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COST AND RETURN ANALYSIS OF RICE FARMING AMONG SMALLHOLDERS RICE FARMERS IN NIGER STATE, NIGERIA

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Abstract – This study was on cost and return analysis in small-scale rice production in Niger State. Specifically, the study described the socioeconomic characteristics of small-scale rice farmers, estimated costs and returns from production and examined socioeconomic factors affecting small-scale rice production in the area. Conducting cost and returns analysis of rice farming can inform policymakers and stakeholders on how to boost productivity and profitability. This research has identified key factors affecting rice farming profitability in Nigeria, enabling policymakers to design effective policies and inventions that support the agricultural sector and improve farmers' livelihood. A cross-sectional study was carried out in some selected local government in Niger state, Nigeria to assess the sources of farm-level economic efficiency in rice production using the Data Envelopment Approach System. Data were collected from a random sample of 120 smallholder rice farmers. Significant factors affecting production included farmer age, farm size, gender, and cooperative society membership. Descriptive and inferential statistics revealed that small-scale rice production was profitable, with a net farm income of N72,805 per hectare and gross margin of N76,372 per hectare. Results of the Economic Efficiency show that the mean EE was 27.9%. Constraints faced by farmers included limited access to finance, poor storage, and high agrochemical costs. The study recommends targeted credit facilities and policy interventions to enhance productivity and profitability.

Keywords: Cost and return analysis, Nigeria, Niger State, Rice farming, Smallholders rice farmers.

1. Introduction

Rice (Oryza sativa) is a staple food for over 50% of households globally (Akinniran & Faleye, 2020). Nigeria, despite producing approximately 2 million metric tons of milled rice annually, relies heavily on imports, with an estimated 3 million metric tons imported yearly (FAO, 2020). This significant gap has led to Nigeria becoming the largest rice importer in sub-Saharan Africa (Toba *et al*., 2022). To address this imbalance, various initiatives have been implemented to enhance rice productivity along the value chain. These efforts include the Anchor Borrowers Scheme, the Agricultural Transformation Agenda Special Programme (ATASP), and other international projects (Omolehin *et al*., 2019). However, despite these interventions, rice yields and quality in Nigeria remain suboptimal (Senuga *et al*., 2020). The world's population is expected to exceed nine billion by 2050 (United Nations, 2019). According to Nwahia, (2020), involvement in rice production is profitable.

Presently, Nigeria is the largest producer of rice in West Africa but the second largest importer in the world, accounting for 25% of continent's imports (Muhammad *et al.*, 2018). In 2017, the nation's annual production capacity was about 5.3 million tonnes, and over 2.7 million tonnes ($600 million worth) of rice was imported into the country (FAO, 2017). Despite this production capacity, Nigeria rice sub-sector could not meet the domestic requirement. The inability of the sector to meet the demand is attributed to low productivity, inefficient use of resources and low mechanisation level (Okam *et al*., 2016). It has become a staple food in Nigeria such that every household; both the rich and the poor consume a great quantity (Godwin, 2012). A combination of various factors seems to have triggered

the structural increase in rice consumption over the years with consumption broadening across all socio-economic classes, including the poor. Rising demand is as a result of increasing population growth and income level (GAIN, 2012) coupled with the ease of its preparation and storage. Rice (*Oryza sativa*) is a primary staple food for millions in West Africa and the fastest-growing commodity in Nigeria's food basket (Akande, 2003). Its production is crucial in ensuring food security and reducing import dependence. The Nigerian environment's ecological nature is aptly very suitable for cultivating different rice varieties. Rice is not only a key source of food but also a significant employer of labour and a source of income (WARDA, 2004). The potential land area for rice production is between 4.6 million and 4.9 million hectares. However, only 1.7 million or 35% of this is cropped to rice (Singh ***et al***., 1997). Local rice production has not kept pace with domestic consumption demand (International et al. Institute, 1995).

