

# Profitability Analysis of Small-Scale Rice Processing Among Women in Yola-South Local Government Area of Adamawa State, Nigeria

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**Abstract**—This study analyzed the economics of small-scale rice processing by women in Yola South Local Government Area of Adamawa State, Nigeria. Specifically, the socio-economic characteristics of the women rice processors were described, the profitability of rice processing by the women processors was determined and factors influencing profit from rice processing were determined. Primary data were collected from 173 respondents who were sampled using multistage; purposive and snowball sampling. Descriptive statistics, profitability analysis and multiple regression analysis were employed to analyze the data. The results revealed that 39.31% of the respondents were within the age range of 30–45 years with a mean age of 16 (min) and 70 (max), 78.61% were married, had secondary education (36.52%) with a household size of 6–10 individuals. 82.08% of the respondents do not belong to any association, 95.38% do not have access to credit, and a majority (84.64%) were into rice processing as a primary occupation. The cost and return analysis revealed that the total variable cost incurred by the women processors per month was ₦508.3194, with the cost of paddy rice constituting 52.08% of the total variable cost. The total revenue from rice processing was ₦105.61 and return on capital investment was 1.21. The factors that influenced the profitability of rice processing were age ( $p < 0.05$ ), educational qualifications ( $p < 0.05$ ), membership of association ( $p < 0.05$ ), and purchase cost ( $p < 0.01$ ). The major constraints faced by the respondents were lack of awareness, price fluctuation, high cost of paddy rice, and poor access to credit among others. A few recommendations among others include women rice processors should form local group memberships to have a sound voice that will effectively champion their cause to have better access to processing inputs and credits, then policies should tilt towards the provision of incentives for better processing techniques.

**Keywords:** Small-scale, rice processing, Yola South, Adamawa

Rice (*Oryza sativa L.*) is the most economically important food crop in many developing countries and has also become a major crop in many developed countries where its consumption has increased considerably (Daniel *et al.*, 2020). It is among the three leading cereal food crops of the world; with maize (corn) and sorghum being the other two. All three directly provide not less than 42% of the world's required caloric intake and, in 2009, human consumption was responsible for 78% of the total usage of produced rice (Ricepedia, 2019). Rice is a staple food for over 50.0% of the world's population and is an important part of global nutrition projects (Bose *et al.*, 2020).

Nigeria is the continent's leading consumer of rice, one of the largest producers of rice in Africa and simultaneously one of the largest rice importers in the world. Rice is also an important food security crop; it is an essential cash crop for small-scale producers who commonly sell 80 percent of total production and consume only 20% Food and Agriculture Organization, FAO, 2019). Rice generates more income for Nigerian farmers than any other cash crop in the country percent (Food and Agriculture Organization, FAO, 2017). The annual national demand for rice in 2019 was 5 million tons while annual production stood at only 3.78 million tons. The demand for rice in Nigeria has been soaring speedily at an estimated rate of 10% per annum due to population growth, increased levels of income and urbanization. An average Nigerian consumes 24.8 kg of rice per year representing 9% of the total calorie intake (FAO, 2017). Rice consumption has risen tremendously at about 10% per annum due to changing consumer preferences (Ahmed, 2021).

## I. INTRODUCTION

Relevant studies have shown that the estimated demand for rice in Nigeria has been put at 5 million metric tons of milled rice while the annual output is estimated at 2.21 million metric tons, with a large gap for demand and supply of 2.79 million metric tons of milled rice. (Daniel *et al.*, 2020). This short supply fall has been supplemented through importation using Nigeria's meager foreign reserve that is supposed to be used for capital projects within the nation. It has also been reported by Adesina (2013) that Nigeria spent about ₦356 billion annually on rice importation, an average of ₦1 billion daily on rice alone.

The current economic situation in Nigeria has made milled rice an option for many families, particularly among the lower-income population, and this has created a sharp increase in demand for this product. Reiteratively, the demand for milled rice has increased significantly in recent years and is expected to increase further in the future. Danbaba (2023) reported a milled rice demand of 8 million MT in 2022, compared to the 7 million MT demanded in 2021. This has confirmed the reports that rice demand in Nigeria increased by 7.8% per annum, while the supply increased by 2.3% (Obianefo *et al.*, 2020). The current demand and supply situation of milled rice in Nigeria is alarming; given the current trends, it is clear that the demand for milled rice will continue to grow, which will continue to drive prices up, making it increasingly difficult for lower-income families to afford basic staples.

