International Journal of Innovative Agriculture & Biology Research 12(2):9-21, April-June, 2024

© SEAHI PUBLICATIONS, 2024 www.seahipaj.org ISSN: 2354- 2934

Assessing The Production Efficiency Of Small-Scale Rice Farming In Katsina State, Nigeria

Ahmad Abubakar Umar[1]*, Hadiza Aliyu Saulawa[2] & Buhari Alhassan[3]

[1]Department of Mathematics and Statistics,
College of Science and Technology,
Hassan Usman Katsina Polytechnic, Katsina State, Nigeria
***Correspondence email: ahmadkaikai@hukpoly.edu.ng**

[2]Department of Library and Information science,
College of Liberal Studies,
Hassan Usman Katsina Polytechnic, Katsina State, Nigeria.

[3]Department of Mathematics,
Faculty of Natural and Applied Sciences,
Al-Qalam University, Katsina State, Nigeria.

ABSTRACT

This research assesses the production efficiency of small-scale rice farming in Katsina State, Nigeria, focusing on socio-economic characteristics, costs, returns, and constraints faced by farmers. Rice farming is crucial to Nigeria's food security, especially after importation bans. Katsina, a key rice-producing state, recorded 250,000 metric tonnes in 2020, with major production in Bakori, Dandume, Funtua, and Malumfashi. The study objectives include describing farmer demographics, estimating production costs and returns, and identifying farming constraints. Data from structured questionnaires will be analyzed using descriptive statistics, gross margin analysis, and a stochastic frontier cost function. Initial findings highlight literacy among farmers. Challenges include poor infrastructure and market access. Recommendations emphasize youth engagement in farming and government support through subsidies and improved agricultural practices to enhance rice production efficiency in Katsina State.

Keywords: production efficiency, rice farming, market access

INTRODUCTION

Rice production is a critical component of Nigeria's agricultural landscape, driven by its significance as a staple food for the country's burgeoning population. With over 200 million inhabitants, Nigeria's annual rice consumption surpasses 7 million tonnes (BBC, 2022), highlighting the paramount importance of boosting domestic rice production to meet local demand and reduce reliance on imports. In response to this demand, the Nigerian government has prioritized initiatives aimed at enhancing local rice farming, including policies to curtail rice imports (BBC, 2022). The impact of these measures has been substantial, with a noticeable shift towards increased rice farming activities across the nation (Blueprint Newspaper, 2022).

Katsina State, located in the northwest geopolitical zone of Nigeria, plays a pivotal role in the country's rice cultivation efforts. In 2020 alone, Katsina recorded an impressive yield of 250,000 metric tonnes of rice (Blueprint Newspaper, 2020), with significant contributions from local governments such as Bakori,

Dandume, Funtua, and Malumfashi. This underscores the vital role of small-scale rice farming in contributing to Nigeria's rice production targets and food security objectives.

Despite progress, challenges persist for smallholder rice farmers in Katsina and other regions of Nigeria. These challenges range from socio-economic factors affecting farm productivity to constraints associated with production costs, market access, and infrastructure (FAO, 2022; Igbekele et al., 2004). Understanding the dynamics of small-scale rice farming in Katsina State is therefore essential for designing targeted interventions that enhance the efficiency and sustainability of rice production.

This paper aims to assess the production efficiency of small-scale rice farming in Katsina State, Nigeria. By examining the socio-economic characteristics, cost structures, returns, and constraints faced by rice farmers in the region, this study seeks to provide valuable insights into the opportunities and challenges of smallholder rice farming in contributing to Nigeria's quest for self-sufficiency in rice production. Through rigorous analysis and empirical evidence, this research endeavors to inform policy recommendations and interventions aimed at promoting the resilience and competitiveness of small-scale rice farming in Katsina State and beyond.

The significance of this research lies in its potential to contribute to the ongoing discourse on agricultural development and food security in Nigeria. By focusing on the specific context of small-scale rice farming in Katsina State, this study seeks to generate actionable insights that can inform policy decisions aimed at supporting and empowering rice farmers. Moreover, the findings of this research can serve as a basis for further studies and interventions aimed at addressing the multifaceted challenges faced by smallholder farmers across Nigeria. The assessment of small-scale rice farming efficiency in Katsina State represents a critical step towards enhancing the productivity, profitability, and sustainability of rice production in Nigeria. By shedding light on the socio-economic dynamics and constraints faced by rice farmers in the region, this study aims to contribute towards the development of evidence-based policies and interventions that promote inclusive agricultural growth and food security.

