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Financial Profitability of Rain-fed Rice (*Oryza sativa*) Farmers in Taraba State, Nigeria

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Abstract

This study analysed the financial profitability of rain-fed rice farmers in Taraba State, Nigeria. The study described the socio-economic characteristics of rice farmers, estimated the profitability of rice cultivation and pinpointed the obstacles related to rice production in the research region. Data were collected with the aid of a structured questionnaire and analyzed using descriptive statistics and farm budgeting techniques. Results of the socio-economic characteristics of the farmers revealed that farmers had 45 years on average, majority (83.6%) of the farmers were male, 76.5% were married with an average household size of 8 persons, majority (87.3%) of the farmers had some form of education, with 10 years of farming experience on average, 71.5% of the farmers do not belong to any cooperative organization, and 86.7% do not have contact with extension agents. Majority (53.3%) acquired their land through inheritance. Most (53.3%) of the farmers used the machine method of land cultivation, majority (78.4%) of the farmers in the study area used the broadcasting method of planting, and most (92%) of the farmers used the manual method for harvesting. The farm budget technique revealed that rice production was profitable with a net farm income of ₦410,380 and a return of 0.65 kobo invested. Poor access to credit, poor roads, high cost of transportation, and high cost of fertilizer were the biggest constraints. The study recommended farmers should be encouraged to join a cooperative organization to enable them have access to credit facilities in the study area.

Keywords: Rice, Farmers, Production, Financial profitability

1.0 Introduction

The majority of people worldwide, particularly in Nigeria, consume rice (*Oryza sativa*), a staple cereal grain that is farmed throughout Africa and whose significance is growing quickly. After maize, it is the grain with the second-highest production globally (FAO, 2016). For the majority

of people in Asia, Latin America, the Caribbean, and Africa, rice is an essential food source. It is crucial to the food security of over half of the world's population. Developing countries contribute 95% of the overall production, with China and India alone responsible for approximately half of the world's output. 20% of the world's dietary energy comes from it, compared with 19% from wheat and 5% from maize (FAO, 2018). Rice has had a significant role as a critical crop for global food security and economic growth over the years (Chukwu *et al.*, 2016). Due to the high consumption by both affluent and underprivileged family units, it has become a significant cuisine in Nigeria. Notwithstanding, a number of variables seem to be driving up Nigeria's need for rice consumption. The primary factor influencing Nigerian consumers' shifting preferences for rice seems to be urbanization. Nigerians' changing income levels and population growth are other influences (Kara *et al.*, 2019).

Beyond just being a staple food, rice is widely grown in Nigeria and provides farmers with a significant source of revenue. About 80% of Nigeria's farmer populations are smallholder farmers, who produce the majority of the country's food supply (Akinsuyi, 2011). According to Akpokidje *et al.* (2020), these smallholder farmers are restricted to rural regions and rely on farming as their primary source of income. According to data from a number of Nigerian states, the price and availability of rice have emerged as key factors influencing the welfare of the nation's poorest customers, who have poorer levels of food safety (Central Bank of Nigeria (CBN), 2015).

Rice is cultivated in almost all the ecological zones in Nigeria, mostly by small-scale farmers (Kara, *et al.*, 2019; Jonah *et al.*, 2023). Of Nigeria's 79 million hectares of arable land, only roughly 1.8 million are being used for rice cultivation out of 4.6 million hectares that are suitable for the crop (National Rice Development Strategy (NRDS), 2020). This represents an improvement of almost 25 million hectares of land that were used for the production of different food crops in 2019 of which 6.37 million were used for rice cultivation alone (CBN, 2016).

The rice output in 2016 was 4.536 million tonnes, the area harvested increase was 3,300 hectares and the yield per hectare was 1.37 tonnes. In 2021, production output expanded to 5 million tonnes and the area harvested increased to 3,650 hectares, the yield per hectare declined to 1.36 tonnes, suggesting extensive rice cultivation. On the other hand, rice consumption has increased from 4.22 million tonnes in 2008 to 6.7 million tonnes in 2016 and 6.95 million tonnes in 2021. Despite the increase in output that is sustained over the years, and consumption increase, local production could not meet demand, likely because of population growth, urbanization, and consumers' preference for rice.

