzo -Umani Local Government Area of Anambra State. The study showed that swamp rice farms had the highest average

return per hectare, followed by irrigated and least by upland rice. It was also observed that scarcity of land, financial constraints, unfavorable rainfall patterns and the inefficient distribution of irrigation water limited production of rice during the survey period.

In an economics of upland rice production study by Aderinola (1997) estimated cost and returns for upland rice production and determined efficiency for resource utilization of upland rice farms in Ondo State of Nigeria. He estimated production function and computed MVP of resources to indicate the level of allocative efficiency. Findings from the study indicated that land, hired labour and purchase input were underutilized while rice seeds and family labour were over utilized and that farmers operated at diminishing positive return to scale.

A study by Onyenwaku (1991), compared the resource-use efficiency between irrigated and non-irrigated farms in Nigeria. The results showed that technical efficiency was higher on irrigated farms compared with non-irrigated farms. However, both groups' under-utilized land, capital and other farm inputs, but labour and irrigation service were over utilized.

Chickwendu and Amos (1996) estimated the costs and returns of maize production in three villages in Niger State. Results from the findings showed that labour accounted for 77.8% of the total cost of production indicating a low demand for mechanization services. They also showed that sole maize production among small holder farmers is profitable only if family labour is not considered as item of cost. The computed Marginal Value Product (MVP) for labour and seeds are 116.4 and 49.1 respectively indicating that farmers were relatively efficient in the use of labour while



seeds were not used efficiently. Resources analysis shows that farmers could increase the efficiency of their resource-use by using more improved seeds.

Ojo (2000) examined the factor productivity in maize production in Ondo State, Nigeria. The result of the finding showed that maize production was profitable in the study area while the regression analysis showed that the explanatory variables explained about 87% of variability in the output of maize in the study area. The elasticity of production for each of the variable inputs showed that each was one with positive decreasing marginal returns while the overall returns to scale (RTS) was 1.15, meaning that production was in the stage one or irrational zone of the production surface. The value of marginal value product (MVPs) of farm size and seeds planted were greater than their unit price, while those of others are below their unit prices. This implies that those inputs were optimally allocated.

Ogunfowora *et.al* (1979) examined resource productivity in traditional agriculture in Kwara state, Nigeria. They estimated a Cobb-Douglas production function through a method of Ordinary Least Square (OLS) and observed that labour and seeds inputs were inefficiently utilized. Farm size (scale of operation) and the level of technology were not taken into consideration hence this made the result to be generalized.

In another developments, Oludimu, (1987) using Cobb-Douglas production function examined the efficiency of resources-use in various farm enterprises and concluded that efficient use of resource took place only at the rational stage of production (i.e., at the decreasing but positive return to scale stage). Further examination of the independent variables however, revealed a diminishing marginal

return and decreasing return to scale on farm investment and over utilization of resources.

Fasusi and Fasina (2005) examined resource-use efficiency of Yam Production in Ondo state, Nigeria using data collected from 142 yam farmers randomly sampled from 5 Local Government Areas of the state. The result of the production function analysis using the Ordinary Least Square (OLS) revealed that the estimated coefficients of Cobb-Douglas functional form (being the lead equation among other two estimated functional forms) of farm size, hired labour and seeds significantly differed from zero at 5% level while the computed Marginal Value Product (MVPs) for farm size, hired labour, family labour and seeds were greater than their marginal factor cost (MFCs), implying under utilization of the inputs.

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 The Study Area

The study was conducted in Ekiti State. The state was carved out of the old Ondo State in 1996. It has 16 Local Government Areas with Ado-Ekiti being the capital town. Ekiti State shares boundaries with Ondo State in the south and east, Osun State in the west and Kwara and Kogi States in the north (Fig 1.). The total land area of the state is 700km² of which a greater part of it is good and useful for agriculture (Ekiti State Agricultural Development Project, 1997). (EKADEP)

The rainfall pattern varies across the ecological zones in the state. Generally, the annual rainfall measurement is estimated between 1000mm and 1500m (EKADEP, 1997). Rain commences early between February and March and stabilizes between May and June.

The state is basically an agrarian state and the people mostly depend on agriculture as a means of livelihood. Generally, the people are good at arable crop production such as cereals (rice and maize), root and tubers (yam, cassava and cocoyam) and vegetables (tomatoes, okro, pepper and leafy vegetable). They are also involved in cash crop production such as cocoa, oil palm and cashew.