Farmers often rely on trial-and-error methods when making farm production decisions, leading to uncertain and undesirable outcomes (Bamiro et al., 2015). The increasing global population and demand for agricultural commodities have created a need to increase production efficiently to meet demand (Sofi et al., 2015). Agricultural productivity, measured as returns to factors of production, can be evaluated at various levels, from farm to global measures. Variations in productivity are often attributed to management factors or inefficiency gaps (Ahmad et al., 2002). To achieve sustained growth in agriculture, efficiency must be increased, and productivity differentials reduced. A cost and return analysis was conducted using input, cost, yield, and output data from farmers to assess the profitability of rice production. To maximize profits, farms must allocate resources efficiently, ensuring that the marginal value product (MVP) equals the marginal cost (MC) (Chukwuji et al., 2006). Allocative efficiency requires determining the optimal combination of inputs to produce output at minimal cost and identifying potential profit increases through resource reallocation (Shahooth et al., 2006). Research has shown that investing in value addition activities can increase profitability for rice farmers (Hussaini et al., 2019). A study in Kebbi State found that the average rate of return on investment in value addition activities was ₦1.25, indicating a profit of ₦1.25 for every ₦1 invested. Other studies have revealed that rice farmers can realize higher income from selling their produce in milled form than in paddy form (Uke et al., 2018; Omoare & Oyediran, 2017). A value chain analysis of rice production systems in Ebonyi State found that the gross margin accruing to rice processors or traders for a metric ton of basic milled rice was ₦55,800 (Chidiebere-Mark, 2017). Further value addition to quality rice incurred an additional cost of ₦2,600.

A survey of rice growers in the Sialkot district revealed significant marketing challenges. Due to the urban location of markets, farmers often sell their produce at the farm gate to avoid transportation costs, relying on commission agents who offer lower prices than market rates (Paul et al., 2011). This practice perpetuates inefficiencies in the marketing system. Studies have shown that profit efficiency among rice growers is affected by socio-economic factors, including household education, non-farm employment, credit constraints, and institutional constraints (Mubarik et al., 1989; Mohammed, 2009). These factors contribute to general inefficiencies, ranging from 5% to 87%. Conducting cost and returns analysis is essential for identifying efficient resource allocation in rice farming. By understanding the costs involved in different production stages and the returns generated, farmers can make informed decisions regarding resource allocation, such as labor, inputs, and technology adoption. This knowledge can also guide farmers in deciding whether to continue or expand their operations. Researching cost and returns analysis among rice farmers in Nigeria is crucial for sustainable agricultural development, informed policymaking, and improved farmers' livelihoods. By identifying best practices and technological advancements, researchers can contribute to optimizing input usage, adopting efficient farming techniques, and exploring innovative approaches to maximize returns while minimizing costs.

2.0 COST AND RETURN ANALYSIS OF RICE FARMING AMONG SMALLHOLDERS RICE FARMERS

Rice is a staple food crop for millions of people worldwide, particularly in developing countries. However, rice farmers in these countries face numerous challenges that affect their productivity, profitability, and livelihoods. This literature review aims to synthesize the existing knowledge on the challenges facing rice farmers in developing countries.

Cost Structure of Rice Farming

Studies have shown that the cost structure of rice farming varies significantly across different regions and countries. For example, a study by Haruna et al. (2009) in Nigeria found that the total cost of rice production was N63,419 per hectare, with labor costs accounting for 44.6% of the total cost. Similarly, a

study by Dzene (2010) in Ghana found that the total cost of rice production was GH₵1,413 per hectare, with fertilizer costs accounting for 34.6% of the total cost.

Returns to Rice Farming

The returns to rice farming among smallholder farmers have been found to be relatively low. For example, a study by Mohammed (2009) in Nigeria found that the average net return to rice farming was N14,419 per hectare. Similarly, a study by Tana (2011) in Tanzania found that the average net return to rice farming was TZS 1,234,000 per hectare.

Factors Affecting Cost and Returns

Several factors have been found to affect the cost and returns of rice farming among smallholder farmers. These include farm size, education level of the farmer, access to credit, and use of improved technology (Dzene, 2010; Haruna et al., 2009). For example, a study by Olukosi and Erhabor (1988) in Nigeria found that farm size and education level of the farmer were significant determinants of the net return to rice farming. This literature review has highlighted the importance of cost and return analysis in understanding the economics of rice farming among smallholder farmers. The review has shown that the cost structure of rice farming varies significantly across different regions and countries, and that the returns to rice farming are relatively low. The review has also identified several factors that affect the cost and returns of rice farming, including farm size, education level of the farmer, access to credit, and use of improved technology. These findings have important implications for policymakers, extension agents, and other stakeholders seeking to improve the productivity and profitability of smallholder rice farmers.