In an attempt to bridge the rice demand-supply gap in Nigeria, some efforts have been made by the Nigerian government over sustainable rice production and zero importation of paddy rice production. Some of these initiatives included the Africa Rice Initiative in 2012 and; the National Rice Development Strategy (NRDS) from 2009-2018. Of recent, the ban on rice importation by the Nigerian government, the ongoing Anchor Borrowers Programme (ABP) launched by the CBN, and the Green Alternatives Policy initiated by the Federal Ministry of Agriculture and Rural Development (FMARD) in 2015 aimed at encouraging domestic rice production (Kara *et al.*, 2019).

Rice farming has a number of expenses, and before production starts, its viability must be determined. Maximizing profits is a crucial objective for any agricultural enterprise. A farmer's goal is always to increase profit while minimizing expenses. The understanding of cost analysis and benefit cost ratio in monetary terms allowed Taraba State to accomplish this. Based on this assumption, a study was carried out in Taraba State to examine the financial viability of rain fed rice producers in the region under investigation. The specific objectives of the study were to;

- i. describe the socioeconomic characteristics of the rice farmers in Taraba State,
- ii. estimate the costs and returns in rice production and
- iii. identify the constraints associated with rain fed rice farmers.

2.0 Methodology

2.1 The Study Area

The study was conducted in Taraba State of Nigeria. The state lies between latitudes 6°30'00" and 10°36'00" North of the equator and longitudes 9°10'00" and 11°50'00" East of the Greenwich Meridian (Taraba State Government (TRSG), 2015). It has a land area of about fifty-nine thousand and four hundred square kilometers (59,400 km²) with a population of 4,025,000 people projected at an annual growth rate of 3.5% as of 2022. The State has sixteen (16) Local Government Areas and two Special Development Areas and shares borders with Plateau, Nasarawa, and Benue States to the West, Adamawa, and Gombe States to the North, and to the East with the Republic of Cameroon (Taraba State Government (TRSG), 2015). The state features savannah and rainforest flora, well-drained alluvial soils, and a tropical wet-dry climate.

Maximum temperatures in the state can reach 32°C, especially during the hottest months of March and April. The South of the state experiences 1000 to 2500 mm of rainfall annually, while the North experiences 1000 to 1850 mm. The minimum temperature is about 18°C experienced between December to January each year. The relative humidity is extremely low (13%) between January and February (Taraba Agricultural Development Programme (TADP), 2016).

About 80% of the state's population lives off subsistence farming, making it mostly an agrarian state. The region's climate, soil, and hydrology are favorable for growing crops such as rice, maize, sweet potatoes, yams, millet, and soybeans. It is also suitable for forestry, freshwater fishing, and animal grazing. Due to the variety of cultures, different farming systems are practiced in the State (TRSG, 2015).

2.2 Sampling Techniques

Taraba State is made up of four agricultural zones namely: zone I (Ardo-kola, Jalingo, Karim-Lamido, Lau, Yororo, and Zing), zone II (Gassol, Ibi, Donga, and Wukari), zone III (Bali, Kurmi, Gashaka, Takum, and Ussa) and zone IV (Sarduna). Multi-stage sampling procedure was employed in the selection of the rice farmers. In the first stage, three out of the four agricultural zones were selected based on their prominence in rice production namely: zone I, zone II, and zone III. In the second stage, three Local Government Areas (LGAs) were selected from each of the selected three zones due to the concentration of rice farmers in the LGAs. Zone I: Ardo-kola, Jalingo and Karim-Lamido, Zone II: Donga, Gassol and Wukari and Zone III: Bali, Kurmi, and Takum giving a total of nine (9) LGAs. In the third stage, two rice farming communities

(villages) were randomly selected from each of the Local Government Areas, giving a total of 18 farming communities and finally, 5% of the respondents were randomly selected from each of the villages in proportion to their population to give 454 rice farmers out of which 435 questionnaires were properly filled and returned, as shown in Table 2.1.

