



RESEARCH ARTICLE

PROFITABILITY ANALYSIS OF UPLAND RICE PRODUCTION AMONG RESOURCE POOR FARMERS IN KADUNA STATE, NIGERIA: A STOCHASTIC PROFIT EFFICIENCY FRONTIER APPROACH

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ABSTRACT

This research work analyzed profitability of upland rice production among resource poor farmers in Kaduna State, Nigeria: A stochastic profit efficiency frontier approach. A Multi-stage sampling technique was employed. Data of primary sources were collected through the use of a well-designed and a well-structured questionnaire from 150 sampled rice farmers. The outcomes show that the mean age of the sampled rice farmers was 42 years. The average farm size cultivated by the rice farmers was 3.18 hectares which show that the rice farmers were small scale farmers. The gross margin obtained was N522,188.16/ha with the gross margin ratio of 0.564 and the operating ratio of 0.392 indicating that rice production was a profitable enterprise. The significant factors influencing profit efficiency of rice production were: fertilizer cost ($P < 0.01$), cost of hired labour ($P < 0.01$), cost of chemical and herbicide ($P < 0.01$), seed cost ($P < 0.01$), transportation cost $P < 0.01$ and cost of land and machineries ($P < 0.05$). The constraints facing farmers in the course of rice production were: lack of credit facilities, inadequate extension agents, bad road infrastructures, lack of farm inputs, high cost of fertilizers, and high cost of labour. The study recommends that rice farmers should be provided with farm inputs like: improved seeds varieties, fertilizers, and agro chemicals at a subsidized price in order to improve productivity and profit efficiency, farm machineries like tractors, and irrigation facilities for dry season rice farming should be made available by Nigerian government to rice farmers to encourage mechanized farming all year round to ensure there is food security in the country.

KEYWORDS

Profitability Analysis, Upland Rice Production, Stochastic Profit Efficiency Frontier Approach, Kaduna State, Nigeria.

1. INTRODUCTION

Rice (*Oryza sativa*) as one of the most important staple crops in Nigeria, plays a significant and crucial role in ensuring food security and also provides a source of income and livelihoods for millions of the smallholder farmers in Nigeria (FAO, 2021). The required quantity of rice in Nigeria is almost about 6.9 million MT, there is a reduction of 5% in consumption rate due to high increase in prices amid the dwindling purchasing power of the rice consumers (USDA, 2022). Efficiency refers to the act of achieving a good result with little waste of effort and resources (Rahaman et al., 2021; Alabi et al., 2023). There is existence of inefficiencies in agricultural production, the functions play by agricultural development in alleviating poverty and food security cannot be ignored, agricultural development helps in increasing farm productivity and it plays a major role in reducing rural poverty and hunger (Rahaman et al., 2021). The significance of this study lies in its potential to contribute valuable insights into the profitability of upland rice production, which can inform

policymakers, agricultural extension services, and other stakeholders in designing targeted interventions to enhance the livelihoods of resource-poor farmers (Afolabi et al., 2019). By identifying the determinants of profit efficiency, this research intends to provide evidence-based recommendations to improve rice production practices, promote sustainable agricultural growth, and alleviate poverty in the region (Afolabi et al., 2019). Among the various regions of Nigeria, Kaduna State stands out as a significant contributor to upland rice production (FAO, 2021). However, despite its agricultural importance, resource-poor farmers in Kaduna State encounter numerous challenges in achieving profitability in upland rice production (Olayemi et al., 2016). Limited access to productive resources, information, and modern agricultural technologies hinders their ability to maximize profits from rice cultivation (Ajibefun et al., 2018). The outcomes of this study will contribute to the body of the existing knowledge in agricultural economics, particularly in the area of profit efficiency analysis, where limited research exists in the context of upland rice production in Nigeria (Olayemi et al., 2016). More

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so, the practical implications of this research are more significant for formulating policy by policymakers and developmental organizations that are seeking to support sustainable agricultural practices and to improve the economic conditions of resource-poor farmers in Kaduna State, Nigeria (Afolabi et al., 2019).