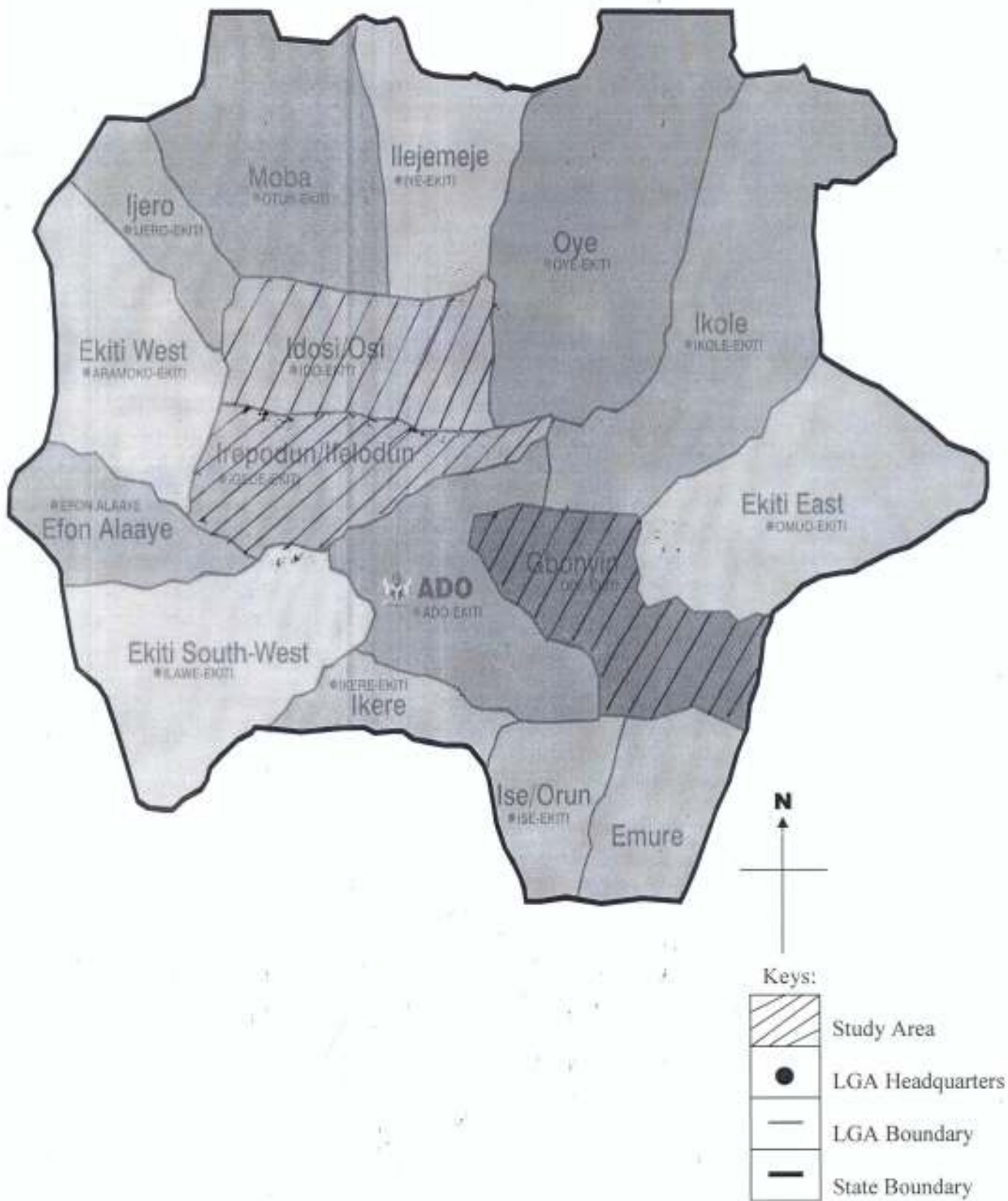


Figure 1: Map of Ekiti State showing the sampled areas in shaded portion.
 (Source: Dept. of Information Services, Ministry of Information, Ado-Ekiti)

3.2. Data Sources

The study made use of both primary and secondary data. The primary data on rice production were collected on the farm level data in the study area with the aid of well structured questionnaire administered by trained enumerators and some of the state's Agricultural Development Project (ADP) field staff.

The secondary data were obtained from the Federal Office of Statistics, the state ADP's annual report, Central Bank of Nigeria(CBN), Previous research report and other relevant agencies within and outside the country.

3.3 The Data

The data collected include information on the socio-economic and economic variables of the farmers such as age, educational level measured by years spent in school, marital status, farming experience, household size, source of credit and size of credit obtained.

Information also collected include the input-output data of the farmers for the production function analysis. The output data represents the total farm output of rice in kg (paddy rice, that is un-milled rice). The input data include: land area under rice cultivation (ha), family and hired labour in man-days, quantity of fertilizer (kg) used; amount spent on fertilizer, quantity of herbicide and pesticide (litres) used amount spent on herbicide and pesticide; quantity and cost of seed planted, and cost of simple farm tools such as cutlass; hoes and other farm implements.

3.4 Sampling Technique and Sample Size

The study used a multi-stage sampling technique. The first stage was the purposive selection of three Local Government Areas (LGAs) noted for rice production namely:

Gboyin; Irepodun Ifelodun and Ijan Iluomoba LGAs. The second stage involved random selection of three rice producing villages from each of the three LGAs. The list of the LGAs and villages producing rice in each of the LGAs were readily obtained from the state's ADP office. The third and final stage was the random selection of 15 farmers from each of the villages, making a total of 45 farmers per LGAs and thus, a total of 135 farmer were sampled for the study. The list of farmers in each village was also compiled with the Village Extension Agents.

3.5. Method of Data Analysis

The analytical technique employed involved descriptive statistics, budgeting analysis, and production function analysis. The descriptive statistics such as mean, standard deviation, frequency distribution and percentages were used to analyze the socio-economic characteristics of the respondents. The production function analysis using the Ordinary Least Square (OLS) method of multiple regression technique was used to estimate the parameters /coefficients of the best fit functional form which serves as a basis for measuring the level of resource-use efficiency of the inputs; while the computed MVPs for each of the input serves as a measure of allocative efficiency of the input used by the respondents.

3.5.1. Budgeting Analysis

This includes Gross Margin and Net Revenue to analyze the profitability of rice enterprises by the farmers in the study area;

The Gross Margin (GM) was specified as:

$$GM = TR - TVC \quad (1)$$

$$= \sum_{i=1}^6 P_i Q_i - \sum_{j=1} C_j X_j \quad (2)$$

Where: subscript i refers to the i-th respondents while j represents observation of the j-th variable costs and

TR = Total value of output of rice production (N)

TVC = Total variable cost of rice production/ha

P_i = Unit price of rice produce from the i-th enterprise in (N)

Q_i = Quantity of rice produced in Kg/ha

C_j = Unit price of input used (N)

X_j = Quantity of variable input used in kg

If $GM > 0$, then the farm enterprise is profitable.

The Net Revenue (NR) was specified as:

$$NR = GM - TFC \quad (3)$$

$$= TR - (TVC + TFC)$$

$$= TR - TC$$

$$= PQ - TC$$

Where:



TFC = Total fixed cost (cost of farm implement such as cutlass, hoe, spade and spraying pump).

TC = Total cost of production

The total revenue (TR) represents the value of total output of paddy rice produced per hectare. In order to calculate the gross margin and net revenue for this study, inputs cost were valued at prices paid by farmers and depreciated. Labour used was valued using the wage rate per man-day for the operations in the study area. However, opportunity costs were imputed for family labour utilization.

3.5.2. Estimation of Resource-Use Efficiency (Resource Productivity) of input use by the Respondents

The production function was used to determine the resource-use efficiency of input used by the respondents in rice production in the study area. However estimation of the production function parameters was done using the Ordinary Least Square method (OLS) of multiple regressions techniques. For this study, four functional forms were specified and fitted to the data using OLS as specified below:

Linear function:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 \quad (4)$$

Double log function:

$$\text{Log } Y_i = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + \beta_6 \log X_6 + \beta_7 \log X_7 \quad (5)$$

Semi-log function:

$$Y_i = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + \beta_6 \log X_6 + \beta_7 \log X_7 \quad (6)$$

Exponential function:

$$\text{Log } Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 \quad (7)$$

Where:

- Y_i = total farm output of paddy rice produced (kg)
- X_1 = cultivated land area of rice (ha)
- X_2 = sum of family and hired labour (man days)
- X_3 = quantity of seed planted (kg)
- X_4 = quantity of fertilizer used (kg)
- X_5 = quantity of herbicides and pesticide used (litres)
- X_6 = Farming Experience (years)
- X_7 = Depreciation cost on fixed input (N)

The β_i 's were parameters estimated. While e_i is the error term assumed to be normally distributed with zero mean value and constant variance, that is $(0, \sigma^2)$.

3.5.3. Evaluation Criteria for the Selection of the Best –Fit Functional Form

Trial runs were made for the four specified models to determine which of the models fitted the data most. The following criteria were used:

- The goodness of fit: This called for magnitude of the coefficient of multiple determinations R^2 with special reference to adjusted R^2 because it attempts to correct the optimistic bias of the sample R^2 and also, it is not influenced by the number of regressors.
- The appropriateness of the sign of the regression coefficient.
- The magnitude of the standard error (SE); the equation with the least value is preferred.
- The significance of the t-statistics and F- statistics test: Test of significance on regression coefficient indicates the probability that a coefficient of the

size could have arisen by chance from the sampled data if the true value of the coefficient were zero.

3.5.4. Computation of Allocative Efficiency of input Used by the Respondents

Optimum input utilization can be determined by taking into cognizance input (P_x) and output prices (P) in relation to the marginal product (MP_x) of input used which serves as the basis for computing Marginal Value Product (MVP_x) of input used during the production process.