Rice processing is an important activity in Nigeria's agricultural sector that has the potential to bring significant value to the country. It is a combination of operations that turn paddy into high-quality white rice and is highly dependent on processors' management capabilities. This can help improve Nigeria's economic stability and the livelihoods of those who depend on the business for survival, it creates jobs within the country and generates additional income for farmers who are in the business of small-scale rice processing options such as parboilers, millers, and traders. This will help to reduce poverty within the country and improve the overall standard of living. It can also improve the shelf-life of the crop which can add value to the grain and reduce post-harvest losses and add value to the grain. It promotes local consumption and production and also make it more affordable to the general public (Osabuohien *et al.*, 2018). In addition, processing rice

can reduce the environmental impact of harvesting such as the burning of rice husks, greenhouse gas (GHG) emissions, and the burning of firewood which is unsafe for environmental sustainability.

About 95% of rice processors in Nigeria are small scale and they use low capacity and outdated mills and this results to poor quality of rice than imported rice. The small-scale processors make up the most significant sub-sector of the domestic rice milling industry in Nigeria. The operators serve many people, including rural traders, paddy farmers, retailers, wholesalers, and final consumers, and supply almost 70% of the domestic rice consumed in Nigeria (Olugbenga *et al.*, 2024).

Small-scale rice processing involves activities such as drying, cleaning, husking, grading, and polishing to convert a raw grain into a value-added product. This process increases the value of the rice by removing the inedible husk as well as any foreign material that may be present. The process therefore involves several stages; from threshing of rice to removal of the husks, milling of the shelled paddy rice to removing the bran layer, and then an additional whitening stage to reach market standard. Danbaba (2023) identified processing as the main cause of rice shortages in Nigeria, and clarified that in 2022, not all the 8 million metric tons (MT) of milled rice, which was consumed at 34.5 kg per capita, was produced in Nigeria. This supports Chukwujekwu (2023) claim that 44.0% of the 7 million MT of milled rice demanded and supplied in Nigeria in 2018 was imported from other countries.

Processing activities in rice start from the time of harvesting up to storage and marketing. Perhaps, each of these stages involves several activities. Women are more involved in the following rice processing activities; threshing, soaking, winnowing, parboiling, sun-drying before and after parboiling, packaging, storing, and marketing while men are involved in milling, destoning, and transporting. Effiong *et al.* (2015) affirmed that women's participation in most of the activities is usually undertaken in post-harvest processing of the crop.

The role played by women in agricultural production in achieving food security, alleviating poverty, and rural development cannot be over-emphasized. Women undertake a wide range of activities from food production, processing, and marketing. Many women are involved in small-scale rice processing

and one of their problems is the quality of their milled rice. Locally processed rice is usually dull in color, broken, and contains foreign matters such as stones and husk. The procedure involved in local rice processing has been one of the major challenges directly responsible for the poor quality and lower price as compared with imported rice (Obianefo *et al.*, 2022).

Most women processors still practice the local or traditional methods of rice processing. The processing requires special skills since large percentages of broken rice are not desirable in commercial packages (Okunola *et al.*, 2019). The challenges associated with traditional processing are the presence of small stones in the grains, broken kernels, and incomplete removal of some husks which makes it less attractive. The introduction of modern machines capable of removing small stones in the local rice processing industry has given the improvement in the market and demand for local rice in Nigeria. A typical mechanical modern rice processing plant can process up to 3000kg of rice and remove 50% of moisture in about 6 hours is an improvement that needs to be encouraged (Ajala and Gana, 2015).

Rice processing affords women high-income opportunities, however, there are many obstacles to starting a small processing rice business. From a technical perspective, most small-scale operators lack the necessary technology and skills to process rice properly (Ujang, 2012). There is also a need to raise capital to pay for the necessary equipment to ensure operational efficiency. Additionally, the market needs to be developed for small millers to take advantage of the new value-added products. Similarly, women are also more risk-averse than men and this affects their pursuit of specific functional strategies and ultimately their performance. Women face a lot of setbacks in exploiting their potential as a result of socio-cultural structures. These reasons among other factors have made the locally processed rice to have low market value and less demand.

Most of the empirical studies on rice processing were not disaggregated by gender and were conducted elsewhere. Some of these studies include; James and Gabriel (2016) in Ghana who studied the economic analysis of rice processing by women and found the enterprise to be profitable and factors determining the profit were also determined; Akanbi and

Olohunbebe (2023) in Kwara state northwest Nigeria studied the technical efficiency and profitability of rice processing where both male and female were used in the sample; Adam and Bidoli (2018) assessed gender involvement in rice processing under staple crop processing of agricultural transformation agenda support program Kebbi state; and Uzoamaka and Ikenna (2020) on constraints faced by rice processors in milling and branding of home grown rice in Enugu State, southeastern Nigeria among others. There is therefore the need to carry out a study of this nature in this area, considering the roles women play both as homemakers and in providing livelihood support for families. The broad objective of the study is to carry out an Economic Analysis of Small-Scale Rice Processing by Women in Yola South Local Government Area of Adamawa State, Nigeria. The specific objectives are to:

- i. describe the socio-economic characteristics of small-scale women rice processors in the study area;
- ii. estimate cost and return of rice processing;
- iii. determine factors influencing profit from rice processing; and

## II. METHODOLOGY

### The Study Area

The study was conducted in Yola-South Local Government Area of Adamawa State, Nigeria. It is located in North-Eastern Nigeria and lies between latitudes 9° 11'N to 9° 20'N of the equator and longitude 12° 23' E to 12° 33'E of the Greenwich meridian. It has an average elevation of about 192m (Adebayo, 2020). It shares common borders with Yola North and Girei Local Government Area to the North, Demsa Local Government Area to the west, and Fufore Local Government Area to the South and east. Yola South has two districts, namely; Namtari and Yola. The Major settlements are Yola town, Namtari, Ngurore, Njoboli, and Yolde pate. The Local Government was created in 1996 with administrative headquarters in Yola. It has a land area of 719km<sup>2</sup> (Adebayo, 2020) and a population of 237,527,782 (legit.ng). The major ethnic groups in the area are Fulani, Vere, Bata, Hausa and Kanuri. The major economic activities of the inhabitants are farming, trading and civil service. Other occupations include fishing, calabash carving, pottery, blacksmithing, processing, and weaving. The climate of the state is generally of the hot humid Tropical

type, with two distinct seasons: the dry seasons last for a minimum of five months (November– March), and the wet seasons span from April to October (Adebayo, 1999). The average annual rainfall in the area is estimated at 945mm, with maximum and minimum temperatures of 34.5°C and 21.6°C respectively.

Rice is cultivated in both the rainy and dry seasons. River Benue and its tributaries that pass through the local government area have led to an increase in dry-season farming, especially rice and vegetables. Also, rice processing activities are going on in the area, especially among women. (Wikipedia, 2022). Figure 3.1 shows the map of Adamawa State showing Yola South Local Government Area.