1.1 Objectives of The Study

The main objective is to analyze profitability of upland rice production among resource poor farmers in Kaduna State, Nigeria: A stochastic profit efficiency frontier approach. Specifically, the objectives are to:

- (i) determine the socio-economic characteristics of rice farmers,
- (ii) analyze the profitability of upland rice production,
- (iii) evaluate the factors influencing profit efficiency of upland rice production,
- (iv) evaluate the socio-economic factors influencing profit inefficiency of upland rice production, and
- (v) determine the constraints facing resource poor rice farmers in the study area.

2. METHODOLOGY

This research work was conducted in Kaduna State, Nigeria. The state occupies between Longitudes 06° 15' and 08° 50' East and Latitudes 09° 02' and 09° 02' North of the equator. The State has a total land area of 4.5 million hectares. The vegetation of the state is divided into 2: the Northern guinea savanna and the Southern guinea savanna. There are 2 seasons in the State: the dry seasons, and the wet season, the wet season starts from April to October, the dry season is between October to March, and in between the dry and the wet seasons is the brief harmattan period which span from November to February. The mean rainfall is about 1,482mm, the temperature of the State ranges from 35°C - 36°C, which can be as low as 10°C to 23°C during the harmattan period. The population of the State in 2021 stood at 8.9 million people. They are involved in farming. Crops grown include: pepper, okra, maize, sorghum, ginger, rice, yam, cassava, tomatoes and millet. Animal reared include: goats, cattle, sheep, poultry, and rabbit. A multi-stage method of sampling was used. One hundred (150) resource poor rice farmers were selected. Data obtained from resource poor rice farmers were of primary sources and were collected using a well-structured and a well-designed questionnaire. The questionnaire was administered to resource poor rice producers using well trained enumerators.

3. RESEARCH DESIGN

A descriptive and cross-sectional research design was employed with the aim of describing the socio-economic characteristics of resource poor rice producers, and to evaluate profit efficiency of rice production and socio-economic factors influencing profit inefficiency of upland rice production.

3.1 Sampling Techniques and Sample Size

A multi-stage sampling technique was used. In the 1st stage, purposive sampling procedure was used to select Kaduna State based of the numerous numbers and concentration of tomato producers in the area. The 2nd stage involved random selection of 4 area councils using ballot box method. In the third stage, three (3) villages were selected randomly from each local government area based on the intensity of resource poor rice producers. In the 4th stage, from sampling frame of 240 upland rice farmers, proportionate and simple random sampling technique was used to select the required sample size of 150 resource poor upland rice farmers. This study employed the formula advanced by Yamane (1967) in the determination or estimation of the sample size. The formula is stated thus:

$$n = \frac{N}{1+N(e^2)} = 150 \quad (1)$$

Where,

n = Required Sample Size

N = Population of the Rice Farmers

e = Maximum Acceptable Margin of Error (5%) as Determined by the Researcher

4. METHODS OF DATA COLLECTION

The data were collected through the use of a well-designed and a well-structured questionnaire. The data collected were cross sectional data from primary source, the data were collected from the resource poor upland rice producers were: socio-economic profiles of the farmers, prices of production inputs, quantity of inputs used and constraints faced by farmers in the course of rice production. Data were analyzed using the following descriptive and inferential statistics:

Descriptive Statistics: Data collected from field survey on resource poor rice farmers were summarized through the use of mean, frequency distributions, and percentages. Descriptive statistics was used to have summary profiles of the socio-economic characteristics of resource poor rice farmers as stated specifically in objective 1 (i)

Farm Budgetary Technique: Gross margin (GM) and net farm income analysis of rice production was estimated using the following models:

$$GM = TR - TVC \quad (2)$$

$$GM = \sum_{i=1}^n P_i Q_i - \sum_{j=1}^m P_j X_j \quad (3)$$

$$NFI = TR - TC \quad (4)$$

$$NFI = \sum_{i=1}^n P_i Q_i - [\sum_{j=1}^m P_j X_j + \sum_{k=1}^k GK] \quad (5)$$