Marginal Product of input x (MP_x) is therefore defined as an additional increase in the level of output as a result of additional unit of input. This can be derived using the relationship shown below:

$$\epsilon_i = \frac{\partial Y}{\partial X} \cdot \frac{X_i}{Y_i} = MP_x \cdot \frac{1}{AP_x} = \frac{MP_x}{AP_x} \quad (8)$$

$$MP_x = \frac{\partial Y}{\partial X} \quad (9)$$

$$AP = \frac{Y}{X}, \text{ hence, } \frac{1}{AP} = \frac{X}{Y} \quad (10)$$

Where:

ϵ_i represents production elasticity defined as a measure of the proportional change in output resulting from a proportional change in input with all given input levels held constant, AP_x represents Average Product and is defined as amount of product obtained per unit of input at a particular level of production or level of input use.

For Cobb-Douglas (CD) functional form, the coefficients of the estimated production function analysis serves as a direct measure of input elasticities (ϵ_i) of production process as shown below:

Assuming a Cobb Douglas functional form is implicitly represented below:

$$Y_i = a_0 X_1^\alpha X_2^\beta = \text{Log} Y_i = \text{Log} a_0 + \alpha \text{Log} X_1 + \beta \text{Log} X_2 \quad (11)$$

$$MP_{X_1} = \frac{\partial Y}{\partial X_1} = a_0 \alpha X_1^{\alpha-1} X_2^\beta \quad (12)$$

$$MP_{X_2} = \frac{\partial Y}{\partial X_2} = a_0 \beta X_1^\alpha X_2^{\beta-1} \quad (13)$$

$$\epsilon_i = \frac{MP_x}{AP_x} \quad (14)$$

$$\epsilon_{x_1} = MP_{X_1} \times \frac{X_1}{Y} = \frac{a_0 \alpha X_1^{\alpha-1} X_2^\beta}{1} \times \frac{X_1}{a_0 X_1^\alpha X_2^\beta} = \alpha \quad (15)$$

$$\epsilon_{x_2} = MP_{X_2} \times \frac{X_2}{Y} = \frac{a_0 \beta X_1^\alpha X_2^{\beta-1}}{1} \times \frac{X_2}{a_0 X_1^\alpha X_2^\beta} = \beta \quad (16)$$

The coefficient CD serve as a direct measure of elasticities for the inputs as prove above unlike other functional forms which coefficients of their production function serve as direct measure of MP_x. Therefore, to calculate MP_x for input x, for CD, the relationship below is normally employed:

$$MP_x = \epsilon_{x_1} \times X \times AP_x \quad (17)$$

However, marginal value product (MVP_x) of input used is computed by multiplying the estimated marginal product (MP_x) from the production function analysis with the arithmetic mean of output price (P) (Osuntogun, 1980). Hence, allocative efficiency of an input is computed by comparing the marginal value products (MVP_x) of inputs used to the input prices (P_x) (Adeniyi, 1988) as shown below:

At optimum level ,computed MP_x is expected to be equal to the ratio of the arithmetic mean price of input (P_x) and that of output price(P) such that :

$$MP_x = \frac{P_x}{P} \quad (18)$$

$$MP_x \times P = P_x \quad (19)$$

Where:

$$MVP_x = MP_x \times P$$

Therefore:

$$MVP_x = P_x$$

When:

- i. $MVP_x = P_x$, it means, optimum utilization of input used
- ii. $MVP_x > P_x$, it means, under utilization of input used, hence to get back to the optimum level (economic level), the use of such inputs must be increased.
- iii. $MVP_x < P_x$, it means, over utilization of inputs, hence, reducing the use of the inputs will add to total output.

CHAPTER FOUR

4. Result and Discussion

4.1.0 Socio-Economic Characteristics of the Respondents.

4.1.1 Age

The age distribution of the respondents is presented in Table 2. The age of the respondents ranges between 25 and 69 years. The highest age concentration of about 39 % fell within the range of 55-64 years. About 20% of the respondents fell within 45-54 years. The age range of 25-34 years and 55-69 years had about 16% and about 7% respectively while the average age of the respondents was estimated as 52.78 year with a standard deviation of 20.43 years. The implication of the findings show that unless the farm operations in rice cultivation witnesses the injection of young able farmers, rice production in the study area will suffer a setback as existing farmers would have reached their declining productivity level, since most of the farm operations in rice cultivation, such as land clearing, tilling, weeding and harvesting, require a lot of strength and energy. Thus, it agrees with the assertion of Ogundele and Okoruwa, (2006) that only those farmers within the productive age group of 20-45 years are likely to possess the necessary strength to carry out these operations. Therefore, as farmers' age increases, there is tendency that productivity will continue to decrease owing to their declining strength.

Table 2: Distribution of the Respondents by Age

<i>Age Group (years)</i>	<i>Frequency</i>	<i>Percentage</i>
25-34	21	15.56
35-44	25	18.52
45-54	27	20.00
55-64	52	38.52
≥65	10	7.40
Total	135	100

Source: Survey data, 2005

4.1.2 Sex

Table 3 shows that about 79% of the respondents were males while about 21% were females. This implies that there is domineering of male gender in rice production in the study area. This can be attributed to the fact that most of the farm operations in rice cultivation such as land clearing, tilling, weeding and harvesting require a lot of strength and energy which women may not be able to provide.

Table 3: Distribution of the Respondents by Gender

<i>Gender Group</i>	<i>Frequency</i>	<i>Percentage</i>
Male	107	79.26
Female	28	20.74
Total	135	100

Source: Survey data, 2005

4.1.3 Marital status

The marital status distribution of the respondents is presented in Table 4. The study revealed that about 84% of the respondents were married, while about 16% were single. The marital status of the farmers had a lot of influence on the production

Table 4: Distribution of the Respondents by Marital Status

<i>Status</i>	<i>Frequency</i>	Percentage
Single	21	15.60
Married	114	84.40
Total	135	100

Source: Survey data, 2005

performance of these farmers. Family members for those married could be involved in farming activities by providing farm hands thus reducing the cost of labour in the long run.

4.1.4 Household Size

The result in Table 5 show that many of the farmers have household size with 1 to 5 members (48.89%) followed by those with 6 to 10 members (42.96%) while 8.15% had 11-15 members. An average household size of seven members with a standard deviation of 7.89 members was obtained from the analysis. The implication of this finding is that farmers keep large household size in the area as is common in most developing countries. Household members play significant roles in farming as they provide labour requirement in the farm. This is particularly important in view of the generally increasing cost of hired labour and inability of farmers to make use of improved mechanical tools either due to the high cost or relative smallness of farm size.

Table 5: Distribution of the Respondents by Household Size

<i>Household Size</i>	<i>Frequency</i>	<i>Percentage</i>
1-5	66	48.89
6-10	58	42.96
≥11	11	8.15
Total	135	100

Source: Survey data, 2005

4.1.5 Educational level

Table 6 revealed that few of the respondents (9%) had no formal education, about 23% had primary school education, another 22% had secondary school education while about 36% had post secondary educations. The average years of schooling for the farmers was 12.39 years.

This high level of literacy no doubt could affect the level of technology adoption and skill acquisition among the farmers since, education enhances technology adoption and the ability of farmers to plan and take risk: Farmers with higher levels of education are likely to be more efficient in the use of inputs than their counterpart with little or no education.