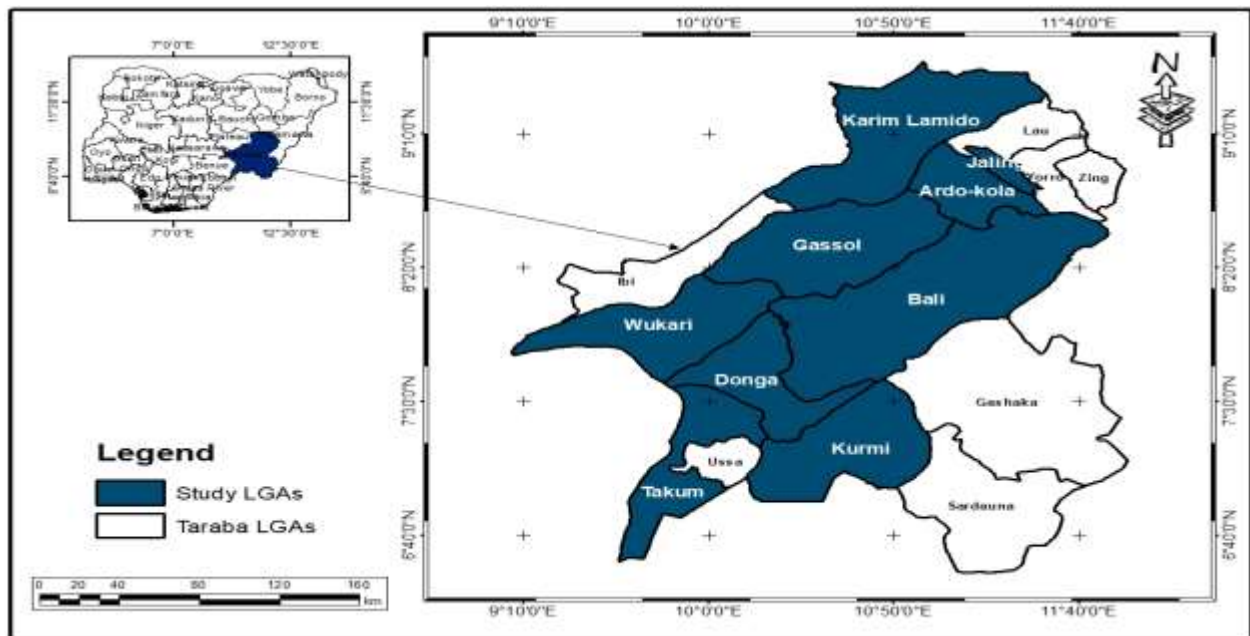


Figure 2.1: Map of Taraba State showing the study area

Source: Department of Geography, Taraba State University, Jalingo

2.3 Source and Method of Data Collection

Data for this study were collected from primary sources using structured questionnaires and interview schedules.

2.4 Analytical Technique

Descriptive statistics including mean, frequency, and percentage and budgeting techniques were used to address the objective of the study.

2.4.1 Budgeting Techniques

The costs and return structure of rice farming were ascertained using the budgeting technique known as Net Farm Income (NFI). The difference between gross farm income and total production costs was calculated using the following method:

$$\text{NFI} = \text{TR} - \text{TC} \dots \dots \dots \text{Equation 2.1}$$

Where:

NFI = Net Farm Income (₦) per hectare

TR = Total Revenue (₦) per hectare

TC = Total Cost (₦) per hectare

The straight line technique was used to compute the fixed costs, which included land rent charges and depreciation on fixed costs:

Table 2.1: Sample Frame

S/N	LGA	Farming village	Population of rain fed rice farmers	Estimated sample of rain-fed rice farmers
Zone 1	Ardo-kola	Malam Ali	643	32
		Mayo– Renewo	606	30
	Karim– Lamido	Sallah Duna	899	45
		Amache	577	29
	Jalingo	Kona	995	50
		Sarkin Dawaki	949	47
Zone 2	Gassol	Marraba Gassol	504	25
		Sabon – Gida	442	22
	Donga	Akate	553	28
		KadarKo	432	22
	Wukari	Gidin – Dorowa	262	13
		Tsokundi	396	20
Zone 3	Bali	Maihula	407	20
		Gazabu	454	23
	Kurmi	Didan	304	15
		Sabon – Gida	193	10
	Takum	Tati – Takum	160	8
		Manya	294	15
Total	9	18	9070	454

Source: International Fund for Agricultural Development (IFAD)/Taraba state VCDP Land Area Supported from 2016 to 2022.

$$\text{Depreciation} = \frac{P-S}{N} \dots\dots\dots \text{Equation 2.2}$$

Where:

P = Purchased Price

S = Salvage Value

N = Number of years of the assets

The cost of all inputs, including labor, fertilizer, seed, insecticides, and herbicides, was included in the total variable costs (TVC).

A number of profitability ratios were calculated, including the operating ratio (OR), rate of return on variable cost (RRVC), and rate of return on naira invested (RNI):

$$\text{OR} = \frac{\text{Total variable cost}}{\text{Total Revenue}} \dots\dots\dots \text{Equation 2.3}$$

The operating ratio shows the efficiency of a farm's management by comparing the total operating expense of a farm to net sales. The operating ratio shows how efficient a farm's management is at keeping costs low while generating revenue or sales. The smaller the ratio, the more efficient the company is at generating revenue versus total expenses. Therefore, if the farmer's operating ratio is less than 1, it means that cost management is efficient; if it is one or above, it means that cost management is inefficient.

$$GR = \frac{\text{Total Revenue}}{\text{Total Cost}} \dots\dots\dots \text{Equation 2.4}$$

The gross ratio, which compares a farm's total revenue to its total costs, indicates whether or not the farm is profitable. When the ratio is larger than 1, it indicates that the business is profitable; when it is less than 1, it suggests that the business is not profitable.

$$RNI = \frac{\text{Net Farm Income}}{\text{Total Cost}} \times \frac{100}{1} \dots\dots\dots \text{Equation 2.5}$$

Return per naira invested, which represents a farm firm's net farm income as a percentage of total costs, provides a gauge of profitability. The amount of return for each naira invested in the firm is then shown by the percentage.

3.0 Results and Discussion

3.1 Socioeconomic Characteristics of the Farmers

The result of the socio-economic characteristics of respondents is presented in Table 3.1. The mean age of the farmers was 45 years, with an age variability of 11.3 years. The result implies that the farmers in the study area are young and energetic. This is important because, as youth, they may be willing to assume greater risk in anticipation of profit than the older or much younger ones. The result agrees with Ojo *et al.* (2020) and Nwahia (2020), who in the Southern Region of Ebonyi State, Nigeria found a mean age of 46 and 47 years, in their findings.

The result of the analysis shows that the majority (83%) of the sampled rice farmers in the study area were male, whereas 17% were female. This implies that more men were involved in rice production in the study area. The reason might be that rice production in the study area requires physical strength that women may not possess. The result agreed with Odoemenem and Inakwu, (2018) and Chidiebere-Mark *et al.* (2020) who reported that 65% and 59.4% of rice farmers were male-dominated in the Southern Region of Cross River and Ebonyi State, Nigeria.

According to the results, 77% were married and 23% of farmers were unmarried. The fact that the unmarried individuals were primarily young and still dependent may have contributed to their low participation rate. The majority of the young people were into schooling or learning one form of trade or the other. The study agrees with Oladejo (2016) who found that the majority (80%) of the rice farmers in Osun State were married.