Market Access and Price Fluctuations

Studies have shown that rice farmers in developing countries often face difficulties in accessing markets and obtaining fair prices for their produce (Tana, 2011; Olukosi & Erhabor, 1988). The lack of market information and the dominance of middlemen and cartels can lead to price fluctuations and reduced profitability for farmers (Dzene, 2010).

Credit and Financial Constraints

Rice farmers in developing countries often face credit and financial constraints that limit their ability to invest in their farms and improve their productivity (Mubarik et al., 1989; Mohammed, 2009). The lack of access to credit and financial services can force farmers to rely on informal sources of credit, which can be expensive and unsustainable.

High Cost of Inputs

The high cost of inputs, such as seeds, fertilizers, and pesticides, is another challenge facing rice farmers in developing countries (Haruna et al., 2009). The cost of these inputs can be prohibitively expensive for small-scale farmers, who often have limited financial resources.

Marketing Problems

Rice farmers in developing countries also face marketing problems, such as the lack of storage facilities, transportation costs, and the dominance of middlemen (Olukosi & Erhabor, 1988). These problems can lead to reduced profitability and income for farmers.

3.0 Materials and Methods:

3.1 Study Area

Niger State is located in the North Central part of Nigeria and is the largest state in the country. It is located between latitude 6° 30' N to 11° 20' N and longitude 2° 30' E to 10° 30' E. The region occupies 296,898 km^2, representing about 32% of the country's land area. It was named after the River Niger. Two of Nigeria's major Hydroelectric Power stations, the Kainji Dam and the Shiroro Dam, are in the State. The State experiences two main seasons: dry and wet, with the wet season beginning towards the end of March and the end of October. The dry season starts from November of each year to March. The rainfall per annum ranges from 1000 to 1500mm with an average of 187 to 220 rainy days and an average monthly temperature ranging from 21°C to 37°C. The zone's vegetation consists of the forest Savannah Mosaic, Southern Guinea Savannah and the Northern Guinea Savannah. The vegetation, soil and weather patterns are favourable for producing a broad spectrum of agricultural food, industrial and cash crops of various types. The major crops grown in the State include rice, maize, millet, sorghum, yam and cassava (Tologbonse, 2004).

3.2 Method of Data Collection

Data for the study were elicited from primary sources. A structured questionnaire was used to collect the primary data in the study area, data collected include the farmers' social characteristics such as age, marital status, educational level, household size, land ownership status, extension contact, credit access, and cooperative society membership. Input-output data were also collected; these include area devoted to

rice cultivation, quantity of fertiliser used, labour input and capital inputs. A multistage technique was used to get a representative sample and achieve the stated objectives of the study. Firstly, four (4) Local Government Areas (LGA_s) in Niger state, namely: Wushishi, Shiroro, Lavun and Katcha purposively selected. The choice was based on the preponderance of rice farmers in these LGA_s. This was followed by a random selection of three (3) villages from each LGA as follows: Wushishi (Kanko et al.), Katcha (Jibo et al.), Shiroro (Bassa et al.), Lavun (Zanchita et al.). Lastly, 10 % of respondents were chosen from the sampling frame in each village. The researcher collected data, and it lasted from May to September 2022.

3.3 Analytical Technique

3.3.1 Farm Budgeting Model

The farm budgeting model is a widely used tool in farm management and production economics studies. It enables farmers to estimate costs, returns, and profitability, thereby facilitating informed decision-making.