METHODOLOGY

The stochastic frontier cost efficiency estimation

The variables specified for Cobb-Douglas frontier cost efficiency which include the dependent variable C_i and the independent variable P_i were specified as follows:

$$C_i = \emptyset_0 + \emptyset_1 P_{LS} + \emptyset_2 P_{YL} + \emptyset_3 P_{GR} + \emptyset_4 P_{YE} + \emptyset_5 P_{AG} + \emptyset_6 P_{LE} + \mu_i \quad \text{……..…. (1)}$$

Transforming the equation in to natural log we have

$$l_n C_i = \emptyset_0 + \emptyset_1 l_n P_{LS} + \emptyset_2 l_n P_{YL} + \emptyset_3 l_n P_{GR} + \emptyset_4 l_n P_{YE} + \emptyset_5 l_n P_{AG} + \emptyset_6 l_n P_{LE} + \mu_i \quad \text{….. (2)}$$

C_i**:** Total Cost of Production (including inputs, labor, and other expenses);

P_{LS}**:** Average Land Size for Rice Cultivation (in hectares);

P_{YL}**:** Average Yield per Hectare (in metric tons);

P_{GR}**:** Gross Revenue from Rice Sales;

P_{YE}**:** Years of Experience in Rice Farming;

P_{AG}**:** Age of the farmers;

P_{LE}**:** Educational level of the respondents;

μ_i**:** Error term.

$\emptyset_i$**:** The coefficient to be estimated; representing the elasticity when the production function is based on Cobb-Douglas type

DATA PRESENTATION AND ANALYSIS

This research generally examined the productive efficiency of Small-Scale Rice production. In this section, the data collected from farmers in Bakori, Dandume, Danja, Sabuwa, Kafur, Funtua, and Faskari local governments of Katsina south senatorial district for this study will be compiled presented and analyzed. The result will hence be used in drawing inferences and conclusions based on the statistical tools used in the research. Two hundred (200) questionnaires were distributed to the rice farmers where 184(92%) were successfully retrieved in which all of them were found to be valid and were used for data presentation and analysis.

Data Presentation

Socio Economic characteristics of the respondents

Table 3.1: Age of the respondents

AGE	Frequency	%
< = 30 years	23	7.07
31-40	48	18.48
41-50	76	39.13
51-60	45	19.57
61-70	22	9.78
71+	18	5.98
Total	**184**	**100**

Source: Field work (2024)

The table above show that 23 respondent representing 7.07% aged less than or equals to 30 years, 48 respondent representing 14.48% aged between 31-40 years, 76 respondent representing 39.13% aged between 41-50 years, 45 respondent representing 19.57% aged between 51-60 years, 22 respondent representing 9.78% aged between 61-70 years, while 18 respondents representing 5.98% aged 71 years or more as shown in figure one.

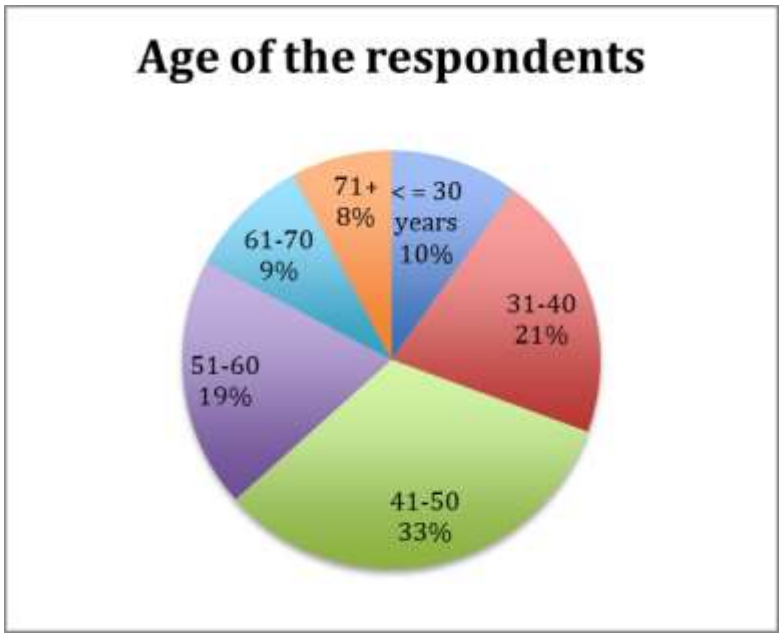

Figure 1: Pie chart showing the age of the respondents

Table 3.2: Gender of the respondents

College	Frequency	%
Males	168	91.30
Females	16	8.70
Total	**184**	**100**

Source: Field work (2024)

The table above indicates that 168 respondents were males representing 91.30% and 16 respondents representing 8.7% were females.