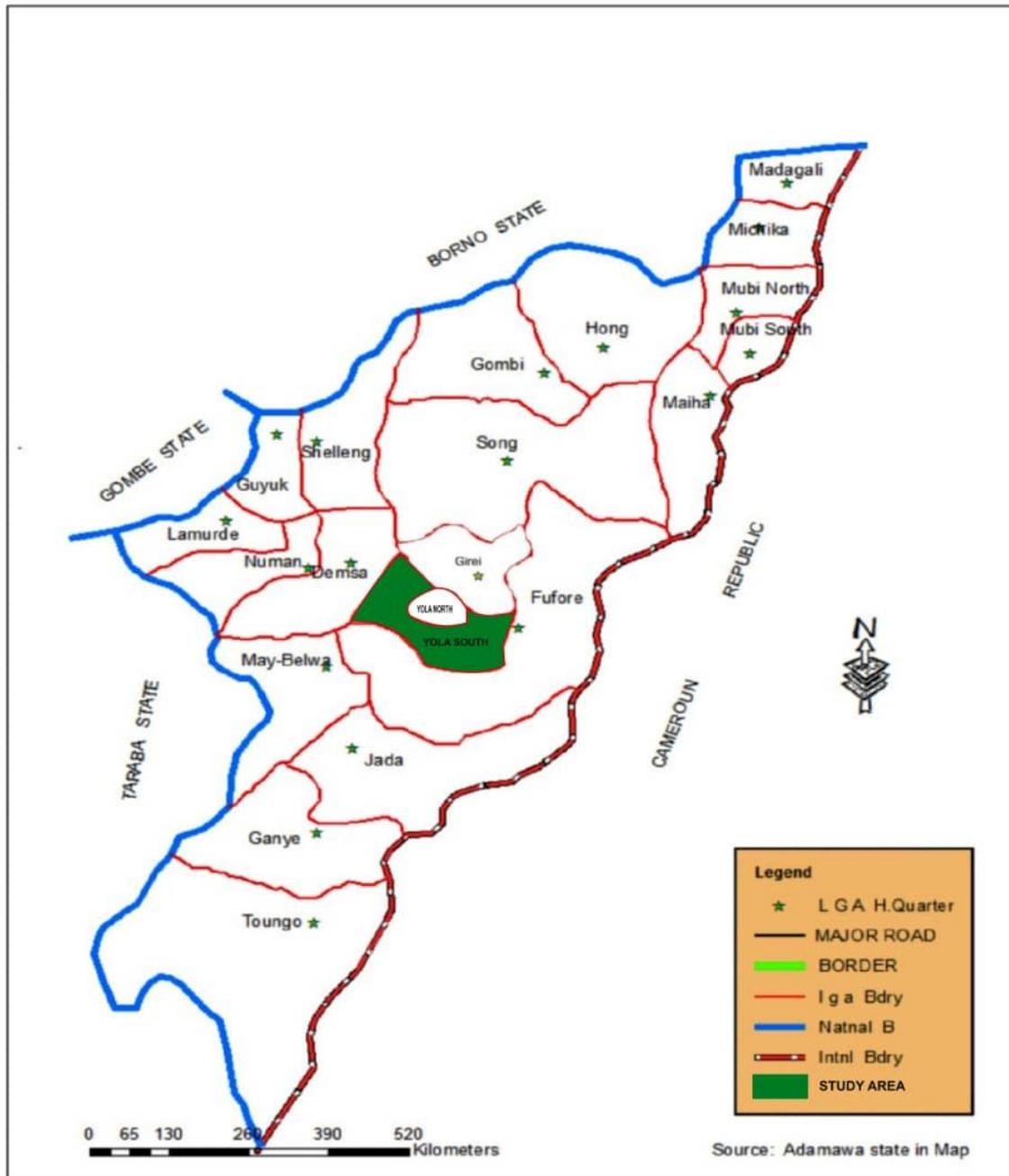


Figure 3.1: Map of Adamawa State Showing the Study Area

Source: Adebayo and Tukur (1999)

#### Sources and Methods of Data Collection

Primary data were used for the study and were obtained through the administration of questionnaires to women processors in the study area. The

questionnaire was structured into sections to address the specific objectives of the study. Data were collected using kobo collect tool within a space of three months between March and May, 2022. This

ensured complete retrieval rate (100%) of the questionnaires.

**Sampling Techniques and Sample Size**

Multistage, purposive and snowball sampling techniques were employed to generate the sample used for the study. In the first stage, 5 wards out of the 11 wards in the study area were purposively sampled due to the higher concentration of women involved in rice processing activities. The women processors are spatially distributed across the wards; those involved in rice processing activities are mostly into parboiling operations with low or zero technology. It has been identified that most of the women that engaged in rice parboiling don't take part

in any form of association and they operate on a small scale, hence their population (sampling frame) was not obtained as planned. There was no any list of registered women processors in the area, hence snowballing was used.

In the second stage, snowball sampling was employed where women processors who were identified at the onset of the survey were used to locate other women processors in their area where a total of 184 women processors were administered with questionnaires. However, only questionnaires from 173 respondents were used for the analysis as shown in Table 1.

Table 1: Sampled Women Rice Processors

Sampled wards	Communities Selected	Number of Processors	Number of Processors Selected
Namtari	1. Namtari Manga	35	33
Bole Yolde Pate	2. Shagari Phase II	5	3
	3. Yolde Pate (Yadim Road)	17	16
	4. Wuro Hausa (Dandu)	74	70
Adarawo	5. Ngurore	39	38
Makama B	6. Fattude Girei	14	13
Total		184	173

Source: Field Survey, (2022)

**III. METHODS OF DATA ANALYSIS**

Both descriptive and inferential statistics were used in the analysis of the data collected. Descriptive statistics were employed to describe the socio-economic characteristics of the respondents. Gross Processing Analysis (GPA) was used to determine the differences between the costs and returns associated with small-scale rice processing in the study area. It was specified as;

$$PM = \sum P.Q - \sum C.Q \dots\dots\dots 3.1$$

Where;

PM = Processing margin (₦)

$\sum C.Q$  = Cost x Quantity of variable input = TVC = Total variable cost (₦)

$\sum P.Q$  = Price x Quantity of Output = TR = Total Revenue (₦)

The return on investment was also computed as the ratio of Processing Margin (PM) to Total Variable Cost as;

$$RoI = PM/TVC$$

Where;

RoI = Return on Investment

PM = Processing Margin

TVC = Total Variable Cost

Multiple regression analysis was used determine the factors influencing the profit from rice processing. Four functional forms of the regression models were tried to select the lead equation where linear regression model was selected as the best fit based on the large number of variables that are significant and the diagnostics on multicollinearity (VIF) and tolerance conducted. The explicit function is expressed as:

$$Y = \beta_0 - \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + e_i \dots\dots\dots 3.5$$

Where:

Y = Profit of processed rice (₦)

X<sub>1</sub> = Age of respondents (years)

X<sub>2</sub> = Educational level (number of years spent in school)

X<sub>3</sub> = Household size (number of persons)

