



**PROFITABILITY ANALYSIS OF RICE MILLING AND MARKETING IN BAUCHI STATE, NIGERIA**

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**ABSTRACT**

The study analysed the profitability of rice milling and marketing in Bauchi State, Nigeria. Multi-stage sampling procedure was used for the selection of respondents. The respondents comprised rice processors (millers) and marketers. Data were collected using questionnaire and analysed using descriptive statistics, farm budgeting techniques and multiple regression analysis. The findings revealed that majority (87.5%) of the millers and all (100%) of marketers were male and married with a mean age of 39 and 44 years respectively. However, 43.8% of the millers and 40% of the marketers had a family size of between 6-10 people per household with majority (62.5%) of the millers having tertiary education. The analysis also shows that half (50%) and more than half (53%) of the millers and marketers had a marketing and milling experience of between 11-20 years. The result of the budgeting model revealed that millers had a net income of ₦714 per bag with a return per naira of ₦1.46 and marketers had a net income of ₦1, 672 per bag with a return per Naira of ₦ 0.12. The results of the regression analysis revealed that years of milling experience and education level were the factors influencing rice milling while household size and membership of association were significant factors influencing rice marketers' income. However, high cost of diesel (96.7%) and transportation cost (95%) were the major constraints faced by the millers and marketers in the study area. The study concluded that, milling and marketing of rice is a profitable ventures in the study area. It is therefore, recommended that government together with stakeholders should provide adequate infrastructure and introduce favorable policies to strengthen the rice value chain in the study area.

**Keywords:** Analysis, Marketers, Millers, Profitability and Rice

**INTRODUCTION**

Rice (*Oryza sativa L.*) Is one of the most consumed cereal crops and shapes the lives of more than half the world's population. Majority of the world population depends on rice for about 80 percent of its food calorie requirements (Zarmai *et al.*, 2014). For instance, in terms of rapid population growth, increased demands in rice were met largely due to higher rice production. The growth of population and urbanization in recent times has led to rapid increase in demand of rice, especially in Nigeria. Nigeria has recently overtaken Egypt to become the biggest producer and consumer of rice in Africa. It is grown on approximately 4.4 million hectares of land in the country, with an annual production of 8.3 million tonnes (Federal Ministry of Agriculture and Rural Development (FMARD, 2021). Despite that, the United States Department of Agriculture (USDA, 2021) reports that Nigeria still imports about 2.3 million tonnes of rice as at 2021. This mainly due deficit in production as domestic demand exceeds supply, it is necessary to bridge the gap through improvement of the rice value chain, especially the areas of processing and marketing.

The Nigerian government has been focusing on 'Value Chain' in the agricultural sector since 2011. Some programs implemented under the Value Chain scheme include; Nigerian



Incentive-based Risk Sharing for Agricultural Lending (NIRSAL), Growth Enhancement Scheme (GES), Anchor Borrowers among others, the priority crop value chains include, rice, cocoa, cassava and cotton (Johnson *et al.*, 2013). These schemes were mainly targeted towards improving local production of staple crops and make the country secured and self-sufficient in production of some of the crops. In agriculture, value chain can be viewed as a ‘farm production to consumption’ series of processes and flows (Miller and Da Silva, 2007). It was introduced to improve productivity, profitability and subsequently performance of the participants in the agricultural sector. In Bauchi state, the agricultural sector serves their main source of livelihood for most of the population. FMARD in collaboration with National Agricultural Extension and Research Liaison Service (NEARLS), (2021) revealed that about 146,020 hectares of land in the state was used to produce 232,000 tonnes of rice. It is generally observed that there is low level of investments in the rice value chain in the state despite its potential. The lack of proper evaluation and information on the profitability of the participants involved in milling and marketing levels of the rice value chain might have been the major reason for the sector’s failure in attracting the attention necessary from stakeholders in the state. The profitability analysis of rice milling and marketing in Bauchi State aims to provide such information. The main objectives of the study were profitability analysis of rice milling and marketing in Bauchi State, Nigeria. The specific objectives were to; describe the socio-economic characteristics of the rice millers and marketers in the study area; examine the profitability of the rice milling and marketing in the study area; determine the effects of the socio-economic variables on net income of millers and marketers and identify constraints associated with milling and marketing of rice.