Table 6: Distribution of Respondents by Educational level.

<i>Educational Level</i>	<i>Frequency</i>	<i>Percentage</i>
No formal Education	12	8.89
Primary School Education	31	22.96
Secondary School Education	43	31.85
Post Secondary School Education	49	36.30
Total	135	100

Source: Survey data, 2005

4.1.6 Year of Farming Experience of the Respondents

Table 7 shows the number of years of farming experience of the respondents in the study area. The study revealed that few (9%) of the respondents had less than ten years, about 16% had 11-20 years, 30% had 21-30 years, 35% had 31-40 years while only 10% had above 41 years of farming experience.

The average farming experience of the respondents was estimated to be 27.29 years with a standard deviation of 23.85 years. The implication of these findings is that farmers in the study area could be said to be experienced in rice production. A farmer who has been growing rice for, say, 10 years is likely to be more knowledgeable about the weather/climate, the incidence of pest and disease, and other agronomic condition of the area than a farmer who is just coming into the business irrespective of the level of education. Farming involves a lot of risks and uncertainties, and to be competent enough, a farmer must have stayed on the farm for quite some time.

Table 7: Distribution of the Respondents by Year of Experience

<i>Years Experience</i>	<i>Frequency</i>	<i>Percentage</i>
≤10	12	8.89
11-20	21	15.56
21-30	41	30.37
31-40	47	34.81
≥41	14	10.37
Total	135	100

Source: Survey data, 2005

4.2.0. Economic Factors

4.2.1. Sources of Finance of Respondents

The results of the data analysis revealed that about 26% (35) of the respondents had access to credit facilities as presented in Table 8. However, majority 70.34% of the respondents depended on personal savings as their major source of finance, 6.21% depended on money lenders, 3.44% depended on friends, 9.66% depended on relatives, 8.28% depended on cooperative societies, 1.38% depended on grants and only 0.69% obtained loan from the Nigeria Agricultural Cooperative and Rural Development Bank (NACRDB).

This result, could be an indication that majority (89.65%) of the respondents depended on non-formal source for financing their rice production activities in the study area. The reason for this could be because they do not have collateral security required by the commercial banks or any formal lending institutions of finance. Again, farmers may find it difficult to cope with the interest rate from these financial sources.



Table 8: Distribution of Respondents Based on the Credit Source

Types of Credit Source	Frequency	Percentage
Personal Savings	102	70.34
Money lenders	9	6.21
Friends	5	3.44
Relatives	14	9.66
Cooperative society	12	8.28
Grants	2	1.38
NACRDB	1	0.69

Source: Survey data, 2005

* Multiple responses exist

4.2.2. Size of Credit obtained for production Process

Table 9 shows the size of credit obtained by the 35 respondents in the study area who obtained credit facilities. The study revealed that, 29 of them representing about 83% of the respondents obtained about N20, 000 worth of credit, about 11% obtained between N 21,000 and N 40,000 worth of credit, few, (3%) obtained between N 41,000 and N 60,000 worth of credit while 3% obtained between N 61,000 and N 80,000 worth of credit in the study area. However, the mean value of loan obtained by the respondents was N17,476.54 with standard deviation of N6,841.37.

By this result, it was observed that considering the number of the respondents with access to credit facilities and most importantly the size of average loan /credit obtainable by the respondents in the study area, one could conclude that the size of average credit obtained may not permit the farmers to enhance their conventional allocative efficiency as they may not be able to overcome the financial

Table 9: Distribution of Respondents by the Size of Credit Obtained

<i>Credit size(N)</i>	<i>Frequency</i>	Percentage
≤20,000	29	82.86
20,999 - 40,000	4	11.42
40,999 - 60,000	1	2.86
60,999 - 80,000	1	2.86
Total	35	100

Source: Survey data, 2005

constrains to purchase required inputs of say fertilizers or new technological package such as high yielding seeds. According to Weissman (1990), credit shortages adversely affect small farmers' access to input and cooperative storage facilities.

4.3.0. PRODUCTION PERFORMANCE OF RICE FARMERS IN THE STUDY AREA

The production performance of the farmers is presented under the following headings:

-input utilization

-output performance analysis

4.3.1. Input Utilization Profile of the Respondents

4.3.1.1 Farm Size

From Table 12, the average farm size per farmer was 1.71ha. About 61% of the respondents had a farm size of less than 1.0 ha, some 17% had farm size of between 1.1 and 2.0 ha, about 7% had 2.1-3.0 ha, 5% had 3.1- 4.0 ha while 10% had over 4.1 ha of farm size.

In addition, estimated average farm size of 1.71 ha with standard deviation of 1.76 ha was obtained from the analysis. This finding attest to the fact that majority of

the respondents are small scale farmers. According to Upton, (1972) farm sizes in Nigeria have been described as small, medium or large scale, if they fall into categories of less than 5 ha, between 5 ha and 10 ha, or more than 10 ha, respectively. The average farm size that could be cultivated by a rice farmer irrespective of the technology depends on the availability of land, the ownership structure, and availability of labour input.

Table 10: Distribution of the Respondents by Farm Size

<i>Farm sizes (ha)</i>	<i>Frequency</i>	<i>Percentage</i>
0.1 – 1.0	82	60.74
1.1 – 2.0	23	17.04
2.1 – 3.0	10	7.40
3.1 – 4.0	7	5.19
≥ 4.1	13	9.63
Total	135	100

Source: Survey data, 2005

4.3.1.2. Labour Utilization in Rice Production

The labour utilization profile from the data analysis revealed that about 28% of the respondents used family labour only, about 35% used hired labour only while 37% used both family and hired labour in the course of their production (Table 11).

The average mandays of labour employed by the rice farmers was estimated at 311.47 mandays with a standard deviation of 96.30 mandays. The implication of this finding attests to the fact that in Nigeria, agriculture is still highly labour intensive as most operations are still being carried out using hand tools (Ogundele and Okuruwa, 2006). Hence, labour still constitute the most important input to smallholder

Table 11: Distribution of Type of Labour used by the Respondents

<i>Type of labour</i>	<i>Frequency</i>	Percentage
Family labour	38	28.10
Hired Labour	47	34.80
Both	50	32.00
Total	135	100

Source: Survey data, 2005

agricultural production in Nigeria. Hence any constraint to the cost and availability of labour could be detrimental to farm productivity.

4.3.1.3. Seed Use

The quantity and type of seed planted by rice farmers depend on the production system, size of the farm, availability of seed varieties, price per kg, the technology available to the farmer, ability of the farmer to take risks and the suitability of the variety to a particular environment. This also has effect on the level of output realized at the end of the farming operation. The recommended amount of seeds per hectare of upland and lowland rice production system was put at 80-100kg/ha for broadcasting and 60kg for drilling (IRRI, 1995). This study found that the respondents planted an average of 60.48 kg of seeds per ha with standard deviation of 114.06kg. This is in agreement with recommendations. The findings have a lot of implication for output and yield.