$X_4$  = Processing experience (years)  
 $X_5$  = Access to credit (1, yes, 0, no)  
 $X_6$  = Purchase cost (₦)  
 $\beta_0 - \beta_6$  = Parameters of regression model  
 $e_i$  = Error term

IV. RESULTS AND DISCUSSION

**Socio-economic Characteristics of the Respondents**  
 The socio-economic characteristics of the respondents in Table 2a reveal that the women engaged in small-scale rice processing in the study area are predominantly within their economically active ages, with an average age of 38 years,

suggesting they possess the strength and adaptability required for productive activities. The mean household size of eight persons indicates relatively large family structures, which may provide a pool of household labour for processing while simultaneously exerting pressure on household consumption needs. Furthermore, the respondents reported an average of ten years of processing experience, reflecting a considerable level of expertise and familiarity with rice processing techniques, although the wide variation in experience points to the coexistence of both new entrants and highly experienced processors.

Table 2a: Socio-economic Characteristics of the Respondents

Variables	Minimum	Maximum	Mean	Std. dev.
Age (years)	16	70	38	10.31
Household size (number)	1	24	8	6.08
Processing experience (years)	1	49	10	7.11

Source: Filed survey, 2024

Furthermore, the result of socio-economic characteristics of the respondents in Table 2b showed that 9.83% were single, 78.61% were married, 8.67% were widows and 2.89% were divorced. This shows that the majority of the women rice processors in the study area are married, hence with large household size there will be greater use of family labour for processing activities. The result agrees with Obisesan (2019) who reported that high proportion of married people enhance the supply of labour and commitment in working to enhance their productivity. Uzoamaka and Ikenna (2020) in Enugu state and Ibitoye *et al.* (2014) in Kogi state found that rice processing enterprise was dominated by married women. The educational level indicates that 8.43% of the respondents had no formal education, 9.55% had non-formal education, 35.39% had primary education, 36.52% had secondary education, and 7.30% had tertiary education. This shows that over 92% of the respondents have attained one form of education or another. This agreed with the finding of Uzoamaka and Ikenna (2020) and Enwelu *et al.* (2021) both in Enugu state where they reported that the enterprise was dominated by literate people hence, will possibly be innovative in increasing processing efficiency. The membership of the association by the respondents shows that 17.92%

belong to an association, while the majority (82.08%) do not belong to any association. This result corroborates the findings of Oyebanjo (2024) in Ogun State, Nigeria where a majority (51.2%) of rice processors do not belong to any association.

The access to credit by the respondents showed that only a few (4.62%) had access to credit, while the majority (95.38%) did not have access to credit. It was also shown that the majority (84.64%) of the respondents indicated that rice processing was their major occupation, while 11.56% were involved in rice processing as a secondary occupation. Similarly, majority (56.07%) of respondents engaged in parboiling, milling and marketing, 17.34% engaged in parboiling only, 2.89% of the respondents do Parboiling and milling, while 23.70% of the respondents do Parboil and marketing of rice processed. The result agrees with the findings of Ewuzie *et al.* (2019) who stressed that the traditional methods of processing rice paddy involve soaking the paddy in water for 2 to 3 days to soften the kernel, followed by steaming the soaked paddy for 5– 10 minutes and dried in the sun, mortar and pestle device to remove the husk or use of simple machines for dehulling/milling; then the grain is cleaned using a winnowing basket which are done by women.

Table 2b: Socio-economics Characteristics of the Respondents (n=173)

Variables	Frequency	Percentage
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Marital Status	Frequency	Percentage
Single	17	9.83
Married	136	78.61
Widow	15	8.67
Divorced	5	2.89
Level of Education	Frequency	Percentage
No formal	15	8.43
Non-formal	17	9.55
Primary	63	35.39
Secondary	65	36.52
Tertiary	13	7.30
Membership	Frequency	Percentage
Yes	31	17.92
No	142	82.08
Access to credit	Frequency	Percentage
Access	8	4.62
No access	165	95.38
Processing Activities	Frequency	Percentage
Parboiling only	30	17.34
Parboiling and milling	5	2.89
Parboiling, milling and marketing	97	56.07
Parboiling and marketing	41	23.70

Source: Field survey, 2024

Profitability Analysis of Small-scale rice processing Table 3 shows the cost and return that accrued to women processors per month in the study area. It disclosed that the total variable cost incurred was ₦508.3194. The cost of paddy rice constitutes a greater proportion (52.08%) of the total variable cost incurred in the processing of rice which amounted to N 283,654.57 followed by the cost of parboiling (17.54%), cost of milling (7.48%), cost of firewood (6.95%), cost of empty sack (5.07%), and cost of storage (4.01%). The total variable cost constitutes ₦508.3194 for rice processing. This signifies that the total variable cost used in the processing of rice is more and variable items constitute a significant amount in the processing of rice. This is in line with the findings of Ewuzie *et al.* (2019) who compared the profitability of actors in the rice value chain in

Ebonyi State of Nigeria. Domestic rice supply and found that rice processing is a viable venture in the study area.