Table 3.3 Educational level of the respondents

Level of Education	Frequency	%
None	28	15.25
Primary	38	20.65
Secondary	60	32.61
Tertiary	14	7.61
Islamic	44	23.91
Total	**184**	**100**

Table 3.3 shows that 28(15.25%) of the farmers do not attend any school, 38(20.65%) of the farmers attended Primary schools, 60(32.61%) attended Secondary schools, 14(7.61%) attended Tertiary schools while 44(23.91%) attended Islamic schools. This indicate that majority of the farmers that participated in this research were literate as shown in figure 2.

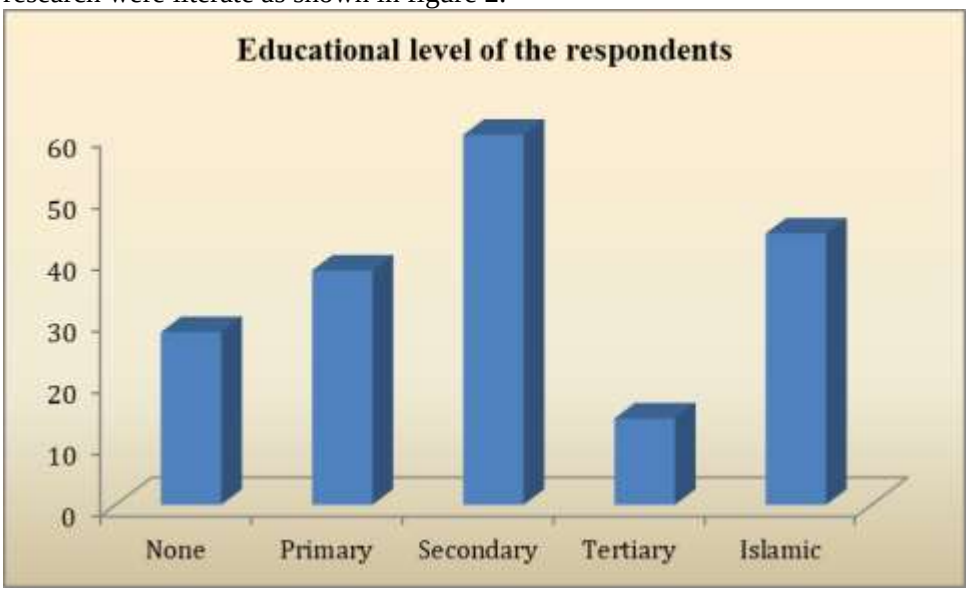

Figure 2: Bar chart showing the educational level of the respondents

Table 3.4 Marital status of the respondents

Marital Status	Frequency	%
Single	33	17.93
Married	134	72.83
Divorced	8	4.35
Widowed	9	4.89
Total	**184**	**100**

The above table shows that 33(17.93%) of the farmers interviewed were singles, 134(72.83) were married, 8(4.35%) were divorced while 9(4.89%) were widowed.

Table 3.5 Household Size of the farmers

Size	Frequency	Percentage
2	21	11.4
3-5	53	28.8
6-8	62	33.7
9+	48	26.1
Total	184	100

Table 3.5 shows that 21(11.4%) of the farmers were two in their house, 53(28.8%) were 3-5 in number in their house, 62(33.7%) were 6-8 in number in their house while 48 farmers representing 26.1% were 9 or more in number in their house.

Table 3.6 Years of Experience in Rice Farming

Years	Frequency	Percentage
<5 Years	12	6.5
6-10 Years	23	12.5
11-15 Years	32	17.5
16-20 Years	45	24.4
21+ Years	72	39.1
Total	184	100

Table 3.6 shows that 12(6.5%) of the farmers interviewed were cultivating rice for less than 5 years, 23(12.5%) of them were cultivating rice for 6-10 years, 32(17.5%) were cultivating rice for 11-15 years, 45(24.4%) were cultivating rice for over 16 to 20 years while majority of them 72(39.1%) experienced farming for over twenty years.

Table 3.7 Land Ownership of the rice farmers

Ownership	Frequency	Percentage
Owned	118	64.2
Leased	24	13.0
Rented	42	22.8
Total	184	100

Table 3.7 shows that more than half of the rice farmers interviewed 118(64.2%) possessed their own land, 24(13%) liased with others while 42(22.8%) were cultivating rice on rented farms. This shows that majority of the farmers within the study area possessed their own land for rice farming.