3.3.2 Profitability Analysis

Profit is realized when returns exceed costs, while losses occur when costs surpass returns (Olukosi & Erhabor, 1988). The model's profitability analysis is based on the following equations:

Net Farm Income (NFI) = Gross Income (GI) - Total Costs (TC) ... (1)

Total Costs (TC) = Total Variable Costs (TVC) + Total Fixed Costs (TFC) ... (2)

Substituting equation (2) into equation (1) yields:

NFI = GI - (TVC + TFC) ... (3)

NFI = GI - TVC - TFC ... (4)

Where:

NFI = Net Farm Income

GI = Gross Income

TVC = Total Variable Costs

TFC = Total Fixed Costs

Total Variable Costs (TVC) are calculated by multiplying the quantity of each variable input by its unit price and summing up all the inputs used in the production process.

Sampling Technique

The sample size for this study was determined using the formula:

n = N / (1 + N(e)^2) ... (5)

Where:

n = sample size

N = population size

e = margin of error

3.3.3 Gross Margin Analysis

The gross margin analysis involves evaluating the efficiency of an individual enterprise so that a comparison can be made between the enterprises. According to Olukosi, Isitor and Ode., (2006), gross margin analysis is one method of calculating the profitability of small-scale cropping enterprises. It is a helpful planning tool when fixed capital is a negligible portion of the farming enterprises, as is the case of small-scale subsistence agriculture prevalent across Nigeria. The GM is given by the difference between the Gross Financial Income GFI (GI) and the total variable cost (TVC) of production. That is

GM = GI – TVC --------- (6)

Where,

GM = Gross margin,

GI = Gross income, and

TVC = Total Variable Cost.

Also,

NFI = GM – TFC --------- (7)

4.0 Results and discussion

Socio-Economic Characteristics of the Respondents

The socio-economic characteristics of rice farmers, which include age, gender, marital status, level of education, farming experience, household size, source of finance and cooperative membership, are presented in Table 1. The results show that the respondents aged 21-40 constituted the majority (75.80%). Gender (Sex) is significant in rice production and agriculture. It is another essential attribute that could influence the efficiency of a farm. The results of the distribution of respondents according to gender are presented in Table 1. Most of the respondents involved in rice production in the study area were males, constituting 94.20% of the entire population. Dzene (2010) found that male-headed households positively

correlated with efficiency. This means that male-headed households are likely to be more efficient than their female counterparts and that men can best handle most farm activities because they are more tedious and labour-intensive.

Table .1: Socio-economic characteristics of the rice farmers

Socio-economic variable	Frequency	Percentage	Means	Standard Deviation.
Age				
11-20	9	7.5		
21-30	63	52.5		
31-40	28	23.3		
41-50	14	1.7		
>50	6	5.6		
Total	**120**	**100.0**	**32.9**	**10.1**
Sex				
Male	113	94.2		
Female	7	5.8		
Total	**120**	**100.0**		
Marital status				
Single	31	25.8		
Married	89	74.2		
Total	**120**	**100.0**		
Educational Background				
None	2	1.7		
Quranic	32	26.7		
Adult	7	5.8		
Primary	15	12.5		
Secondary	37	30.8		
Tertiary	27	22.5		
Total	**120**	**100.0**	**8.8**	**5.6**
Years of Experience				
<5	16	13.3		
6-10	26	21.6		
11-15	44	36.7		
16-20	14	11.7		
21-25	20	16.7		
Total	**120**	**100.0**	**13.9**	**6.9**
Household Size				
<3	52	43.3		
4-6	39	32.5		
7-10	21	17.5		
>10	8	6.7		
Total	**120**	**100.0**	**3.8**	**1.7**
Cooperative Society				
Non-member	38	31.7		
Member	82	68.3		
Total	**120**	**100.0**		
Source of finance				
Personal saving	8	6.7		
Friend/Relatives	112	93.3		
Total	**120**	**100.0**		

Source: field survey, 2022

4.1 Cost and Returns analysis of rice production in the study area

Results in Table 2 indicate the costs, returns, and profitability analysis associated with rice production. The total variable costs accounted for the most significant proportion (64.74%) of the total cost of rice

farming in the study area, which amounted to ₦6,550 per hectare. The cost of seeds, agrochemicals, bags, etc, which are summed up under others, is the significant component of variable cost, closely followed by the cost of fertiliser and labour. This is in line with the findings of Haruna *et al*. (2009) that fertiliser, planting materials, and labour are some of Nigeria's most important inputs in crop production.