Furthermore, Table 3 disclosed that the total revenue that accrued to the women rice processor was ₦105.61 with the gross margin. This implies that rice processing in the study area is profitable and the return on capital investment was 1.21. This indicates that for every ₦1 invested the processors gain 21 kobo in the processing of rice in the study area. Also, Inuwa *et al.* (2011) conducted a study titled Analysis of the profitability of rice processing and marketing in Kano State and found that the Net Processing Income was ₦3,378,855.08 per respondent per annum.

Table 3: Profitability Analysis of Small-scale Rice Processing among Women (₦/kg)

Variable Items	Amount (₦)	Percentage of Total Cost
a). Variable Costs		
Cost of paddy rice	264.78	52.08
Cost of parboiling (Labour)	89.18	17.54
Cost of transportation	8.20	1.61
Cost of Milling	38.04	7.48
Cost of de-stoning	6.05	1.18

Cost of water	12.01	2.36
Cost of firewood	35.31	6.95
Cost of loading and offloading	8.58	1.69
Cost of empty sacks/bags	25.77	5.07
Cost of storage	20.40	4.01
Total Variable Cost (TVC)	508.32	100.0
b). Revenue		
Sales of Milled rice	571.46	
Value of rice consumed	42.47	
Total Revenue (TR)	613.93	
Return on Investment (ROI)	1.21	
Processing Margin (PM) (TR-TVC)	105.61	

Source: Field Survey, 2024

#### Factors Influencing Profitability of Local Rice Processing among Women

The results of the multiple regression on factors that influence the profitability of rice processing among women processors in the study area are presented in Table 4. Four functional forms were tested and the result revealed that the linear regression model was found to be the best fit with four of its' explanatory variables, namely, age, educational level, membership of association, and purchase cost were significant and positively related to profit accruing from rice processing as shown below in an explicit form.

The predictive power of the model as represented by  $R^2$  was 0.905, meaning that 91% of the variation in the profit from rice processing is explained by variables included in the model and that only 9% of the variation was accounted for by random errors. This indicates a good fit and correctness of the specified distributional assumption of the composite error term. The overall model is also significant at 1% as explained by the magnitude of the F-statistics. To verify whether there is a case of multicollinearity among the independent variables, the variance inflation factor (VIF) and tolerance test are used. It is evident that the correlations among the explanatory variables are all below 50%, the data used therefore do not seem to have problems of multicollinearity (Appendix III). Gujarati and Porter (2009) stated that a VIF value of greater than 10 and a tolerance value of less than 0.1 calls for concern. The VIF in this case ranged from 1.08 to 1.40, and the tolerance value of 0.66 to 0.91 shows the absence of multicollinearity.

Analysis in Table 4 shows that the coefficient of age was positive and significant at a 0.05 level of

probability. This implies that as the women involved in rice processing grow older, they have a greater chance of being cost-efficient thereby, increasing the profitability of rice processing. The older a person becomes the more experience the person becomes, especially in understanding the dynamics of any line of activity. This result corroborates the findings of James and Gariel (2016) in the Navrongo Municipality of the Upper East Region of Ghana who found rice processing to be profitable, and age positively influences rice processing in the study area.

The educational level has a positive coefficient and is significant at a 0.05 level of probability. This implies that as women processors acquire higher education, there is a higher tendency to accrue remunerative profit from the venture. This is in line with the findings of Bello *et al.* (2015) who conducted a study in Kano on rice parboiling and technologies and found that educational qualifications contribute positively to the profitability of rice processing in the study area.

Membership of the association also showed a positive coefficient and significance at 0.05 level of probability. This implies that belonging to an association enables women rice processors to improve in rice processing, thereby increasing their profit. Cooperative membership helps women processors to acquire skills, inputs, market linkage as well as pooling of resources to enhance efficiency. A similar result was obtained by Bello *et al.* (2015) who found membership of an association contributing positively to the profitability of rice processing in Kano State.

The purchase cost of paddy rice has a positive coefficient and is significant at 0.01 level of probability. This implies that as the purchase cost increases, there is going to be an increase in production cost which could lead to an increase in profit. This is however contrary to apriori expectation where cost is expected to be inversely related to profit. Marketers have a way of transferring the

burden to the final consumers by way of raising the prices of their commodities in other to cover the cost incurred in the line of operations. This result disagrees with the findings of James and Gariel (2016) who found rice processing to be profitable and that purchase cost inversely influences rice processing in the study area.