Where

P_i = Price of Rice ($\frac{N}{Kg}$),

Q_i = Quantity of Rice (Kg),

P_j = Price of Variable Inputs ($\frac{N}{unit}$),

X_j = Quantity of Variable Inputs (Units),

TR = Total Revenue (N),

TVC = Total Variable Cost (N),

GK = Cost of all Fixed Inputs (Naira)

NFI = Net Farm Income (Naira)

The farm budgetary technique was used to analyze the profitability of rice production as stated in specifically in objective 2 (ii).

Financial Analysis: According to Alabi *et al.* (2020), gross margin ratio (GMR) is defined as:

$$GMR = \frac{\text{Gross Margin}}{\text{Total Revenue}} \quad (6)$$

According operating ratio (OR) is defined as to (Olukosi and Erhabor, 2015):

$$OR = \frac{TVC}{GI} \quad (7)$$

Where,

TVC = Total Variable Cost (Naira),

GI = Gross Income (Naira),

The financial analysis was used to analyze the profitability of rice production as stated in specifically objective 2 (ii).

4.1 Stochastic Profit Efficiency Frontier Model

The stochastic profit efficiency frontier model according Sadiq and Singh (2015), Ejoha (2019) is stated as follows to (Alabi et al., 2022):

$$Ln\pi^* = \beta_0 + \sum_{j=1}^6 \beta_j LnX_{ij} + \beta_k LnX_k + v_j - \mu_i \dots \quad (8)$$

where,

π^* = Normalized Profit (Naira),

X_i = Vector of Variable Input Prices faced by i^{th} Farmers (Naira/Unit)

X_k = Vector of Fixed Factors of the i^{th} Farmers (Naira/Unit)

$\ln$ = Natural Log

$\beta_0 - \beta_6$ and β_k = Parameters to be Estimated

X_1 = Fertilizer Cost (Naira)

X_2 = Cost of Hired Labour (Naira per Mandays)

X_3 = Cost of Chemical and Insecticides (Naira per Litre)

X_4 = Seed Cost (Naira per Kg)

X_5 = Transportation Cost (Naira)

X_k = Cost of Land and Machines (Naira)

V_i = Represent Statistical Disturbance Term (Two Sided Random Error)

U_i = Profit Inefficiency Effects of the i^{th} Farmers (One Sided Half Normal Error)

$$U_i = \gamma_0 + \gamma_1 Z_1 + \alpha_2 Z_2 + \gamma_3 Z_3 + \gamma_4 Z_4 + \gamma_5 Z_5 + \gamma_6 Z_6 + \gamma_7 Z_7 \quad (9)$$

where,

Z_1 = Age (Years)

Z_2 = Gender (Dummy; 1, Male; 0, otherwise)

Z_3 = Level of Education (Years)

Z_4 = Household Size (Number)

Z_5 = Access to Credit (1, Access; 0, Otherwise)

Z_6 = Memberships of Cooperative Society (1, Membership; 0, Otherwise)

Z_7 = Years of Experience (Years)

γ_0 = Constant Term

$\gamma_1 - \gamma_7$ = Parameters to be Estimated

U_i = Error Term due to Profit Inefficiency

This was used specifically to achieve objectives 3 (iii), and 4 (iv).

Principal Component Analysis: The constraints facing resource poor rice farmers was subjected to principal component model. This was used to specifically achieve objective five(v).