## **MATERIALS AND METHODS**

### **The Study Area**

The study was conducted in Bauchi State. The State is located in the North-eastern region of Nigeria and it occupies a total land area of 49,119km<sup>2</sup> representing about 5.3% of Nigeria’s total land mass. It is located between latitudes 9° 30 and 12° 30 N and longitudes 8° 50 and 11 50 East. The state has a projected population of 7,652,402 as of 2021 based on annual growth rate of 3.2% (NPC, 2006). The state has two distinctive vegetation zones, namely the Sudan and the Sahel Savannah. The Sudan savannah covers the southern parts of the state which consists of grasses which gets richer southwards. The mean annual temperature is 24°C and average rainfall of 700mm-1300mm (Bauchi state.gov.ng, 2020). The major economic activities in the state are farming and livestock rearing. Its vast fertile soil is an added advantage for producing Agricultural products such as rice, maize millet, groundnut and guinea corn.

### **Sampling Procedure**

Multistage sampling technique was used for the selection of respondents for this study. The respondents are the millers and marketers. Three Local Government Areas (LGA) were purposively selected based on the intensity of rice processing and marketing in the area. These LGA’s are Dass, Toro and Itas-gadau. For the processors (millers) one milling cluster was purposively selected from each of the three LGA. Random technique was use to proportionately select 20% of the respondents (32). Also, for the marketers, a major rice market was purposively selected from each of the three local government areas to give a total of three markets. Simple random sampling was use to proportionately select 20% of the marketers as respondents (40). Therefore, the sample comprised 32 millers and 40 rice marketers from the three selected Local Government Areas making a total of 72 respondents.



**Method of Data Analysis**

Data were analysed using descriptive, budgeting model and inferential statistics.

**Farm budgeting Techniques**

The simple budgeting technique (Net Farm Income) was used to achieve objective iii. This technique was used by Inuwa *et al.* (2011) and Abah *et al.* (2015) Net Farm Income according is expressed as follows;

$$\sum_{i=1}^n NFI_i = \sum_{i=1}^n GI_i - \sum_{i=1}^n TC_i \quad \dots(1)$$

Where;

NFI = Net Farm Income (₦)

GI = Gross Income (₦)

TC = Total Cost (₦)

i = Value chain participants (Miller & Marketer)

**Operating Ratio**

The operating ratio reveals the proportion of the gross income that goes to pay for the operating cost. In normal farm setting, the operating ratio is more significant than fixed ratio in that most of the resources utilized are variables, while fixed items are mostly negligible. It's a planning tool use for determining performance of a farm business (Olukosi and Ogungbile, 2005). The operating ratio formula employed for this study is;

$$\text{Operating Ratio (OR).} = \frac{\text{Total Variable cost(TVC)}}{\text{Total Revenue (TR)}} \quad \dots(2)$$

**Value Added Model**

The value-added model was used to measure the value addition by respondents along the chain. McCormick and Schmitz (2001) stated that value added per unit of product is the difference between the sale price obtained by a trader in the chain of value and the total expenses incurred to procure goods and services it transforms. It is calculated without making deduction for depreciation of fixed assets or depletion and degradation of natural resources.

$$VA = C_{PT} - C_{PU} \quad \dots(3)$$

Where; VA= Value Added (₦)

C<sub>PT</sub>=Cost of purchasing transformed paddy or milled rice (₦)

C<sub>PU</sub>=Cost of purchasing paddy in its untransformed state (₦)

**Inferential Statistics**

Multiple regression technique was used to determine the effect of socio-economic characteristics on net income of rice millers and marketers. The regression model used was expressed as:  $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + e$  ... (4)