Table 4: Regression Result of Factors Influencing Profitability of Rice Processing among Women

Variable	Coefficient	Standard Error	T-Value
Constant	-104760.21	95009.64	-1.103
Age (X <sub>1</sub> )	3987.50**	1954.01	2.041
Education (X <sub>2</sub> )	52238.01**	24945.92	2.094
Household size (X <sub>3</sub> )	244.99	3537.65	0.069
Experience (X <sub>4</sub> )	2234.68	2918.93	0.766
Credit Access (X <sub>5</sub> )	39610.05	92334.15	0.423
Association (X <sub>6</sub> )	88308.28**	36062.00	2.449
Purchase Cost (X <sub>7</sub> )	0.823***	0.023	35.27
R <sup>2</sup>	0.905		
Adjusted R <sup>2</sup>	0.901		
Mean VIF	1.20		
F-Ratio	218.19		

\*\*\* Significant at 1%, \*\* Significant at 5%

Source: Field Survey, 2022

## V. CONCLUSION

The study concludes that most of the women rice processors in the study area were at the active stage, married, had relatively large household size, attended one form of formal education or the other, did not belong to any association, and had no access to credit and had relatively number of years of experience in rice processing. Most of the women rice processors engaged in parboiling, milling, and marketing, and the types of operation conducted by women rice processors in threshing, paddy drying and parboiling and they source paddy rice by purchase. The profitability analysis has revealed that the enterprise is profitable as the value of gross margin was positive. The factors influencing the profitability of rice processing among women in the study area include age and educational qualifications of the women, and membership of an association, and the purchase cost of paddy.

## VI. RECOMMENDATIONS

Based on the findings of the study, the following recommendations are hereby made;

- i. Policy considerations should focus on the provision of support services through the provision of incentives for better processing that will facilitate the process of rice processing and better products with high market value and profit.
- ii. Women rice processors should form local group memberships to have a sound voice that will effectively champion their cause to have better access to farm inputs, and credits and address other barriers to enhance their role in rice processing.
- iii. Rice processing is a profitable enterprise and females in the study area are largely involved, thus women should be encouraged to go into the enterprise and be given adequate training. This can be achieved by creating awareness through women's associations and cooperative society groups.

## REFERENCES

- [1] Adam, A. G., Bidoli, T. D., Ammani, A. A. and Oduhie, T. C (2018). Gender Participation in Rice Processing Value Chain in Kebbi and Sokoto States, Nigeria. *Global Journal of*