5. RESULTS AND DISCUSSION

5.1 Socio-Economic Characteristics of Rice Farmers

The results of the summary statistics of the socio-economic characteristics of the rice farmers is presented in Table 1. The results show that the average age of the rice farmers was 42 years. This signifies that the rice farmers were much younger energetic and in their active age of productivity. The study further show that 79% of the rice farmers were male which indicates that rice farming was mostly carried out by male farmers. Also about 67% of the sampled rice farmers were married. This means that most of the rice farmers has available labour supply for rice production because as the farmers were married it's a clear indication that they have family members that might participate in rice production that could reduce the cost of labour. Most of the rice farmers had some level of formal education as indicated by the number of years spent in school which was 13 years on average meaning that some farmers had primary, secondary and even tertiary education. Education level of farmers could enable them to source market information and adopt new innovation and technology easily. The average number of persons per households were 11 persons per household. This signifies that rice farmers had enough labour supply for rice production. The sampled rice farmers had a farming experience of about 20 years. Experience enables farmers to accumulate experience in rice production and get familiar with the soil management practices which enable them to utilize their resource efficiently and maximize profit. About 43% of the sampled rice farmers had access to credit facilities. The average farm size cultivated by the rice farmers was 3.18 hectares which indicate that the rice farmers were small scale farmers producing on a small scale basis. This is consistent with the findings who reported that most rice farmers are small scale farmers of (Alabi et al., 2023). Majority (68%) of the sample rice farmers were members of cooperative society in the study area. Membership of cooperative organization could provide farmers with opportunity of having access to rice production inputs like agrochemicals, fertilizer, improved seed varieties and credit facilities, they can also market their rice produce collectively to maximize profit. This is in line with the

findings who reported that cooperative association enables farmers to purchase farm inputs in bulk at a cheaper rate and to market their product collectively of (Ayinde et al., 2019).

Table 1: Summary Statistics of Socio-Economic Characteristics of Rice Farmers	
Variables	Summary Statistics
Age (Years)	41.96
Gender (% Male)	79%
Marital Status (% Married)	67%
Level of Education (Years)	13.11
Household Size (Number)	10.61
Farming Experience (Years)	19.67
Access to Credit (% Yes)	43%
Farm Size (Mean in Ha)	3.18
Member of Cooperatives (% Member)	68%
Sample Size (n)	150

Source: Field Survey (2022)

5.2 Profitability of Rice Production In The Study Area

Table 2 presented the results of the profitability of rice production. The results show that the total variable cost incurred by the rice farmers per hectare was 362,643.92 with the cost of labour being the highest proportion of about 32.9%. The total fixed cost incurred by the farmers was 40,475.60 and the total cost incurred by sampled rice farmers was 403,119.92 while the estimated total revenue obtained by the farmers on average per hectare was 925,307.68. The gross margin estimated was 522,188.16. The NFI incurred by the rice farmers was 481,712.56. The results also show that the estimated GMR was 0.564 and the OR was 0.392 indicating that rice production was profitable. The study is in line with the results of who observed significant level of profit of rice production in Vietnam (Dang, 2017).

5.3 Factors Influencing Profit Efficiency of Rice Production

The results of the maximum likelihood estimates of the stochastic profit frontier is presented in Table 3. The results show that the coefficient of the fertilizer cost influences profit efficiency of rice production positively and it was significant at ($P < 0.01$) probability level. The magnitude of the of the coefficient of the fertilizer cost was 0.04298 implying that a percentage change in the fertilizer cost will results in the increase in the profit efficiency of rice production by 4.3%. This is in consonance with the findings of (Oluwafemi et al., 2020). The cost of hired labour has positive influence on the profit efficiency of rice production, the coefficient of hire labour was 0.25867 and it was significant at ($P < 0.01$) which signifies that percentage change in the cost of hired labour will lead to increase in the profit efficiency by 25.9%. The cost of chemical and insecticides and cost of seed input was 0.01233 and 0.096126 respectively. This implied that percentage change in the quantity of this variables will result in the increase in the profit efficiency of rice production by 1.2% and 9.6% respectively. This could be because as the quantity of chemical and insecticides increase as a result of weeds ad insects control the yield of rice will be efficient thereby leading to increase in profit efficiency. This result corroborates the findings of who reported similar result. The coefficient of transportation cost influence profit efficiency positively and it was significant at ($P < 0.01$) implying a unit change in the cost of transportation will result in the increase in profit efficiency of rice production. Likewise, the cost of land ad machines also influences profit efficiency positively and it was significant at ($P < 0.05$) probability level (Alabi et al., 2023). The coefficient of the cost of land and machines was 0.0419072 this implies that percentage change in the cost of land and machines as a result of land expansion and use of machines in cultivating the land for rice production will result in the increase in profit efficiency of rice production.