4.3.1.3. Fertilizer Application

Fertilizer is known to be one of the most critical inputs in rice production because of the high response of the crop to fertilizer application. The estimated average quantity of fertilizer applied by the respondents was about 72 kg/ha. However, this fell below the recommended rate of 250 to 350 kg per hectare for upland and lowland swamp rice production system. This could have serious effects on yield (Ogundele and Okoruwa, 2006).

4.3.1.4. Agrochemical Application

In the face of scarcity and increasing wage rate of farm labour, the use of herbicides has been observed as a major labour saving device as the labour requirement for weeding always accounts for a high proportion of the total farm labour cost in rice production. Rice, like other grains, requires prompt application of agrochemicals such as pesticides and insecticides to check the menace of pest and disease infestation that may occur as a result of overgrowth of weeds.

However, an average 1.30 liter/ha of herbicides and pesticides was applied by the respondents in the study area. This finding is in agreement with the findings of (Ogundele and Okoruwa, 2006) and is in conformity with recommended quantity by International Rice Research Institute for the traditional rice (IRRI, 1995).

4.3.2. Output Performance Analysis

Table 12 shows the yield of rice farmers. The result revealed that 36.30% of the respondents had yield of about 500kg/ha; 32.60% had 501 to 1000kg/ha; 11.11% had between 1001 and 1500kg/ha; 5.93% had 1501 to 2000kg/ha, 1.48% had 2001 to 2500kg/ha; 2.22% had 2501 to 3000kg/ha while 10.30% had above 3000kg/ha. An

estimated average yield of 1,211.85kg/ha was obtained by rice farmers in the study area. This shows that the small-scale nature of rice production considering the average farm size of 1.71ha as against the expected yield of 1.86kg/ha in the study area (IRRI, 1995).

Table 12: Distribution of Farmers by Farm Yield (kg/ha)

<i>Farm yield in kg/ha</i>	<i>Frequency</i>	percentage
≤500	49	36.30
501-1000	44	32.60
1001-1500	15	11.11
1501-2000	8	5.93
2001-2500	2	1.48
2501-3000	3	2.22
≥3001	14	10.36
Total	135	100
Mean		1.71Kg/ha

Source: Survey data, 2005

4.4.0: Cost and Return Analysis

4.4.1: Analysis of Respondents' Cost of Production

Table 13 shows the analysis of costs incurred by the rice farmers in the study area. The farmers' total cost of production is made up of Total Variable Cost and Fixed Cost. Statistic revealed that out of the total cost, cost of seeds accounted for 8.38%, cost of fertilizer accounted for 6.47%, cost of herbicides accounted for 3.06%, cost of pesticides accounted for 0.67%, cost of transportation accounted for 3.91%, while labour cost accounted for 74.73%. The overall percentage share of depreciation cost

(only fixed cost) (TFC) out of the total cost (TC) was 2.78% while Total Variable Cost share (TVC) out of the Total Cost (TC) was 97.22%.

The fact that cost of labour accounted for the largest share of the total cost is an indication that labour is an important determining factor in rice production among the farmers. This implies that the average farmer in the sample area will have to spend more in acquiring more labour when expanding their size of their operation.

Table 13: Distribution of production costs for the respondents (N)

<i>Variables</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>% of TC</i>
Cost of seeds	4,877.93	4,117.99	8.38
Cost of fertilizer	3,768.15	6,954.72	6.47
Cost of Herbicides	1,782.22	5,825.44	3.73
Cost of Pesticides	391.11	2,160.40	0.67
Cost of transportation	2,275.85	4,542.81	3.97
Labour Cost	43,509.70	30,220.17	74.75
Total variable cost(TVC)	56,604.96	31,206.19	97.22
Depreciation cost(TFC)	1,619.29	1,363.41	2.78
Total cost (TC)	58,224.25		100

Source: Survey data, 2005

4.4.2. Returns Analysis

Table 14, shows the distribution of the farmer's total revenue, which was estimated at an average of ₦133.13 per kg of paddy rice as market price in the study area.

The study revealed that 15.56% of the respondents realized about ₦ 50,000 as a receipt from rice production in the study area, 25.19% had between ₦ 51,000 and ₦ 100,000, 15.56% had between ₦ 101,000 and ₦ 150,000, while 7.41% had between

₦151,000 and ₦200,000. Some 5.92% had between ₦ 201,000 and ₦ 250,000, 5.92% had between ₦ 251,000 and ₦ 300,000 and 2.22% had between ₦ 301,000 and ₦ 350,000. Others, 3.70% had between ₦ 351,000 and ₦ 400,000, 5.19% had between ₦ 401,000 and ₦ 450,000 while 13.33% had above ₦ 451,000.

The estimated average revenue for a representative rice farmer was ₦ 275,882.37.

Table 14: Distribution of Respondents by accrued total revenue

<i>Size of Revenue(₦)</i>	<i>Frequency</i>	<i>Percentage</i>
≤ 50,000	21	15.56
51,000-100,000	34	25.19
101,000-150,000	21	15.56
151,000-200,000	10	7.41
201,000-250,000	8	5.92
251,000-300,000	8	5.92
301,000-350,000	3	2.22
351,000-400,000	5	3.70
401,000-450,000	7	5.19
≥451,000	18	13.13
Total	135	100
Mean	275,882.37	Std = 393,446.38

Source: Survey data, 2005

4.5.0: Profitability Analysis

This section discusses the profitability measures of rice production with respect to the Gross Margin and the Net Returns.

4.5.1. Gross Margin Analysis

Table 15 presents the Gross Margin involved in rice production in the study area. The cost elements in the total variable cost include those of seeds, fertilizer, herbicides, pesticide, transportation, and labour.

However, from the analysis, the Total Variable Cost (TVC) for a representative rice producer in the study area obtained was ₦56,604.96 while the corresponding Total Revenue (TR) was ₦275,882.37. The Gross Margin (GM) was ₦ 221,277.41 and GM/ha was ₦ 129, 401.89 for the study area.

This finding indicates that rice production was profitable in the area. Thus, the respondents were able to cover their total operating expenses per hectare in the study area

4.5.2. Net – Return Analysis

Table 16 presents also the net return for rice production in the study area. The Total Cost elements comprise Total Variable Cost as defined earlier and Total Fixed Cost on fixed inputs such as cutlass, hoe, spade, sprayer (pump). The net–return (the difference between total revenue obtained earlier as ₦275, 882.37 and total cost estimated as ₦58,224.25) was estimated to be ₦218,658.12 per annum for the study area while NR/ha was estimated as ₦127,285.45. This finding attests to the fact that rice production is profitable in the area. Hence, the first null hypothesis that the Net-Revenue ($H_{01}:NR=0$) is not different from zero is ejected at 5% level of significance.