3.2 Farming Practices And Outputs

Table 3.8 Average Land Size for Rice Cultivation (in hectares)

Size	Frequency	Percentage
<1 Hectare	117	63.59
1-3 Hectares	34	18.48
4-6 Hectares	14	7.61
7-9 Hectares	11	5.98
10 or more Hectares	8	4.35
Total	184	100

Table 3.7 shows that a large number of farmers 117 (63.59%) were cultivating less than one hectare annually, 34 (18.48%) farmers were cultivating 1-3 hectares annually, 14 (7.61%) farmers were cultivating 4-6 hectares annually, 11(5.98%) farmers were cultivating 7-9 hectares annually while 8 (4.35%) farmers were cultivating 10 or more hectares annually. This shows that a large number of farmers were cultivating less than one hectare annually.

Table 3.9 Types of Rice Cultivated:

Type	Frequency	Percentage
FARO 44	26	14.1
FARO 52	23	12.5
FARO 59	34	18.5
FARO 61	14	7.6
GAWAL R1	30	16.3
Other	57	31
	184	100

The above table shows that 26(14.1%) of the farmers were cultivating FARO 44, 23(12.5%) of the farmers were cultivating FARO 52, 34(18.5%) of the farmers were cultivating FARO 59, 14(7.6%) of the farmers were cultivating FARO 61, 30(16.3%) of the farmers were cultivating GAWAL R1 while 57(31%) of the farmers were cultivating other variety of rice. It can be concluded that majority of the farmers in the study area were cultivating FARO 59 or GAWAL R1 as shown in figure three.

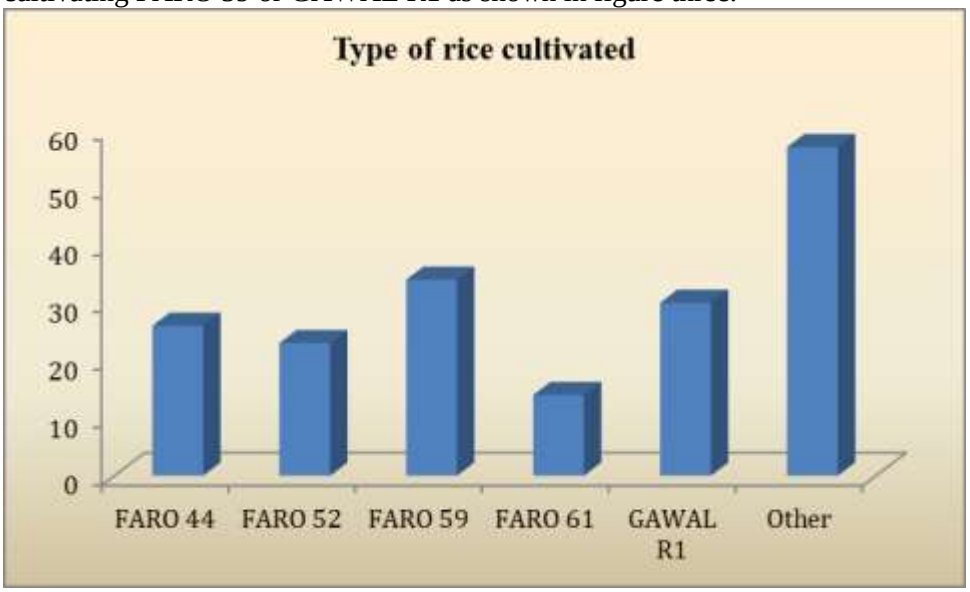

Figure 3: Bar chart showing the type of Rice Cultivated in the study area

Table 3.10 Average Yield per Hectare (in metric tonnes):

Metric Tonne	Frequency	Percentage
<1 Tonne	81	44.02
1-3 Tones	65	35.33
4-6 Tones	24	13.04
7-9 Tones	9	4.89
10 or more Tones	5	2.72
Total	184	100

From the above table, it can be observed that 81(44.02%) are cultivating less than one tonne per hectare, 5(35.33%) are cultivating 1-3 tonnes per hectare, 24(13.04%) are cultivating 4-6 tonnes per hectare, 9(4.89%) of the farmers are cultivating 7-9 tonnes per hectare while 5(2.72%) were cultivating 10 or more tonnes per hectare**.**

Table 3.11 Main Sources of Water for Irrigation

Source	Frequency	Percentage
Ground Water	46	25
Surface Water	21	11.4
River	39	21.1
Lake	45	24.5
Reservoir	13	7.1
Other	20	10.9
Total	184	100

Table 3.11 shows that 46(25%) of the farmers were using Ground Water, 21(11.4%) of the farmers were using Surface Water, 29(21.1%) of the farmers were using River water, 45(24.5%) of the farmers were using lake as their sources of water, 14(7.1%) of the farmers were using Reservoir while 20(10.9%) of the farmers were using other sources of water for rice irrigation.