Where Y = Net Income

b<sub>1</sub> – b<sub>7</sub> = parameters to be estimated

X<sub>1</sub> = Age (years), X<sub>2</sub> = Sex (1=Male, 0= Female), X<sub>3</sub> = Educational level (Years in school)

X<sub>4</sub> = Marital Status (1=Married, 0=Otherwise), X<sub>5</sub>= Household size (Number of persons)

X<sub>6</sub> = Membership of Association (1= Member, 0=Otherwise), X<sub>7</sub>=Years of Experience (Years)

and e = error term



**RESULTS AND DISCUSSION**

**Socio-Economic Characteristics of the Respondents**

The result in the Table 1 showed that majority (87.5%) of the millers and all (100%) of marketers being male and married with a mean age of 39 and 44 years respectively. Also, about 43.8% of the millers and 40% of the marketers had a family size of between 6-10 people per household with majority (62.5%) of the millers having tertiary education. The result shows that half (50%) and more than half (53%) of the millers and marketers had a marketing and milling experience of between 11-20 years. The result show that majority (81.3% and 77%) of the millers and marketers respectively were married with a mean household size of 9 persons. The larger household size means labour activities can be shared among the family members, which increases output and profit while lowering costs. This agrees with Ojiagu *et al.* (2015) who reported that family size positively influence household income. On education, the findings show that both millers and marketers had acquire one form of formal education.

**Table 1: Distribution of respondents according to socio-economic characteristics**

Variables	Millers Frequency	Percentage	Marketers Frequency	Percentage
<b>Age</b>				
21-30	7	21.89	5	12.50
31-50	19	59.38	25	62.50
51-60	5	15.63	6	15.00
61-70	1	03.23	4	10.00
Mean	<b>39</b>		<b>44</b>	
<b>Sex</b>				
Male	28	87.50	100	100
Female	4	12.50	0	0
<b>Marital Status</b>				
Married	26	81.30	31	77.50
Otherwise	5	18.70	9	22.50
<b>Household Size</b>				
1-5	10	31.30	12	30.00
6-10	14	43.80	16	40.00
11-15	4	12.50	5	12.50
16-20	2	06.20	3	07.50
21-25	2	06.20	4	10.00
Mean			<b>9</b>	
<b>Education Status</b>				
No Formal	3	09.40	11	27.50
Primary	2	06.30	12	30.00
Secondary	20	62.50	14	35.00
Tertiary	7	21.90	3	07.50
<b>Years of Experience</b>				
1-10				
11-20	10	31.25	20	50.00
21-30	17	53.13	13	32.50
31-40	5	15.63	6	15.00
Mean	0	0	1	02.50
<b>Membership of Association</b>	<b>13</b>		<b>12</b>	
Member				
Non-member	23	71.90	25	62.50
	9	28.10	15	37.50

**Source:** Field Survey, 2022



### Cost and Returns of Rice Millers

Table 2 shows the cost and returns of rice millers in the study area. The result revealed that utilities (53.50%) constituted the highest costs of rice milling. Net profit was estimated as ₦714 per bag and return per naira invested was put at ₦1.46. Operating ratio was ₦0.39 which is less than a unit and indicates profitability. The result is in line with the findings of Fiamohe *et al.* (2014) who report an average milling profit of ₦1.039 per 100kg of rice in Benin.

**Table 2: Cost and returns of Rice Millers in Bauchi State**

Cost Item	Cost/ Bag (₦)	% of Total Cost
Revenue	₦1,200	
<b>Variable Costs</b>		
Operator wage and feeding	159.00	32.72
Costs of Variable Inputs		
Utilities (diesel, water and power)	260.00	53.50
Maintenance and spare parts	54.00	11.11
Total Variable Costs	473.00	
<b>Fixed Costs</b>		
Depreciation on assets	8.00	1.65
Taxes	5.00	1.02
Total Fixed costs	13.0	
<b>Total Costs</b>	486	100
Net profit	714	
Return on naira	1.46	
Operating ratio	0.39	
<b>Value Added</b>		
Intermediate cost	314	
Total Value added	886	