The average farmer's household has 5 people, with a minimum of one and a maximum of thirty. Given that most farmers have sizable families; this suggests that there was a sufficient supply of family labor for farm activities in the study area. Antia-Obong *et al.*, (2021), also found the average age of farmer's household to be 5 people in a study in a Southern Nigeria state. This result also conforms to the findings of Steven (2016), who conducted a study in the Southern region of Taraba State Nigeria and revealed that the mean household size of his farmers was 8 persons.

The results revealed that 10.6% of the rice farmers had never been to school, 13.6% attained primary school 30.8 % attained secondary school 45% attained tertiary education. This implies that the majority (89.4%) of the farmers had some form of formal education. It means that their

levels of education will expose them and also help them in effective communication and adoption of innovations which could lead to increased output compared with those without formal education. This agrees with the work of Idiong *et al*, (2017) and Nwahia (2020) who revealed that the mean education level of the farmers was recorded as 8 schooling years in the Southern region of Ebonyi State, Nigeria.

Table 3.1: The Farmers Socioeconomic Characteristics

Variable	Frequency	Percentage (%)	Mean	Std. Dev.
Age			44.5	11.3
Sex			0.8	
Male	363	83		
Female	72	17		
Marital status			0.8	
Married	336	77		
Single	99	23		
Household Education			5.0	4.1
Never been to school	46	10.6	11.2	
Had primary	59	13.6		
Had secondary	134	30.8		
Had tertiary	196	45		
Farming experience			9.5	7.3
Membership of cooperative			0.3	
Member	124	28.5		
No Member	311	71.5		
Extension contact			0.1	
Had contact	58	13.3		
No contact	377	86.7		
Method of land acquisition			1.7	
Inheritance	232	53.3		
Other methods	203	46.7		
Method of land cultivation			1.2	
Use machine	232	53.3		
Manual	203	46.7		
Method of planting			2.0	
Transplanting	94	21.6		
Broadcasting	341	78.4		
Method of harvesting			1.0	
Manual	400	92		
Use machine	35	8		

Source: Field survey data, 2024

The mean farming experience of rice farmers in the study area is 9.5 years. It is thus, reasonable to deduce that farmers in the study area are well-experienced in rice farming and portray good signals for higher productivity. The result agrees with the work of Khan *et al*, (2022) in Khyber Pakhtunkhwa, Pakistan wherein the average length of farming experience of rice farmers was 26.21 years with a standard deviation of 7.17.

Cooperative associations are established for the promotion of special interests or to meet certain needs or goals that cannot be achieved by an individual effort. They contribute to the dissemination of innovations, practices, and products as well as sourcing for loans and farm input (Chikezie *et al.*, 2012). Farmers that belong to a cooperative society are likely to adopt innovation more easily than those not in any cooperative society. The majority (71.5%) of the rice farmers did not belong to any cooperative organization. This implies that the majority of the rice farmers in the study area were not members of any cooperative society and, hence may not have benefited from the benefits accumulated by cooperative members such as enhancement of livelihood activities for effective resource mobilization and usage, information dissemination, better expansion of business and profit maximization, acquiring business/ or investment loan and fund mobilization through contributions and personal savings. This finding confirms the work of Gani (2016) who revealed in his work that about 96.00% of rice farmers do not belong to any cooperative society in the northeast region of Nigeria, Ibi Local Government Area of Taraba state.

Extension contact is a driving force for any agricultural development; the greater the number of visits of an extension agent, the greater the chance for farmers to adopt innovations. The result in Table 3.1 indicates that the majority (86.7%) of the rice farmers had no contact with extension agents. This may hurt the adoption of improved rice production technologies. The result of this finding is different from a study by Ojo *et al*, (2020) they revealed in their work that about 53% of the farmers in South-western Nigeria had access to extension service.

Land acquisitions are broadly defined to cover not just the purchase of ownership rights but also the acquisition of usage rights, for instance through leases or concessions, whether short or long-term (Oluwatayo *et al.*, 2019). The outcome of the data in Table 3.1 revealed that the majority (53.3%) of the farmers received their land for rice production by inheritance reflecting that the traditional system of land ownership is still in place in the research area.