These would increase rice output and farm income if resource input were sufficiently available for farmers; the depreciation of fixed costs constituted (35.26%) which amounted to ₦3,567 per hectare**.** Also, the results show that the average total costs (TC) of N10,117 were incurred while average total revenue (TR) of N69,822 per hectare was realised with an average gross margin (GM) of ₦76,372 per hectare and net farm income (NFI) of ₦72,805 per hectare. The results imply that rice production brings high returns to the study farmers and was found to be a profitable enterprise. This findings shows that rice farmers in these local government areas makes good profit and could even improve more if agrochemicals and other constraints faced by them are taken care of or subsidized by the government.

Table 2: Cost and Returns analysis of rice production in the study area

Input	Amount Spent (₦)/hectare	% of Total Cost
(A) Variable Cost		
Fertiliser (kg)	2187	21.62
Family labour (person-day)	542	5.36
Hired labour (person-day)	1,083	10.70
Other costs, e.g. Seeds, agrochemicals Etc (₦)	2,738	27.06
Sub-total	**6,550**	**64.74**
(B) Fixed Cost		
Capital (₦)	797	7.88
Hoes	450	4.45
Cutlasses	760	7.51
Rent on land	1250	12.36
Interest payment	310	3.06
Sub-total	**3,567**	**35.26**
(C) Total Cost (TVC + TFC)	**10,117**	
(D) Total Revenue	**69,822**	
(E) Gross Margin (Total Rev + TVC)	**76,372**	
(F) Net Farm Income (GM - TFC)	**72,805**	

Source: field survey, 2022

4.2 Determinants of Economic Efficiency

Table 3 presents the result of tobit regression used to estimate the effect of some variables on the economic efficiencies of the rice farmers in the study area. The efficiency scores ranged from 0 – 1, hence a limited dependent variable which is censored between 0 – 1 was used. This necessitated the use of tobit regression model to analyse the determinants of efficiency among rice farmers The likelihood test showed that all the models were well fitted i.e. the models were correctly specified, economic efficiencies were significantly affected by five (5) variables.

The economic efficiency was significantly determined by the distance to farm (0.009), membership of cooperative society (-0.075), quantity of fertilizer (-0.015) as well as gender (0.146). Gender had a positive relationship with the economic efficiency meaning that male farmers were more economically efficient than female rice farmers. Distance from home, membership of cooperative society and quantity of fertilizer used had negative effects on the economic efficiency of the rice farmers: The farther the rice field is from the home, the less economically efficient the farmer was. This may be due to the fact that the proximity of the farm to farmer's residence reduced cost incurred for transportation and thus makes the farmers to be more economically efficient. Farmers who were not members of Cooperative Society were more economically efficient than members. Also, the result revealed that the more the amount of fertilizer used, the less their economically efficient the farmer was. This is also in line with the theoretical expectation i.e. excess use of this input will only increase the cost of production.

Table 3: Tobit Regression Result Economic Efficiency

Variable	Economic/Cost Efficiency	
	Coefficient	**t – value**
Age	0.002	1.21
Education	-0.004	-1.44
Household Size	-0.010	-0.93
Land ownership	-0.053	-1.18
Distance	0.009**	-2.18
Extension	0.000	0.07
Credit obtained	-1.530	-0.10
Cooperative	-0.075**	-2.08
Area Cultivated	0.009**	2.20
Fertilizer Quantity	-0.015***	-3.49
Gender	0.146**	2.05
Rice variety	-0.043	-1.32
Constant	0.284*	1.96
Log likehood	51.328	
LR chi^2 (12)	37.96***	
Prob>chi^2	0.000	

* = Significant at 10%, ** = Significant at 5%, *** = Significant at 1%

Source: field survey, 2022

4.3 Constraints of Rice Farmers in the Study Area

Market Information and Price Fluctuations

A significant proportion of respondents (75.83%, n = 91) reported that they lacked up-to-date information about market prices, relying instead on other channel members and farmers for information. This finding is consistent with previous research (Tana, 2011), which highlighted the dependence of farmers on various sources for market information.