Table 15: Net–Revenue Analysis for Rice Production in the study Area

<i>Variables</i>	<i>Mean</i>	<i>Std.Deviation</i>
Farm size	1.71	1.77
Total Variable Cost(TVC)	56,604.96	31,206.19
Total Fixed Cost(TFC)	1,619.29	1,363.41
Total Cost(TC)	58,224.25	31,501.53
Total Revenue(TR)(output)	275,882.37	393,446.38
Gross Margin(GM)	219,277.41	377,085.05
Net –Revenue(NR)	217,658.12	393,268.59
GM/ha	128,232.40	242,103.92
NR/ha	127,285.45	239,210.75

Source: Survey data, 2005

4.6.0. Production Function Analysis

4.6.1. Summary Statistics of Variables for the regression Analysis

The summary statistics of variables for the estimation of the production function through the use of Ordinary Least Square Method (OLS) of multiple regression analysis is presented in Table 16. The mean output of 2,070.27kg with standard deviation of 2,480kg of paddy rice from an average farm size of 1.71ha was obtained from the analysis. This means that an average rice farmer in the study harvested 1,211.85kg of paddy rice per ha which is equivalent to 17 bags of 70kg each.

The average mandays of labour employed by the farmers in the study area was 311.47 mandays with a standard deviation of 226.30 mandays. The large size of mandays is an indication that rice production in the study area is labour intensive as most operations are done manually. The average quantity of fertilizer used was 123kg with a standard deviation of 204.04kg indicating a large variability in the fertilizer

usage among the farmers. The mean quantity of planting materials (seeds) used was 60.48kg with a standard deviation of 114.66kg.

The mean quantity of herbicides and pesticides (litre) used per annum by the farmers was 2.23 litres with a standard deviation of 6.05 litres while an average 19.29 years with a standard deviation of 13.85 years was recorded as years of farming experience in the study area. The implication of the size of variability as measured by the standard deviation compared with mean – value for the quantity of herbicides and pesticides (litre) and the years of farming experience obtained from the analysis is that there was high degree of inequality in the variables among the farmers.

The average depreciation cost on the fixed input such as cutlass, hoe and pump used by the farmers in course of their farm operations was N 11,619.29 with standard deviation of N 1,363.41. The size of variability implies that there was inequality in the amount spent by each respondent on the itemized farm tools per annum in the study area.

Table 16: Summary Statistics of Variable for the Estimation of Production Parameters for Rice Farmers in the study area.

<i>Variables</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Dev.</i>
Output (kg)	640.00	11,500	2,072.27	2,480.97
Land(ha)	0.30	4.90	1.71	1.77
Labour (man days)	86.00	568.0	311.47	96.30
Fertilizer (Kg)	32.00	1200.00	123.00	204.04
Seed(kg)	17.00	450.00	60.48	114.06
Herb & Pest(litres)	0.00	44.00	2.23	6.05
Farming Experience.(yrs)	7.00	50.00	19.29	13.85
Depreciation cost (₦)	141.67	6,750.00	1,619.29	1,363.41

Source: Survey data, 2005

4.6.2. Resource -Productivity of input used by the farmers

The focus here is to determine the resource – use efficiency (productivity) of input used by rice farmers in the study area using Ordinary Least Squares (OLS) models. The models were specified using different functional forms such as linear, semi – log, exponential and Cobb–Douglas(CD) functions in an attempt to obtain a regression result with the best fit.

Following the evaluation criteria for the selection of the best–fit functional form stated in section 3.5.3, CD functional form was selected as the lead equation among the other estimated functional forms (linear, semi – log and exponential) because of its highest adjusted R square value (\bar{R}^2), significance of the F - statistic, least standard error (SE), appropriate sign of coefficient and significance of the t-statistic. All the four functional forms are presented in Table 17.

The regression result of the lead equation is presented as follows:

$$\text{Log}Y_i = 2.527^* + 0.21\text{Log}X_1^* + 0.284\text{Log}X_2^* + 0.564\text{Log}X_3^* + 0.634\text{Log}X_4^* + 0.584\text{Log}X_5^* - 3.621\text{Log}X_6 + 1.981\text{Log}X_7 \quad (20)$$

(8.64)
(4.468)
(3.493)
(2.29)
(3.552)
(2.462)

(1.476)
(1.004)

Figures in parentheses are t-values of the regression coefficients
*statistically significant at 5%.

$$R^2=0.914, F\text{-value}=20.17, SE = 0.301$$

The R^2 for the estimated regression (CD) shows that 91.4% variability in the output (kg) of the farmers is explained by all the explanatory variables. The F – statistic of 20.17 was observed to be statistically significant at 5% meaning that all the explanatory variables jointly influenced the variability in the output of the rice produce by the farmers in the study area.

The estimation of productivity of different inputs included in the regression analysis obtained as the estimates of the coefficients of the CD functional form revealed that all the independent variables (regressors) included in the regression analysis had positive coefficients except year of farming experience. The implication of this finding is that, farm size, labour, quantity of fertilizer applied, quantity of seed planted, quantity of herbicides and pesticides used and depreciation cost on fixed inputs have direct relationship with the dependent variable (output) such that an increase in the value of any of these coefficients will contribute to increase in the total output.

Farming experience had negative coefficient implying that the more experienced the farmer, the older in age and the less productive on the farm. It has been confirmed by other researchers that older farmers tend to be less enthusiastic in adopting innovations/technologies which could lead to increased output.

However, positive coefficient of farm size, labour, seeds and depreciation on fixed input in this study is in conformity with earlier findings by Ojo (2000) and Ogundari and Ojo (2005). Adeniyi (1988) and Aderinola (1997) reported that inefficient use of labour significantly adversely affected rice production. Eremie and Akinwumi (1986) reported low yield per hectare and high labour cost, while Ziwa *et al* (1988) found non – availability of cultivable lands and labour as the constraints to increased rice production.

Result of the second null hypothesis ($H_2: \beta = 0$) that the estimated coefficients of the production functions are not significantly different from zero for the lead equation (CD) revealed that five of the independent variables are significantly different from zero at 5% level of significance (farm size, labour, fertilize, seed, and herbicide & pesticide). This is an indication that these five explanatory variables were important determinants of rice production in the study area

Table 17: The estimated coefficients of econometric analysis of resource-use efficiency of respondents in the study area.

<i>Variables</i>	<i>Linear</i>	<i>Semi-log</i>	<i>Exponential</i>	<i>Cobb-Douglas</i>
Constant	8.046* (2.100)	6.081* (2.167)	2.843* (39.845)	2.527* (8.640)
Farm size	1.451* (2.901)	1.027* (3.903)	0.144* (2.171)	0.21* (4.468)
Labour	7.215 (0.183)	1.581 (1.382)	0.430* (2.758)	0.284* (3.443)
Qty.of fertilizer	5.046* (5.116)	4.046* (2.151)	0.285* (4.996)	0.564* (2.290)
Qty.of seed	8.801 (0.219)	1.84* (2.535)	0.195 (0.246)	0.634* (3.552)
Qty of Herb & Pest.	21.70 (0.639)	2.797 (1.194)	0.329 (1.583)	0.584* (2.462)
Farming Expe.	-21.39 (1.712)	-3.093 (1.521)	-3.034 (1.583)	-2.577 (1.476)
Depreciation cost	0.002 (0.016)	1.663 (0.695)	2.016 (0.731)	1.981 (1.004)
R ²	0.416	0.657	0.440	0.914
\bar{R}^2	0.384	0.439	0.409	0.826
F-Value	12.933	10.598	14.250	20.169
Std.Error (SE)	194.199	202.780	0.331	0.304

From data analysis

Figures in parentheses are t-ratio

** Estimate is significant at 5% level*

4.6.3. Elasticity and Return to Scale

Elasticity measures the proportional change in output resulting from a proportional change in input with all other given inputs held constant. It indicates the expected percentage increase (decrease) in the farm output if the amount of independent variable was increased (decreased) by one percent while other variables are held constant.