Source: Field Survey, 2022

### Cost and Returns of Rice marketers

Table 3 present the cost and return analysis of rice marketers in the study area. The result revealed that marketers had a net profit of ₦1, 672 per bag. A major component of the costs was acquisition costs which constituted the majority (96%) of the total cost followed by handling and transportation consists of the movement of the rice from point of purchase to its destination (warehouse, market among others). A return per naira of ₦0.12 was also realized for every naira spent. Operating ratio was estimated as ₦0.88. The results imply that the rice marketing is profitable in study area. Comparing the performance of the millers and marketers in the study area revealed that return on naira spent for processing and marketing were ₦1.46 and ₦ 0.12 respectively. This shows that the trading aspects was the least performing and subsequently the weakest link of the rice value chain in the study area. The poor performance may be due to low demand for local rice. The production of higher quality rice will lead to increase in demand for local rice in the high-end urban areas as quality drives demand and customers are willing to pay high prices. This agrees with Amfo *et al.* (2022) who also stated customers are willing to pay more for well processed rice.



**Table 3: Cost and returns of Rice Marketers in Bauchi State**

Cost Item	Cost/Bag(₦)	% of Total Cost
<b>Revenue</b>	₦ 15,952	
<b>Variable Costs</b>		
Acquisition costs	13,800	96.64
Transportation costs	165	1.15
Handling costs	200	1.40
Total Variable Costs	14,165	
<b>Fixed Costs</b>		
Depreciation on assets	75	0.52
Taxes	42	0.29
Total Fixed costs	117	
<b>Total Costs</b>	14,280	100
Net profit	1,672	
Return on naira	0.12	
Operating ratio	0.88	
<b>Value Added</b>		
Total Value added	2,152	

**Source:** Field Survey, 2022

### Effect of Socio-economic Characteristics of respondents on rice milling in Bauchi State

Regression analysis was used to estimate the effects of some socio-economic characteristics of the millers and marketers on their net income. Age, sex, education, years of experience, household size, membership of association and marital status were the factors considered as presented in Table 4. The coefficient of multiple determination of 0.674 was determined, which implies that about 67% of the variation in net income of the rice millers in the study area was explained by the explanatory variables included in the model. The coefficient of education was positive and significant at 10% which implies that an increase in education holding others constant will lead to an increase in miller's net income. This is in line with Nwaiwu *et al.* (2012) who reported the importance of education in rice milling. The coefficient of years of experience was also significant and positive at 5% implying that as millers gain experience, there is a chance of accepting new technology, which would lead to higher profits due to increased output. This agree with Igboji *et al.* (2015) who reported that farming experience improves awareness and willingness of farmers to participate in local natural resource management activities to increase income.to participate in local natural resource management activities to increase income.

**Table 4: Socio-economic Factors Influencing Rice Milling**

Variables	B	S.E	T-value
(Constant)	715.553	39.360	18.180
Age(X <sub>1</sub> )	.567	0.546	1.038
Sex (X <sub>2</sub> )	19.542	16.405	1.191
Education(X <sub>3</sub> )	2.952	1.631	1.810*
Marital Status(X <sub>4</sub> )	-16.670	12.945	-1.288
Household size(X <sub>5</sub> )	1.487	1.347	1.104
Membership of Association(X <sub>6</sub> )	11.631	13.146	0.885
Years of Experience(X <sub>7</sub> )	3.875	0.972	3.988**
R <sup>2</sup>	0.674		
F-ratio	7.091		