The profit inefficiency component shows that the significant factors influencing profit inefficiency of rice production were: age of farmers influences profit inefficiency of rice production negatively and it was significant at ($P < 0.10$). The coefficient of age -0.05113 which implies that a unit change in the age of rice farmers will result in the decrease in the profit inefficiency of rice production by 5.1%. This could be because as the age farmers increase they accumulate farming experience and gets familiar with farm management practices that could make them to use their production resources efficiently. This is in line with who opined that as older farmers have more experience in rice production due to number of years in rice production (Ibrahim, 2019). Gender of rice farmer influences profit inefficiency of rice production negatively. The coefficient of gender was -0.0619. This signifies that a unit change in the possibility of rice farmer being a male will lead to decrease in the profit inefficiency

of rice production by 6.2%. The coefficient of educational level, household size and access to credit facilities has significant influence on the profit inefficiency of rice production and it was statistically significant at ($P<0.05$), ($P<0.01$) and ($P<0.05$) respectively. This signifies that a unit change in each of these variables will result in the decrease in the profit inefficiency of rice production by 11.5%, 11.1% and 9.65 respectively. Farmers with formal education could have a higher chance of having the ability of sourcing market information and utilizing farm inputs such as fertilizer, agrochemicals and credit facilities to maximize output that could lead to decrease in profit inefficiency and maximize profit efficiently. This is consistent with who reported that education level of farmers gives them opportunity to adopt new technology and innovation in rice production (Balarabe and Garba, 2018). Farmers with significant number of family members could result in decrease in profit inefficiency due to the reduction in employing hired labour that might save cost thereby increasing profit efficiency. More so access to credit facilities by farmers could enable them to purchase farm inputs like fertilizer, improved seed varieties and agrochemical at the time needed which could result in decrease in profit inefficiency. This outcome is in line with the result of who asserted that there is a significant relationship between profit efficiency and access to credit in rice production in Kwara State (Yusuf, 2022). Membership of cooperative association influence profit

inefficiency of rice production negatively and it was significant at ($P<0.01$) level of probability. The coefficient of cooperative membership was 0.04613 which indicates that a unit change for a being a member of cooperative association will result in the decrease in profit inefficiency of rice production by 4.6%. Cooperative association could provide farmers with the capacity of coming together by pulling their resources which could make them to buy production inputs in bulk and also market their produce as a group that might enable them earn higher profit that could increase their profit efficiency. This outcome is in consonance with the results of who found negative association between cooperative with inefficiency in rice Production that cooperative membership reduces profit inefficiency (Asrat, 2019). The coefficient of nonfarm income influence profit inefficiency negatively and it was significant at ($P<0.05$) probability level. The magnitude of the coefficient of nonfarm income - 0.1089063 signifies that a unit change in the nonfarm income will result in the decrease in the profit inefficiency level of rice production by 10.9%. Addition income from other sources for the farmer may enable them to purchase inputs, hire tractors and other farm machineries that could increase their productivity as well as their profit efficiency level. This result agrees with the findings of who reported that nonfarm income provides rice farmers with capacity to acquire production inputs (Yusuf and Bello, 2019).