Table 3.12 Farming Inputs Used (e.g., seeds, fertilizers, pesticides):

Farming Input	Frequency	Percentage
Seed	170	92.4
Fertilizer	122	66.3
Pesticide	87	47.3
Other	56	30.4

Table 3.13 shows that almost all the farmers interviewed 170(92.4%) saif seed was among their major farming Input, 122(66.3%) said fertilizer was among their farming input , 87(47.3%) said pesticide while 56(30.4%) mentioned other farming input.

Table 3.13 Labour Source:

Source	Frequency	Percentage
Family	37	20.2
Hired	52	28.2
Both	95	51.6
Total	184	100

The source of labor among the farmers interviewed include family 37(20.2), hired 52(28.2%) while majority of them 95(51.6%) were using both Family and hired as their sources of labour.

Table 3.14 Farming Techniques Utilized:

Farming Techniques	Frequency	Percentage
Surface irrigation	21	11.4
Sprinkler	18	9.8
Drip	24	13
Manual	80	43.5
Other	41	22.3
Total	184	100

Table 3.14 shows that 21(11.4%) of the farmers were using Surface irrigation, 18(9.8%) were using sprinkler irrigation, 24(13%) were using drip, 80(43.5%) were using manual technique while 41(22 3%) were using other technique. This shows that most of the farmers were using manual farming techniques.

Table 3.15 Challenges Faced in Rice Production (e.g., pests, diseases, climate) multiple response:

Challenges	Frequency	Percentage
Pest	123	66.8
Disease	76	42.3
Climate	48	26.1
Other	68	37

The main challenge faced by the farmers was pest 123(66.8%) followed by other disease 76(42.3%), a small number of the farmers 48(26.1%) said climate change while 68(37%) while 68(37%) claimed other challenges.

3.3 Costs And Returns Analysis

Table 3.16 Total Cost of Production (including inputs, labor, and other expenses):

Cost of production	Frequency	Percentage
<100,000	53	28.80
100,000-150,000	94	51.09
151,000-200,000	18	9.78
201,00-250,000	11	5.98
>250,000	8	4.35
Total	184	100

Above table shows that 53(28.8%) of the farmers said they are spending less than 100,000 annually, 94(51.09%) were spending between 100,000-150,000 annually, 18(9.78%) were spending about 151,000-200,000 naira annually, 11(5.98%) were spending about 201,00-250,000 annually while 8(4.35%) were spending 250,000 or more annually as shown in figure 4.

Figure 4: Bar chart for total cost of production

Table 3.17 Average Selling Price per Metric tons of Rice:

Selling price	Frequency	Percentage
<500,000	21	11.41
500,000-550,000	46	25.00
551,000-600,000	64	34.78
601,00-650,000	35	19.02
>650,000	18	9.78
Total	184	100

The average selling price of rice per metric tons by some farmers was less than 500,000 naira annually (11.41%), similarly some of the respondents (25%) said between 500,000-550,000 naira, 34.8% said bey 551,000-600,000, 19% said between 601,00-650,000 naira while 9.78% said they are selling their rice at more than 650,000 naira annually per metric tons.

Table 3.18 Gross Revenue from Rice Sales:

Gross Revenue from Rice Sales	Frequency	Percentage
<50,000	28	15.22
50,000-55,000	34	18.48
56,000-60,000	78	42.39
61,00-65,000	26	14.13
>65,000	18	9.78
Total	184	100

Table 3.18 contains the farmers gross revenue from rice sales where 15.22% of the farmers said it is less than 50,000 naira annually, 18.48% said it ranges between 50,000-55,000 naira annually, 42.39% said it ranges between 56,000-60,000 naira, 14.39% said it ranges between 61,00-65,000 naira while 9.78% of the farmers said it sometimes exceeds 65,000 naira annually**.**

Table 3.19 Net Profit from Rice Production

Net Profit	Frequency	Percentage
<500,000	36	19.57
500,000-1M	55	29.89
2M-3M	77	41.85
4M-5M	12	6.52
>5M	4	2.17
Total	184	100

Table 3.19 shows that 36 (19.57%) of the farmers were gaining less than 500,000 annually, 55 (29.89%) of the farmers were gaining 500,000-1 million naira annually, 77(41.85%) of the farmers were gaining 2M-3M naira annually, 12 (6.52%) of the farmers were gaining 4M-5M annually, 4(2.17%) of the farmers were gaining more than 5M naira annually as shown in figure 5.