However, for this study the CD functional form which gave the best fit for the regression analysis, serves as the lead equation in measuring the elasticity of input used by the rice farmers in the study area as presented in Table 18.

The estimated elasticity of farm output with respect to land is 0.21, which is a decreasing positive function of land. The elasticity of mean output with respect to labour was 0.284, indicating a decreasing (positive) function. Elasticity of mean output with respect to quantity of fertilizer (kg), quantity of seed (kg) and quantity of herbicides and pesticides used were 0.564, 0.634 and 0.524 respectively. This means that the elasticity of output with respect to these variables gave a decreasing (positive) function. It is also noted that the elasticity of output with respect to farming experience is a decreasing (negative) function.

The returns to scale parameters (1.636) obtained from the summation of elasticities (ϵ_{pi}) indicates an increasing returns to scale. This implies that the rice farmers are in stage I of the production process. Hence, farmers are in the irrational stage of efficient resource allocation and utilization. Hence, the third hypothesis (H_{03} : $0.1 < \sum \epsilon_p \leq 0.9$) that the rice farmers are operating in the efficient region of production surface that is stage II was rejected.

Table 18: Elasticity and returns to scale

<i>Variables</i>	Elasticity
Farm size	0.210
Labour	0.240
Qty.of fertilizer	0.564
Qty.of seed	0.634
Qty.of Herb. & pesticide	0.584
Farming Experience	-2.577
Depreciation cost	1.981
<i>Return to Scale</i>	1.636

Computed from data analysis

4.7.0. Result of Allocative efficiency of input used

Allocative efficiency of an input is computed by comparing the input; Marginal Value Product (MVP_x) with the inputs' acquisition prices (P_x) as presented in Table 19. Optimum input utilization can be obtained when MVP_x equals P_x ($MVP_x=P_x$), under utilization of input is obtained when MVP_x is greater than P_x ($MVP_x>P_x$) while over utilization of inputs can be obtained when MVP_x is less than P_x ($MVP_x<P_x$).

The Marginal Value Product (MVP_x) as computed and shown in Table 19 revealed that MVPs for labour, fertilizers, seed and depreciation cost are greater than their unit price (P_x) of land, fertilizers, seed and quantity of herbicides and pesticides used and depreciation cost respectively while the MVPs for farm size and chemicals are lower than the unit price of labour. Therefore, unit of land and chemical are being allocated efficiently and that for fertilizer, seed and depreciation shows under-utilization of resources.

Thus, with this results, the fourth null hypothesis ($H_{04}:MVP_x = P_x$) that the rice farmers are allocatively efficient in input use was rejected for all the included input in

the regression as non of the input were operated at optimum level except for labour as shown in Table 19. Hence, land , fertilizers , seed and quantity of herbicides and pesticides used and fixed input such as cutlasses and hoe could be brought into the production surface to increase output while labour should be reduced to increase output such that to get back to the point of economic optimum the use of the input must be reduced. This finding is in conformity with the work of Ojo (2000) who investigated factor productivity in maize production in Ondo state. He observed the MVP for farm size and seeds to be greater than their unit prices while MVPs of labour to be lower than the unity price. Aderinola (1997) in a study on the economics of upland rice production in Ondo state computed MVP of resources to indicate the level of efficiency in the study area. The findings from the study indicate that, there is over-utilization of land among the rice farmers and under utilization of labour.



Table 19: Computation of MVP of Input Used for Rice Production in the study area

<i>Variables</i>	$\beta=\epsilon_i$	AP_x	$MP_x=$ $\epsilon_i \times AP$	P_y	$MVP_x=$ $MP_x \times P_y$	P_x	Decision
Farm size	0.210	1.71	0.36	133.13	47.93	28,388.12	Over utili.
Labour	0.284	311.47	88.46	133.13	11776.68	260.48	Under utili.
Qty. of fertilizer	0.564	123.00	69.37	133.13	9235.235	110.60	Under utili.
Qty. of seed	0.634	60.48	38.34	133.13	5104.211	120.00	Under utili.
Qty. of Heb. & Pest.	0.584	2.23	1.30	133.13	173.07	454.50	Over utili.
Depreciation cost	1.981	19.29	38.21	133.13	5086.89	130.40	Under utili.

Computed from data analysis

4.8.0 Relationship between the results of the resource-use efficiency and allocative efficiency

Comparatively, the results of the resource-use efficiency and allocative efficiencies of the rice farmers in the study area, shows that under-utilization of labour, fertilizer, seed and depreciation cost under the allocative efficiency reflects the result of decreasing (positive) function for these variables as shown under the elasticity of inputs. Contrarily to the expectation, the elasticity of farm size (land) does not conform to the result of the allocative efficiency. Likewise, is the result of quantity of herbicide and pesticides. The under-utilization of labour under the allocative efficiency result conforms with the result obtained under the elasticity of input for labour, as the elasticity gave the decrease (positive) function.

Similarly, under-utilization of depreciation cost does not reflect the result of increasing function under the elasticity of input for depreciation cost.

Hence, these differences can be attributed to instability of unit price of inputs in the study area which in turn affects the allocative efficiency.

CHAPTER FIVE

5.0 SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1. Summary

This study was designed to carry out an analysis of the resource-use and allocative efficiency in rice production in Ekiti state, Nigeria with a view to determining the profitability, resource production and allocative efficiency of input used in rice production in the state. The study involved collection and analysis of data from 135 rice farmers from three LGAs. Descriptive statistics such as mean, standard deviation and frequency distribution were used to analyze the data generated and thus the socio-economic characteristics of the farmers. While the budgeting analysis was used to analyze the profitability of producing rice, production function analysis of Ordinary Least Square (OLS) was used to determine the resource-use or productivity of input employed by the respondents. Allocative efficiency of input used using the coefficients of the estimated regression analysis was determined.

Results from the data analysis show that the average farmer is about 53 years old with an age distribution of the farmers varying between 25 and 69 years. Majority of the respondents are male while few are females. Some 16% of the respondents are single while 84% are married. On the household distribution of the respondents, some 49% of the respondents had between one and five household members. This was followed by those with 6-10 members (43%) while those with 11-15 members constituted about 8% with mean of 7 members. On education, majority (91%) of the respondents were observed to be educated while 9% had no formal or western

education. The years of farming experience of the respondents varied between 3 and 42 years with a mean value of about 27 years.

The analysis of the economic factors revealed that 26%(35) of the respondents have access to credit facilities of which 99% depended on non-formal source for financing rice production in the study area. The mean value of maximum credit obtained by the respondents was N17, 477.

The input utilization profile revealed that farm size of the respondents varies between 0.3 and 4.9ha with an average of 1.71ha. The labour utilization profile shows that 28% of the respondents used family labour only, 35% used hired labour only while 37% used both family and hired labour with an average mandays of 311 labour employed in carrying out various farm operations by the respondents in the study area. The study also found that the respondents planted an average 35kg/ha of rice seeds while the quantity of fertilizer and agro-chemical (herbicides and pesticides) applied per ha were 72kg and 1.30 litres respectively by the respondents.