Table 2: Profitability Analysis of Rice Production per Hectare

Items	Amount (Naira)	% of Total Cost
Total Revenue	925,307.68	
Gross Income	925,307.68	
Variable Cost		
Seeds	39,992.67	
Fertilizer Input	80,580.00	
Insecticides	27,633.33	
Herbicides	24,567.78	9.9
Labour Cost:	57,321.64	19.9
(i) Land Clearing and Preparation		6.9
(ii) Planting	25,569.23	6.1
(iii) Weeding	20,454.65	14.2
(iv) Fertilizer Application	35,768.89	
(v) Chemical Application	15,674.54	
(vi) Harvesting	14,325.50	
(vii) Transportation	12,435.56	
(viii) Loading and Offloading	5,674.23	
Total Labour Cost	2,645.90	
Total Variable Cost	132,548.50	
Fixed Cost	362,643.92	
Estimated Depreciation Value on Tools (Hoes, Machetes)		32.9
Rent on Land	10,475.60	89.9
Total Fixed Cost	30,000.00	
Total Cost	40,475.60	2.6
Gross Margin (GM)	403,119.52	7.4
Gross Margin Ratio (GMR)	522,188.16	
Net Farm Income (NFI)	0.564	
Operating Ratio (OR)	481,712.56	
	0.392	

Source: Field Survey (2022)

Table 3: Maximum Likelihood Results of the Stochastic Profit Efficiency Frontier Model

Variables	Parameters	Coefficient	Standard Error	Z-Value
Constant	β_0	112.0715**	46.74794	2.40
Fertilizer Cost	β_1	0.0429897*	0.0085951	5.00
Cost of Hired Labour	β_2	0.2586769*	0.0338489	7.64
Cost of Chemical and Insecticide	β_3	0.0123328*	0.0043687	2.82
Seed Cost	β_4	0.0961261*	0.020297	4.74
Transportation Cost	β_5	0.0559405*	0.0146868	3.81
Cost of Land and Machines	β_6	0.0419072**	0.02080918	2.03
Inefficiency Component				
Constant	γ_0	1.627346*	0.2676082	6.08
Age	γ_1	-0.0511322***	0.0270967	-1.89
Gender	γ_2	-0.0619072**	0.0280918	-2.20
Educational Level	γ_3	-0.1153613*	0.02232995	-5.17
Household Size	γ_4	-0.011100*	0.0043309	-2.56
Access to Credit Facilities	γ_5	-0.0961261*	0.0530425	-2.54
Membership of Cooperatives	γ_6	-0.0461383*	0.008117	-5.68
Nonfarm Income	γ_7	-0.1089063**	0.04580409	-2.38
Diagnostic Statistics				
Sigma Square	σ^2	0.046447		
Log-Likelihood	γ	24.894632		
Prob > Chi		0.0000		
Gama		0.66483		

Source: Data Analysis (2022)

*Significant at ($P < 0.10$)., **Significant at ($P < 0.05$), ***Significant at ($P < 0.01$).

5.4 Distribution of Profit Efficiency Scores of The Rice Farmers

The summary statistics of the profit efficiency scores distribution of the rice farmers was presented in Table 4. The results show that about 44.7% of the sampled rice farmers obtained profit efficiency between 0.61-0.80 scores. The mean profit efficiency obtained by rice farmers on individual basis was 0.853 (85.3%) with a profit inefficiency gap of about 14.7% that needed to be filled with the existing technology and innovation to reach maximum profit efficiency level by individual farmer. The minimum and maximum profit efficiency level obtained by sampled rice farmers was 0.012 (1.2%) and 1.000 (100%) on individual basis. This agrees with findings of who reported similar profit efficiency in rice production (Obianefo, 2023).

5.5 Principal Component Analysis of The Constraints Faced By Rice Producers

The results of the principal components analysis of constraints faced by rice farmers in the study area is presented in Table 5. PCA is one of the statistical technique that can transform data that are interrelated with many variables into few number of uncorrelated variables in the model.