This may be the reason why most land is fragmented and scattered. This is one of the major problems hindering the development of agriculture in the State and the Nation at large. The result of the finding disagrees with the work of Sunday and Monday (2021) in the South-South Region of Nigeria which shows in their work that only 43% of the farmers acquired their lands for rice production through inheritance.

Information on field management revealed that the majority (53.3%) of the farmers cultivate their farmland using machine implements. The farmers may be efficient in land cultivation operations because of the machine operation and the use of implements. Information on planting methods shows that the sampled farmers (78.4%) indicate broadcasting as the method they used in their planting operations in the study area. Also, the broadcasting method used has an

increasing effect on technical efficiency. The result implies that the technical efficiency of rice farmers in the study area is increasing mostly by using broadcasting methods.

Information on the mode of harvesting revealed that the majority (92%) indicate manual as the method used in their harvesting operations in the study area. Also, the manual method used has a decreasing effect on technical inefficiency. The result implies that the technical inefficiency of rice farmers in the study area is reduced by (8%).

3.2 Costs and Returns of Rice Production

The result of costs and returns per hectare analyzed using net farm income analysis is presented in Table 3.2. The total cost of production incurred was N630,800, out of which the Total Variable Costs (TVC) was N538,000 while Total Fixed Cost (TFC) was N 92,800. Variable costs accounted for 85.3 percent (%) of the total cost of production incurred by the farmers in the study area. This finding is in agreement with that of Luka (2016), who conducted a study on the analysis of rice production among small-scale rice farmers in Donga Local Government Area of Taraba State. In his findings, he reported that variable costs constituted a higher percentage (%) of total costs of production. Among the variable costs, labour is the most costly variable input used in the study area. Fixed costs consist of the cost of rental value of land and depreciation on equipment. The total fixed cost (TFC) was N 92,800 out of which the cost of land alone constituted 10.3% of the total fixed costs of production in the study area. This implies that land is the costly fixed input used in the study area.

The total revenue (TR) from rice production was N1,041,180.00, the net return was N410,380, and the return on investment was 0.65. This means that for every naira spent in rice cultivation in the research region, 65 kobo would be generated. The outcome is consistent with the research conducted by Lawal *et al.* (2023) and Alabi *et al.* (2023). According to their findings, smallholder farmers in the Federal Capital Territory could consider engaging in the lucrative business of rice farming. The profitability ratio of a farm firm, including the operating ratio (OP) and gross ratio (GR) (0.5167 and 1.6505) of rice farmers in the study area, was also disclosed by the study. This finding is in agreement with Olugbenga *et al.* (2023), who reported that rice production was a profitable enterprise in their study area; with a gross margin of 0.46, operating ratio of 0.54 and rate of return on investment of 0.65; implying that farmers got up to 65% profit with up to 35% interest rate borrowing from commercial banks.

3.3 Constraints Faced by Rain-fed Rice Farmers in Taraba State

The constraints associated with rice production in the study area are presented in Table 3.3. The result revealed the following as constraints: poor roads, poor access to credit, lack of extension services, high cost of transportation, high fertilizer and chemical costs, weed control issues, a shortage of improved seeds, a shortage of labor, and high seed costs. These are significant limitations since they restrict the farmers' ability to produce because they are unable to increase their operational scale because of the high cost of production.

The most pertinent constraints of rice production in the study area are poor access to credit, poor road network, high cost of transportation and high cost of fertilizer these were ranked 1st, 2nd, 3rd, and 4th respectively. Poor access to credit which constituted 75.2% of the sampled population is one of the key factors in constraining rice production in the study area. These may

be because most rice farmers in the area are subsistence in nature so they cannot secure access to enough credit facilities. Credit is one of the policy instruments considered to facilitate technology transfer, stimulate productivity, generate employment, and increase income (Hart and Pimentel, 2017). Credit limitations have a detrimental impact on farmers' investment practices, output, and farm growth. The high cost of transportation (65.7%) as a result of poor roads, inadequate vehicles, lack of spare parts, and insecurity which put fear in bringing the farm produce from rural to urban centers is one of the major constraints of rice production. Nigeria's