The result of output performance in terms of harvested paddy rice (unprocessed rice) by the respondents shows that an average of 1,212kg/ha was obtained by farmers from their fields. The result of cost and return analysis, revealed that out of the total cost of production (TC) of N 58,224.25, 8% accounted for cost of seeds, fertilizer accounted for 6%, herbicides and pesticides accounted for 1%, transportation accounted for 4% while labour accounted for 75%. The overall percentage share shows that Total Fixed Cost(TFC) accounted for 3% of TC while Total Variable Cost (TVC) accounted for 97% of TC. However, the respondents' total revenue obtained as return analysis was observed to be N 275,882.37 (N 161.32/ha).

The profitability analysis shows that the mean annual gross margin per hectare and net-revenue per hectare for the rice farms is estimated as N 128,232 and N 127,285 respectively.

Regression analysis revealed that 91.4% variation in the output (paddy rice measured in kg) was explained by all the explanatory variables (farm size, labour, fertilizer, herbicides and pesticides, farming experience and depreciation cost) included in the regression. The signs of coefficients of the Cobb-Douglas functional form revealed that all the explanatory variables had positive coefficients except years of farming experience meaning that the more farming experience a farmer have the lower the quantity of rice harvested. The F-value of 20.17 obtained was significant at 5% meaning that the explanatory variables jointly influenced the quantity of rice produced by the farmers while the estimated t-values for all the independent variables were significant at 5% level except that of years of farming experience and depreciation cost. The return to scale was 1.636, indicating that the respondents operated at the irrational zone of production surface.

The result of allocative efficiency of input use by the respondents revealed that there is under utilization of labour, fertilizer, seeds and depreciation cost of fixed materials such as cutlasses, hoe, and pump/sprayers while there is over utilization of farm size (land) and herbicides and pesticides by the respondents in the study area.

5.2. Recommendation and policy implication

In view of the findings of this study, the following recommendations are made for increased performance of rice farmers in the study area:

- i. The fact that labour was identified as a major input in rice production in the study area considering the magnitude of mandays of labour employed, policy attention should be directed towards providing labour saving technology to ease farm operations. Private participation in this should be encouraged.
- ii. Farmers should be encouraged to plant high yielding rice varieties. This could be achieved by strengthening the extension unit of the Ministry of Agriculture through proper funding so that more farmers could be exposed to the necessary technologies as this will go a long way in improving the present low production capacity of the farmers in the study area. Non-Governmental Organisations (NGOs) could be encouraged to partner with farmers in adopting high yielding rice varieties.
- iii. Farmers should be encouraged to increase their production of rice by increasing their farm sizes. This they could achieve through the formation of cooperative societies that will ensure access to necessary credit facilities and pooling of resources to enjoy economy of size.
- iv. The rice farmers should be given assistance in form of loan in order to be able to cope with increasing costs of inputs. Government should therefore show more seriousness in the implementation of agricultural credit schemes.
- v. Public-Private initiative for extension activities in the state should be strengthened.

5.3. Conclusion from the findings

Analysis of the socio-economic variables showed that the farmers are not quite aged and experienced considering the average age and years of farming experience obtained from the data analysis. However, the study found that the average respondents had high education which positively affected the farmer's adoption of new technology.

Rice production was found to be profitable in the study area considering the fact that the farmers were able to cover their operating expenses and fixed cost respectively as shown by the magnitude of the Gross-Margin and Net-Revenue obtained.

The result of the productivity of inputs revealed that the farmers were inefficient in the use of resources as confirmed by the return to scale (RTS) value obtained from the study. Also, estimation of allocative efficiency of input confirmed the RTS value as the result from the computation shows that variable inputs included in the regression were not optimally allocated.

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Appendix: QUESTIONNAIRE USED FOR THE DATA COLLECTION

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION, FEDERAL
UNIVERSITY OF TECHNOLOGY AKURE, ONDO STATE.

Questions on Resource-Use and Allocative Economic Efficiency of Paddy Rice Production in Ekiti State Nigeria

Dear Respondent,

I am please to inform you that this questionnaire is basically prepared to obtain relevant information that will assist me in my research work on the "Resource-Use and Allocative Economic Efficiency of Paddy Rice Production" in your locality.

Please, kindly give accurate information and be assured that all information obtained will be strictly treated as confidential and sincerely restricted for research purpose of which it is meant for.

Thanks for your anticipated cooperation.

Abiodun Adejoke Sherifat

Respondent Identification No..... *Date of Interview*.....

SECTION A: DEMOGRAPHIC DATA

1. Name of Town/Village:.....
2. Sex: Male { }; Female { }
3. Marital Status: Single { }; Married { }; Widowed { }; Separated { }
4. Age of Respondent:.....
5. Total household size:.....
6. Highest Education Level: No formal education (); Primary education ()
Secondary Education (); University Education (); Non-formal education ().
Others (specify) ().
6. For how long have you in farming business?.....yrs.

SECTION B: CHARATERISTICS OF FARM PLOTS/OUTPUT DATA

8. How did you obtain the farm land?:

Mode of acquisition	Rented *	Purchase*	Borrowed	Inherited	Gift	Community land
Specify						
Amount (N)*						

9. For your farm enterprises, complete this table:

Crops	Rice
Farm size cultivated	
Quantity Harvested	
Unit price(N)	

*Quantity may be in Kg, Bags, No.of tubers e.t.c;

*Unit may be in price per Kg/Price per Bag/Price per tuber e.t.c.

SECTION C: PRODUCTION EXPENSES AND LABOUR UTILIZATION/INPUT DATA

10. What category of labour did you use in your farm?

Family labour (); Hired labour (); Both ().

11. For the hired labour used complete this table:

Operations	Land clearing	Heaping	Planting	Weeding	Spraying	Harvesting	Other operations
No. Used							
No of Days worked in a year							
Wage rate(N)							

12. For the Hired labours used complete this table:

Operations	Male		Female		Children	
	No. Used	No. of days worked	No. Used	No. of days worked	No. Used	No. of days worked
Land clearing						
Heaping						
Planting						
Weeding						
Spraying						
Harvesting						
Others						

13. For the operating expenses, complete this table:

No	Items	Quantity	Values (N)
1.	Seeds/Planting materials for: (i). Yam(sets); (ii). Maize (seeds); (iii). Cassava (cuttings); (iv) Cocoyam (v) potato (v). Others.....		
2	Fertilizers		
3.	Herbicides		
4	Pesticides		
5.	Transportation		
6.	Others.....		

14. For the durable items used in your farm, complete this table:

Items	Quantity	Unit cost (N)	Life Span(Years)
Cutlass			
Hoe			
Spraying Pump			
Spade			

15. Did you obtain credit from any source? Yes () No ()

16. If yes (15) what is your source of credit:

Source of credit	Amount (N)	Interest paid in a year
Money lender		
Friends		
Relatives		
Cooperatives		
Commercial Banks		
Grants		
Others (specify).....		

17. What difficulties did you face in the course of your food crops production?

.....

18. What is likely assistance you want, if government is to provide any?

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