Monopoly of Middlemen and Credit Constraints

Respondents identified the monopoly of middlemen and cartels as a major problem, causing price fluctuations. Additionally, 74.17% of respondents (n = 89) reported facing credit and finance problems during the rice production process. Farmers cited increased production costs and dependence on input dealers who sold fertilizer and other materials on credit, leading to additional expenses after harvesting.

High Price of Inputs

High prices of inputs, such as seeds, chemicals, and fertilizer, were identified as the third biggest problem by 61.66% of respondents (n = 74). Farmers attributed the increased prices to remote locations, high transportation costs, and the expense of other agricultural inputs.

Marketing Problems

The survey revealed that rice growers in the study area faced significant marketing problems. Due to the urban location of markets, farmers often sold their produce at the farm gate to avoid transportation and other costs. As a result, they relied on commission agents who paid lower prices than market prices.

Table 4: Constraints of Rice Farmers in the Study Area

Problems	Frequency	Percentage	Rank
1. Inadequate rainfall	116	96.67	1
2. Incidence of pest and disease	103	85.83	2
3. Poor access roads and transport facilities	97	80.83	3
4. Inadequate storage facilities	91	75.83	4
5. Lack of access to credit	89	74.17	5
6. Poor remunerative prices	77	64.17	6
7. Unavailability of farm input	73	60.83	7
8. Lack of market for the product	68	56.67	8
9. Pilfering/theft	68	56.67	8
10. Lack of access to improved variety	63	52.50	10

*Multiple response were recorded

Source: field survey, 2022

4.4 DISCUSSION

Socio-Economic Characteristics of the Respondents

The socio-economic characteristics of rice farmers in the study area are presented in Table 1. The results indicate that the majority of respondents (75.80%) fell within the age range of 21-40 years. This age group is considered to be in their prime working years, and their dominance in the study area suggests that rice farming is a viable occupation for this age group. The gender distribution of respondents reveals that males constituted 94.20% of the population, while females made up only 5.80%. This significant gender disparity is consistent with previous studies, which have found that male-headed households tend to be more efficient in agricultural production (Dzene, 2010). The dominance of males in rice farming in the study area may be attributed to the labor-intensive nature of the activity, which may be more suited to male physical capabilities. The implications of these findings are that policies and interventions aimed at improving rice production in the study area should take into account the socio-economic characteristics of the farmers. For instance, training programs and extension services may need to be tailored to the needs of male farmers, who make up the majority of the population. Additionally, efforts to promote gender equality and increase female participation in rice farming may be necessary to address the significant gender disparity observed in the study area.

Cost and Returns analysis of rice production in the study area

The cost and returns analysis of rice production in the study area reveals significant insights into the profitability of rice farming. The results presented in Table 2 indicate that the total variable costs accounted for the largest proportion (64.74%) of the total cost of rice farming, amounting to N6,550 per hectare. This finding is consistent with the study by Haruna et al. (2009), which identified fertiliser, planting materials, and labour as the most important inputs in crop production in Nigeria. The results also show that the average total costs (TC) of N10,117 were incurred, while the average total revenue (TR) of N69,822 per hectare was realised. This resulted in an average gross margin (GM) of N76,372 per hectare and a net farm income (NFI) of N72,805 per hectare. These findings suggest that rice production is a profitable enterprise in the study area, with farmers generating significant returns on their investments.

The high returns on investment in rice production in the study area can be attributed to the availability of fertile land, favourable climate, and access to markets. However, the results also highlight the need for government intervention to address the constraints faced by rice farmers, such as the high cost of agrochemicals and other inputs. Subsidizing these inputs or providing alternative solutions could further improve the profitability of rice production in the study area. The findings of this study have implications for policy makers, farmers, and other stakeholders in the rice industry. They highlight the need for targeted interventions to support rice farmers and improve their productivity and profitability. By addressing the constraints faced by rice farmers, the government can help to increase rice production, reduce imports, and improve food security in the country.