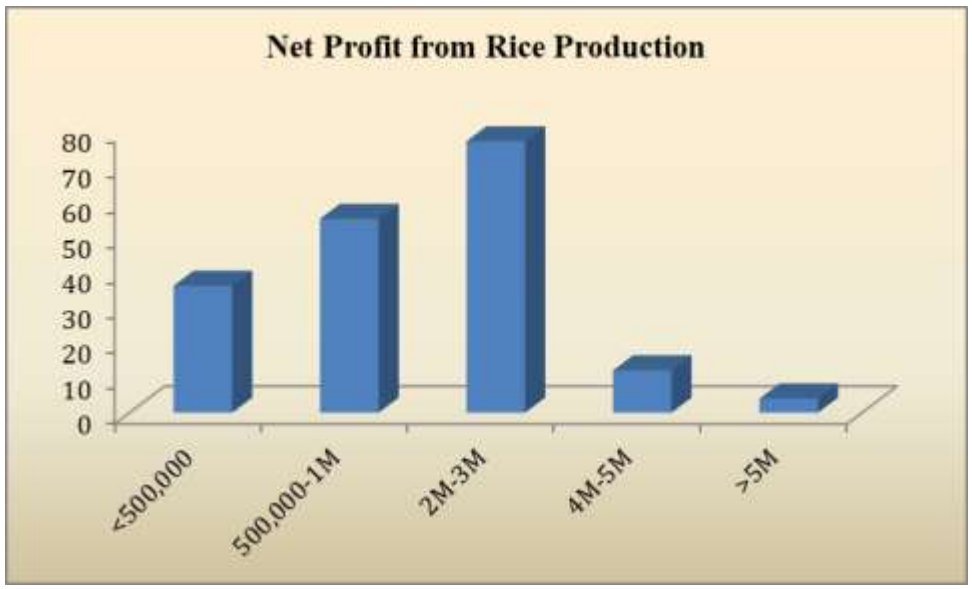

Figure 5: Bar chart showing the Net Profit from Rice Production

Constraints And Support Mechanisms

Table 3.20 main constraints faced in small-scale rice production in Katsina South Senatorial Zone

constraints faced	Frequency	Percentage
Lack of access to credit	56	30.43
Poor infrastructure (e.g., roads, storage facilities)	170	92.39
Market access challenges	145	78.80
Climate-related issues	98	53.26
Others	64	34.78

Table 3.20 shows that 56 (30.43%) of the farmers claimed that Lack of access to credit was their main constraints they faced, 170 (92.39%) of the farmers claimed that Poor infrastructure (e.g., roads, storage facilities) was their main constraints they faced, 145 (78.80%) of the farmers claimed that Market access challenges was their main constraints they faced, 98(53.26%) of the farmers claimed that Climate-related issues was their main constraints they faced while 64 (34.78%) mentioned other constraints.

Table 3.21 Aware of any government or NGO support programs for rice farmers in the area

Aware of any government or NGO support programs	**Frequency**	**Percentage**
Yes	158	86
No	26	14
Total	184	100

The table above shows that majority of the farmers 158(86%) were aware of the government or NGO support program while 26 of the respondents representing 14% said they are not aware of any government or NGO support program.

Table 3.22 Rate Of Efficiency Of Rice Production In Katsina South Senatorial Zone

Efficiency	**Frequency**	**Percentage**
Very Efficient	23	12.50
Moderately Efficient	106	57.61
Inefficient	55	29.89
Total	184	100

The table above shows that 23(12.5%) of the farmers interviewed revealed that rice production was very efficient, 106(57.61%) said it was moderately efficient while 55 (29.8%) said it was inefficient

3.5 The Stochastic Frontier Cost Efficiency Estimation

Table 3.23 Results of the stochastic frontier cost efficiency estimation

Variables	**Coefficient**	**t – Ratio**
Allocative efficiency		
Constant	3.8	2.65***
$l_n P_{LS}$	0.41	4.2**
$l_n P_{YL}$	0.27	1.19***
$l_n P_{YE}$	0.0071	2.21
$l_n P_{LE}$	0.27	4.11**
Allocative inefficiency		
$z_1 P_{GR}$	-0.026	-1.78**
$z_2 P_{AG}$	-0.35	-0.69
Sigma squared	0.17	0.94**
Gamma	0.88	5.32*
LR	396	29.43**

*** significant at 1%; ** significant at 5%; *significant at 10%

A result for the stochastic frontier cost function was displayed in table. Gamma value (γ) estimated (0.94) is significant at 5%, showing that 94% of the variation of the total cost of rice production results from the existence of allocative inefficiency.