Table 3: Average Costs and Returns per Hectare of Rice Production

Variable	Unit	Value (₦)	Percentage
A. Variable Cost	Naira		
Seeds	Kg	43,550	8.09
Fertilizer	Kg	250,250	46.51
Agrochemicals	Litre	37,600	6.99
Labour	Man-days	148,600	27.62
Bags/bagging	No. of bag	21,000	3.90
Transportation	Naira	37,000	6.88
Total Variable Cost (TVC)		538,000	100
B. Fixed cost	Naira		
Land	Ha	65,000	70.04
Depreciation on farm tools and machinery		27,800	29.96
Total Fixed Cost (TFC)		92,800	100
Total Cost (TC)		630800	
C. Returns			
Output (Kg/ha)		1,554Kg	
Price per kilogram		670/Kg	
D. Total Revenue (TR)		1,041,180	
E. Net farm income (TR-TC)		410,380	
F. Return per naira invested (NFI/TC)		0.65(65%)	
G. Operation Ratio (TVC/TR)		0.5167	
H. Gross Ratio (TR/TC)		1.6505	

Source: Field survey data, 2024

agricultural development is severely hampered by the distribution of inputs and outputs to and from farms. About 63.9% of rice farmers complained about the high cost of fertilizer. This may be because most agricultural inputs are associated with high input costs, especially during the farming period. The high cost of chemicals the 5th most important constraint in the study area constitutes about 63% population of the study. This result collaborates with the study of Wessel and Quist-Wessel (2015) who reported high costs of inputs as constraints facing rice farmers.

Lack of extension services: was ranked 6th with (61.1%) important problems facing rice production in the study area. This means that new techniques of farming and innovations would not be made available to the farmers due to the lack of enough face-to-face contact between extension agents with farmers. The finding aligns with the findings by Abah and Tor (2012) who reported that most (66.7%) of the respondents in Lafia Local Government Area of Nasarawa

State, Nigeria never received any training on rice production farming from any government agencies (extension agent).

High cost of seed, weed control problems, and lack of improved seeds, were ranked 7th, 8th, and 9th with 49.4%, 48%, and 44.6% constituting the least important constraint in the study area. This result implies that the acquisition of input such as improved seeds, cost of seed, and weed control both reduced the quantity and the quality of the rice resulting in low yield (Akpan *et al.*, 2013). The result on the inadequacy of labour supply was ranked 10th as the least (33.6%) indicating that farmers experienced a shortage of labour supply. This indicates that most of the farmers used family labour as a source of labour because of the large household size.

Table 3.3: Constraints faced by rice farmers in Taraba State

Problems	Frequency*	Percentage	Rank
Poor access to credit	307	75.2	1
Poor road	302	69.4	2
High cost of transportation	286	65.7	3
High cost of fertilizer	278	63.9	4
High cost of chemical	274	63	5
Lack of extension services	266	61.1	6
High cost of seed	215	49.4	7
Weed control problem	209	48	8
Lack of improved seed	194	44.6	9
Inadequate labour supply	146	33.6	10

***Multiple responses**

Source: Field Survey Data, 2024

4.0 Conclusion

The study concludes that rice production in the study area was undertaken by young, educated, and experienced farmers, the majority of who cultivate their farmland using machines and were profitable, with a net farm income of N410, 380 and a return on naira invested of N0.65.

Recommendations:

The study's conclusions led to the following recommendations:

1. Estimates of farm budget technique show that farmers are profiting; however, because labour was the most expensive variable factor in the study area, the government and non-governmental organizations should support farmers with subsidized farm implements and machines to reduce farm operation costs of labour, thus increasing farmers' profit margins.
2. One of the methods of educating farmers is through extension contact, and the majority of the respondents in the study area had no extension contact. Thus, farmers should be encouraged to go to school, and the government, as a matter of urgency, should provide more extension workers in the study area.

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