Tobit Regression Result Economic Efficiency

The results of the Tobit regression analysis presented in Table 3 provide insights into the determinants of economic efficiency among rice farmers in the study area. The efficiency scores, ranging from 0 to 1, were modeled using a limited dependent variable, which necessitated the use of the Tobit regression model.

The likelihood test confirmed that the models were well-fitted, indicating correct specification. The results revealed that five variables significantly affected the economic efficiency of rice farmers. These variables included distance to farm, membership of cooperative society, quantity of fertilizer, and gender. The findings indicate that gender had a positive relationship with economic efficiency, suggesting that male farmers were more economically efficient than their female counterparts. This result is consistent with previous studies that have found gender disparities in agricultural productivity (Dzene, 2010).

The results also show that distance from home, membership of cooperative society, and quantity of fertilizer used had negative effects on economic efficiency. Specifically, the farther the rice field was from the farmer's residence, the less economically efficient the farmer was. This finding suggests that proximity of the farm to the farmer's residence reduces transportation costs, leading to increased economic efficiency. Furthermore, the results indicate that farmers who were not members of cooperative societies were more economically efficient than members. This finding may suggest that membership in cooperative societies may not necessarily translate to increased economic efficiency for rice farmers. Finally, the results show that the quantity of fertilizer used had a negative effect on economic efficiency. This finding is consistent with theoretical expectations, which suggest that excessive use of inputs such as fertilizer can increase production costs without corresponding increases in output.

Overall, the findings of this study provide insights into the determinants of economic efficiency among rice farmers in the study area. The results highlight the importance of considering factors such as distance to farm, membership of cooperative society, quantity of fertilizer used, and gender when designing policies and interventions aimed at improving the economic efficiency of rice farmers.

Constraints of Rice Farmers in the Study Area

The findings of this study highlight several challenges faced by rice farmers in the study area. One of the primary concerns is the lack of access to up-to-date market information, with 75.83% of respondents relying on other channel members and farmers for information. This dependence on informal sources of information can lead to price fluctuations and reduced profitability for farmers. The study also reveals that the monopoly of middlemen and cartels is a major problem, causing price fluctuations and credit constraints. The majority of respondents (74.17%) reported facing credit and finance problems during the rice production process, highlighting the need for improved access to credit and financial services.

Furthermore, the high price of inputs, such as seeds, chemicals, and fertilizer, was identified as a significant problem by 61.66% of respondents. The remote location of the study area, high transportation costs, and the expense of other agricultural inputs all contribute to the high cost of production. The marketing problems faced by rice growers in the study area are also a major concern. The urban location of markets means that farmers often sell their produce at the farm gate to avoid transportation and other costs. However, this reliance on commission agents results in lower prices than market prices, further reducing the profitability of rice farming.

Overall, the findings of this study highlight the need for improved access to market information, credit and financial services, and affordable inputs. Addressing these challenges will be critical to improving the profitability and sustainability of rice farming in the study area.

5.0 Conclusion

This study investigated the cost and return analysis of small-scale rice production in Niger State, Nigeria. The findings revealed that small-scale rice production was profitable, with a significant gross margin. However, farmers faced constraints such as limited access to finance, poor storage facilities, and high agrochemical costs. The study's results have important implications for policymakers and stakeholders seeking to enhance productivity and profitability in Nigeria's rice sector. Specifically, targeted credit facilities and policy interventions can address farmers' constraints and improve their livelihoods.

The study's limitations highlight the need for further research on small-scale rice production's dynamics and the impact of policy interventions. In conclusion, this study contributes to the understanding of small-scale rice production's economics in Nigeria, providing valuable insights for stakeholders to design effective policies and interventions.

6.0 Recommendations

Based on the conclusions drawn from this research, the following recommendations are proposed:

1. Provide infrastructure such as roads, storage facilities and markets to support rice production and marketing.
2. Policy interventions should prioritize improving storage facilities and reducing agrochemical costs.
3. Develop policies that support the development of the rice sector such as price stabilization mechanisms and input subsidies

4. Promote the use of efficient inputs, such as high-yielding varieties and optimal levels of fertilizers to improve productivity and reduce cost.
5. Encourage private sector investment in the rice sector, particularly in areas such as processing and marketing

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