The estimated parameter of cost function reveals that the coefficients of average land size for rice cultivation (in hectares), average yield per hectare (in metric tons), years of experience in rice farming and educational level of the respondents are positive and significant at 5%. It can be concluded that a raise of the average land size for rice cultivation (in hectares), average yield per hectare (in metric tons), years of experience in rice farming and educational level of the respondents resulted to the rise in the production cost which increases the output and the profit.

Unlike technical efficiency, the socio-economic determinants analysis indicates that age and the Gross Revenue from Rice Sales has a negative impact on the allocative efficiency of farmers. The implication is that high revenue increases the production cost and older farmers tend to attach little importance to minimizing production costs when compared with younger farmers. In other words, younger farmers use the cheapest input combinations throughout the production process.

DISCUSSION

The aim of this research was to investigate the efficiency in the cost of rice farming among Funtua senatorial zone Katsina state. Objective one stated to describe the socio-economic characteristics of the farmers in the study area where the result show that 76 respondent representing 39.13% aged between 41-50 years, 45 respondent representing 19.57% aged between 51-60 years. However, 28(15.25%) of the farmers do not attend any school, 38(20.65%) of the farmers attended Primary schools, 60(32.61%) attended Secondary schools, 14(7.61%) attended Tertiary schools while 44(23.91%) attended Islamic schools indicate that majority of the farmers that participated in this research were literate. 21(11.4%) of the farmers were two in their house, 53(28.8%) were 3-5 in number in their house, 62(33.7%) were 6-8 in number in their house while 48 farmers representing 26.1% were 9 or more in number in their house. 12(6.5%) of the farmers interviewed were cultivating rice for less than 5 years, 23(12.5%) of them were cultivating rice for 6-10 years, 32(17.5%) were cultivating rice for 11-15 years, 45(24.4%) were cultivating rice for over 16 to 20 years while majority of them 72(39.1%) experienced farming for over twenty years. More than half of the rice farmers interviewed 118(64.2%) possessed their own land, 24(13%) liased with others while 42(22.8%) were cultivating rice on rented farms which shows that majority of the farmers within the study area possessed their own land for rice farming.

The second objective to estimate the costs in rice production where it was found that the cost of production mostly ranges between 100,000-150,000 naira or more annually.

The third objective was to determine the returns in rice production where the result indicates that majority of the farmers were gaining two to three million naira or more annually. The forth objective was to analyze the constraints of rice farming in the study area where the result shows that 56(30.43%) of the farmers claimed that Lack of access to credit was their main constraints they faced and 170(92.39%) of the farmers claimed that Poor infrastructure (e.g., roads, storage facilities) was their main constraints they faced and 145(78.80%) of the farmers claimed that Market access challenges was their main constraints they faced indicating that lack of access to credit and poor infrastructure were the major constraints to rice farmers within the study area.

The estimated parameter of cost function result reveals that the coefficients of average land size for rice cultivation (in hectares), average yield per hectare (in metric tons), years of experience in rice farming and educational level of the respondents are positive and significant at 5% indicating that a raise of the average land size for rice cultivation (in hectares), average yield per hectare (in metric tons), years of experience in rice farming and educational level of the respondents resulted to the rise in the production cost which increases the output and the profit. Moreover, age and the Gross Revenue from Rice Sales has a negative impact on the allocative efficiency of farmers. The implication is that high revenue increases the production cost and older farmers tend to attach little importance to minimizing production costs when compared with younger farmers. In other words, younger farmers use the cheapest input combinations throughout the production process.

Summary

This research aimed to investigate the efficiency in the cost of rice farming among Funtua senatorial zone Katsina state. The first objective aimed to describe the socio-economic characteristics of the farmers in the study area. The result shows that majority of the farmers that participated in this research were literate mostly males aged 41-50 years and possessed 3-8 children. The second objective attempted to estimate the costs in rice production. The result shows that the costs in rice production ranges between 100,000 to 150,000 annually.

The third objective was to determine the returns in rice production where the result shows that the returns in rice production ranges between 2-3 million naira annually. The forth objective was to analyze the constraints of rice farming in the study area where majority of the farmers claimed that poor infrastructure which include roads, storage facilities are their main constraints they faced. Similarly, a large number 145(78.80%) of the farmers claimed that Market access challenges was their main constraints they faced.