**Source:** Field survey, 2022 \*Significant at 10% \*\* Significant at 5%



### Estimates of Socio-economic Factors Influencing Rice marketing

Table 5 revealed an  $R^2$  of 0.593 for rice marketers indicating that 59% of the variation in dependent variable (Net income) was explained by the explanatory/independent variables (sex, age, educational level, household size, marital status, membership of association and years of experience) included in the model. The remaining 41% may be attributed to other factors not included in the in the models. The coefficient for household size was positive (44.549) and significant which conform to *a priori* expectation. It implies that an increase in any of these variables holding other constant will lead to an increase in farmer's income. The coefficient of membership of association was negative (-630.117) and significant at 5%., which does not confirm to *a priori* expectation. It implies that an increase in any of these variables holding other constant will lead to a decrease in rice trading income. The coefficients for age, marital status, education and years of experience were positive but not significant. Meaning that they have no influence on profitability of rice trading

**Table 5: Socio-economic Factors Influencing Rice marketing**

Variables	B	S.E	T-value
(Constant)	3458.964	487.924	7.089
Age( $X_1$ )	0.555	0.840	0.661
Education( $X_3$ )	7.330	30.393	0.241
Marital Status( $X_4$ )	45.125	215.797	0.209
Household size( $X_5$ )	44.549	11.323	3.934***
Membership of Association( $X_6$ )	-630.117	196.257	-3.211***
Years of Experience( $X_7$ )	10.867	12.941	.840
$R^2$	0.593		
F-ratio	8.003		

Source: Field survey, 2022 \*\*\* Significant at 1%

### Constraint to Rice Milling

The results in Table 6 revealed that high costs of diesel (96.7%) was the most important constraint to rice milling because majority of milling machines in the study area were diesel engine. Costs of spare parts (93.55%) was the second most important constraint. This is because most of the milling machines were imported which is often expensive. The third major constraint was inadequate of electricity (77.4%).

**Table 6: Constraints to Rice Milling**

Constraints	Frequency*	Percentage (%)	Rank
Costs of Diesel	30	96.77	1 <sup>st</sup>
Costs of spare parts	29	93.55	2 <sup>nd</sup>
Inadequate electricity supply	24	77.42	3 <sup>rd</sup>
Lack of government support (credit)	18	58.06	4 <sup>th</sup>
Road accessibility	17	54.84	5 <sup>th</sup>
Substandard spare parts	12	38.71	6 <sup>th</sup>

\*Multiple responses present

Source: Field Survey, 2022

### Constraint to Rice Marketing

Table 7 present the constraint to Rice marketing. The results show that 95.00% reported that cost of transportation was the major constraint. This is due to scarcity and high cost of petroleum. The second was inadequate of modern marketing technology (80%). The third major



constraint was storage facilities (65%). Inadequate of proper storage facilities which marketers can buy more during harvest and make reasonable gains selling later. Another constraint was fragmented value chain (45%). A well-integrated chain would help maintain a linked series of activities and better quality rice. Fragmented chain will lead to the opposite. This ends up affecting sales and therefore reduction in performance of the participants.

**Table 7: Constraints to Rice Marketing**

<b>Constraints</b>	<b>Frequency*</b>	<b>Percentage</b>	<b>Rank</b>
Transportation issues	38	95.00	1 <sup>st</sup>
Inadequate modern marketing technology	32	80.00	2 <sup>nd</sup>
Inadequate storage facilities	26	65.00	3 <sup>rd</sup>
Competition from imported rice	25	62.5	4 <sup>th</sup>
Inadequate of government support	20	50.00	5 <sup>th</sup>
Fragmented value chain	18	45.00	6 <sup>th</sup>

**Source:** Field Survey, 2022

\*Multiple responses present

## **CONCLUSION AND RECOMMENDATIONS**

The results shows that the rice milling and marketing were profitable in the study area. Age, farming experience, education, household size and membership to association were the factor that influence the net income of rice millers and marketers. In addition, high costs of diesel, spare parts insufficient capital and transportation cost were the major constraints that affect rice milling and marketing in the study area. The study recommended that adequate basic infrastructures (power, water, good access roads among others) should be provided by state government to reduce the cost of milling and rice trading. The Federal and State governments should formulate policies and take necessary actions aimed at increasing demand for locally produced rice. This would encourage the millers and marketers to produce quality rice through value addition.

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