From the results of the analysis the number of principal components that were retained based on the Kaiser Meyer criterion were six (6) based on the Eigen values that were greater than 1. The components that were retained for explanation explained about 77.9% of the total variation of the components that were included in the model. The Kaiser-Meyer-Olkin which is the measure of sampling adequacy (KMO) was 87.3% and Bartlett test of sphericity which revealed the Chi-square value was 325.23 and it was significant at 1 % probability level which also demonstrated that the retained variables were suitable to subjected for principal component analysis. The retained variables as the constraints were: Lack of credit facilities, inadequate extension agents and bad road infrastructures with Eigen values of 3.89661, 1.58617 and Bad Road Infrastructures and were ranked 1st, 2nd and 3rd presented in the order of their importance based on the perception of the rice farmers. Other retained problems were: Lack of farm inputs, high cost of fertilizers and high cost of labour with Eigen values of 1.01648, 1.01499 and 1.01282 and they were ranked 4th, 5th and 6th respectively which were arrange in the order of occurrence based on the perception of the farmers. This results are in consonance with the findings of (Alabi et al., 2023; Alabi et al., 2020). This result is also in line with who reported similar problems of rice crop by rice farmers (Yusuf, 2022).

Table 4: Summary Statistics of Profit Efficiency Scores

Efficiency Score	Frequency	Percentage
0.00 – 0.20	23	
0.21 – 0.40	30	
0.41 – 0.60	17	15.3
0.61 – 0.80	67	20.0
0.81 – 1.00	13	11.3
Total		44.7
Mean	0.8532	8.7
Standard Deviation	0.5476	
Minimum	0.0123	
Maximum	1.000	

Source: Field Survey (2022)

Table 5: Principal Component Model of Constraints Encountered by Rice Producers

Constraints	Eigen-Value	Difference	Proportion	Cumulative
Lack of Credit Facilities	3.89661	2.310441	0.3247	0.3247
Inadequate Extension Agents	1.58617	0.428787	0.1322	0.4569
Bad Road Infrastructures	1.15738	0.140902	0.0964	0.5533
Lack of Farm Inputs	1.01648	0.051481	0.0847	0.6381
High Cost of Fertilizers	1.01499	0.23674	0.0804	0.7185
High Cost of Labour	1.01282	0.06249	0.0607	0.7792
Bartlett Test of Sphericity				
Chi Square	325.23			
KMO	0.873			
Rho	1.0000			

Source: Field Survey (2022)

6. CONCLUSION AND RECOMMENDATIONS

The findings emanating has established that rice production is a profitable enterprise, the rice farmers were active very energetic and in their youthful age of productivity, rice production is dominated by male farmers, the rice farmers were producing on a small-scale level of production with a mean farm size of 3.18 hectares of farm land under cultivation. the total cost incurred by the rice farmers was N403,119.92 and the estimated total revenue obtained by the farmers on average per hectare was N925,307.68/ha. The GM obtained was N522,188.16/ha with the GMR of 0.564 and the OR of 0.392 indicating that rice production was a profitable enterprise. The significant factors influencing profit efficiency of rice production were: Fertilizer cost, cost of hired labour, cost of chemical and herbicide, seed cost, transportation cost ($P < 0.01$) and cost of land and machineries. The statistically significant factors influencing profit inefficiency were: Age, Gender, Educational level, household size, access to credit, membership of cooperative, and non-farm income. Farmers were faced with the following constraints in the course of rice production: lack of credit facilities, inadequate extension agents, bad roads infrastructure, lack of farm input, high cost of fertilizers, and high cost of labour. The following recommendations were suggested: farmers should be provided with farm inputs like fertilizers, improved seeds varieties, and agro chemicals at a subsidized price in order to improve productivity and profit efficiency among rice farmers, credit facilities should be made available to rice farmers at lower interest rate to be enable them to acquire production inputs at appropriate time to maximize profit, Farm machineries like tractors, equipment, farm implements and irrigation facilities for dry season rice farming should be provided by Nigerian

government to rice farmers to supplement labour drudgery and encourage mechanized farming all year round to ensure there is food security in the country. government should construct good roads and infrastructural facilities farmers should also be encouraged to join cooperative membership to have access production inputs and credit facilities.

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