The results of the stochastic frontier cost efficiency estimation shows that a raise of the average land size for rice cultivation (in hectares), average yield per hectare (in metric tons), years of experience in rice farming and educational level of the respondents resulted to the rise in the production cost which increases the output and the profit. However, the result also indicates that age and the Gross Revenue from Rice Sales has a negative impact on the allocative efficiency of farmers.

CONCLUSION

The following conditions were drawn based on the findings so far mentioned. This indicate that majority of the farmers that participated in this research were literate. The costs in rice production ranges between 100,000 to 150,000 annually. The returns in rice production ranges between two to three million annually. There is significant relationship between the average land size for rice cultivation (in hectares), average yield per hectare (in metric tons), years of experience in rice farming and educational level of the respondents and the annual cost of rice production in the study area. Cost increases the output and the profit. But farmers age and the Gross Revenue from Rice Sales has a negative impact on the allocative efficiency of farmers.

RECOMMENDATIONS

From the findings so far concluded, it is recommended that:

1. Farmers should use their youth time to cultivate rice as the higher the age the lower the power by a farmer to cultivate.
2. Government should reduce the revenue charges in order to subsidize the rice farmers as part of encouragement.
3. Cultural practices such as early sowing, narrow spacing of plants and maintaining weed-free fields should be observed to minimize insect infestation.
4. Synchronize planting over a large area to allow the most susceptible stage of rice to escape from insects and Diopsis damage.
5. The farmer should strive to obtain fertilizer recommendations based on the analysis of soil samples. In situations where it is not possible to conduct a soil test due to high cost and unavailability of analytical services, or when the farmer is running out of time because the crop is subnormal in growth.
6. Choose fertile land with good water retention capacity (contain some clay and/or organic matter, i.e. loamy soil); clayed soils are most desirable. Heavy soils of valleys and fadamas are preferred. If you intend growing rice for one or more consecutive years on the same piece of land, it's advisable to consult a reputable soil testing organisation for advice and recommendations.
7. Government should provide improved seeds, timely allocation of fertilizers, agrochemicals and modern methods of rice production which can increase the yield of rice in the state and the country at large.

REFERENCES

Babban Gona. (October, 2022). Interesting Facts About Rice Farming in Nigeria. Https://www.Babbangona.com/interesting-facts-about-rice-farming-in-nigeria/

Bravo. U., and Evenson. E. (1994). Efficiency in Agricultural production: The case of peasant farmers in eastern Paraguay. Agricultural Economics, 1994, **10:**27-37.

Blueprint Newspaper. (September, 2022). Katsina, CBN disburse N12bn to Boost Rice Farming. Https://www.Blueprint.ng/katsina-cbn-disburse-n12bn-to-boost-rice-farming/

British Broadcasting Corporation. (October, 2022). Boosting Rice production in Nigeria. Https://www.bbc.com/news/business-47858725

Food and Agriculture Organization of the United Nations. (August, 2022). Nigeria Agriculture at a Glance. Https://www.fao.org/nigeria/fao-nigeria-at-a-glance

Igbekele A. A., Adebiyi G. D. and Abiodun O. F. (2004). Technical efficiency of small-scale farmers: An Application of the Stochastic Frontier Production Function to Rural and Urban Farmers in Ondo State, Nigeria. International Economic Journal. **20**: 87-107.

Katsina State Government. (September, 2022). Investment Sectors. Https://Katsinastate.gov.ng/invest/investment-sectors/

Maurice. D. C, Adamu. Y. and Joseph. M. (2015). Analysis of Cost Efficiency in Food Crop Production Among Small-scale Farmers in Adamawa state, Nigeria. Global journal of agricultural sciences. **14:** 17-25.

Ogundari. K. and S. O. Ojo (2007). Economic Efficiency of Small-Scale Food Crop Production in Nigeria: A Stochastic Frontier Approach. Journal of Social Sciences. **14**: 123-130.

Saleh. M. K. and Oyinbo. O. (2017). Rice Production under Different Weed Management Technologies Adopted by Rice Farmers in Katsina State, Nigeria. Journal of Agricultural Extension. **21(1):** 149.

Statista. (October, 2022). Production of Milled Rice in Nigeria. Https://www.statista.com/statistics/1134510/production-of-milled-rice-in-nigeria.

World bank. (July, 2022). Employment in Agriculture. Https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=NG

Yee M. A., Ling Y. K., Nhuong T., Kelvin M. S., and Manfred Z. (2021). Technical Efficiency of Small-Scale Aquaculture in Myanmar: Does women's participation in decision-making matter? **21(3)**:10.