- Science Frontier Research: Agriculture and Veterinary*:18 (2): 1-2.
- [2] Adebayo, A.A. (1999). Climate, (Sunshine, Temperature, Evaporation and Relative Humidity). In Adebayo, A. A. and Tukur, A. L. (eds). Adamawa State in map. Paraclate Publishers, Yola. Pp 3-5.
- [3] Adebayo, A.A. (2020). Climate, (Sunshine, Temperature, Evaporation and Relative Humidity). In Adebayo, A. A. and Tukur, A. L. (eds). Adamawa State in maps. Revised edition, Department of Geography, Federal University of Technology Yola, Nigeria. Pp 20-26.
- [4] Adesina, A. A. (2013). Global food and financial crises: Lessons and imperatives for accelerating food production in Africa. *African Journal of Agricultural and Resource Economics*, 8(4).
- [5] Ahmed, U. (2021). Efficiency Analysis of Rice (*Oryza sativa* L.) Production, an MSc thesis (Unpublished) submitted to the Department of Agricultural Economics and Extension, Faculty of Agriculture, Modibbo Adama University, Yola. Pp.1-96
- [6] Ajala, A. S. and Gana, A. (2015). Analysis of Challenges Facing Rice Processing in Nigeria. *Journal of Food Processing*, 1(1):1-6.
- [7] Akanbi, S. O., Olohunbebe, S. A., Alao, B. and Adekunle, A. O. (2023). Technical Efficiency Analysis and Profitability of Local Rice Processing in Kwara State, Nigeria. *Perspectives and Rurales*, 21(42): 1-20.
- [8] Bello, M.M., Abubakar, M.S, and Lawan, I. (2015). Rice Parboiling Practices and Technologies, *Journal of Engineering and Technology*, 10(2): 52-59.
- [9] Bose, A. A., Jatbong, J. N., Danwanka, H. A. and Zayyad, B. (2020). Assessment of Small Scale Paddy Rice Processing and Marketing in Dass Local Government Area, Bauchi State, Nigeria, *International Journal of Science and Advanced Innovative Research*, 5 (2): 82-101.
- [10] Chukwujekwu, O. A. (2023). *Technology Gap Efficiency of Small-Scale Rice Processors in Anambra State, Nigeria* (Doctoral Dissertation, Department of Agricultural Economics and Extension, Nnamdi Azikiwe University, Awka).
- [11] Danbaba, M. (2023). Nigeria Can Be Self-Sufficient in Rice in 8 Years. National Accord. 2023. Available online: <https://www.nationalaccordnewspaper.com/nigeria-can-be-self-sufficient-in-rice-in-8-year-if-research/> (accessed on 19 January 2023).
- [12] Danbaba, M. (2023). Nigeria Can Be Self-Sufficient in Rice in 8 Years. National Accord. 2023. Available online: <https://www.nationalaccordnewspaper.com/nigeria-can-be-self-sufficient-in-rice-in-8-year-if-research/> (accessed on 19 January 2023).
- [13] Daniel, J. D. and Uziel, J. H. (2020). Assessment of Economic Viability of Rice Processing and Marketing in Mayo Belwa LGA of Adamawa State, Nigeria. *International Journal of Agriculture Research and Life Science*; 1(1) 13-30.
- [14] Effiong, J. B., Ijioma, J. C. and Okolo L. C. (2015). Participation of Women Farmers in Rice Production in Bende Local Government Area, Abia State. *International Journal of Agricultural Extension and Rural Development Studies*. 2(2):1-9.
- [15] Enwelu, I. C., Ozioko, R. I., Edeh, I., Ohagwu, V. A., Udoeye, C. E. and Okoro, J. C. (2021). Value Addition in Rice Processing and Marketing in Rural Communities of Enugu State, Nigeria. Proceedings of the 23<sup>rd</sup> Annual Conference of the Agricultural Extension Society of Nigeria held at University of Ilorin between 15<sup>th</sup> – 18<sup>th</sup> April, 2018.
- [16] Ewuzie, C. O. Ifediora, C. U. and Anetoh, J. C. (2019). Profitability of Actors in Rice Value Chain in Nigeria: A Comparative Analysis. *International Journal for Innovative and Applied Sciences*, 5: 213-218.
- [17] FAO, (2017). A Database of the Food and Agriculture Organisation of the United Nations <http://faostat.fao.org>.
- [18] FAO, (2019). The state of food and agriculture 2019. Moving forward on food loss and waste reduction. (2014). Developing Sustainable Food Value Chain. Guiding Principles.
- [19] Ibitoye, S. J., Idoko, D. and Shaibu, U. M. (2014). Economic Assessment of Rice processing in Bassa Local Government Area of Kogi State, Nigeria. *Asian Journal of Basic and Applied Sciences*, 1(2):8-17.
- [20] Inuwa, I. M. S., Kyiogwom, U. B., Ala., Maikasuwa, M. A. and Ibrahim, N. D. (2011). Profitability Analysis of Rice Processing and Marketing in Kano State, Nigeria. *Nigerian Journal of Basic and Applied Science*, 19(2): 293-298.

- [21] James, A. and Gabriel, A. A. (2016). Economic Analysis of Rice Processing by Women in Navrongo Municipality of Upper East Region of Ghana. *International Journal of Sciences: Basic and Applied Research*, 26(2): 221-230.
- [22] James, A. and Gabriel, A. A. (2016). Economic Analysis of Rice Processing by Women in Navrongo Municipality of Upper East Region of Ghana. *International Journal of Sciences: Basic and Applied Research*, 26(2): 221-230.
- [23] Obianefo, C. A.; Okoh, B. C.; Nwigwe, C. A.; Anumudu, O. O. and Toyin, F. A. (2020). Assessment of the knowledge and use of briquettes for climate change option among rice processors in Anambra state, Nigeria. *Covenant J. Entrep*, 4, 1–15.
- [24] Obianefo, C. A.; Okoh, B. C.; Nwigwe, C. A.; Anumudu, O. O. and Toyin, F. A. (2020). Assessment of the knowledge and use of briquettes for climate change option among rice processors in Anambra state, Nigeria. *Covenant J. Entrep*, 4, 1–15.
- [25] Obisesan, O. O. (2019). *Processing Techniques and Efficiency Differentials Among Rice Processors in Nigeria* (Doctoral dissertation).
- [26] Okunola, A. A.; Adekanye, T. A.; Adewumi, D. A. and Ashamu, F. F. (2019). Assessment of rice processing operations in Ekiti State, Nigeria. *Int. J. Civ. Eng. Technology*, 10, 2197–2204.
- [27] Olumayowa, O. (2024). Value Addition And Profitability Of Local Rice Processing In B Obafemi-Owode Local Government Area, Ogun State, Nigeria. *Ethiopian Journal of Environmental Studies & Management* 17(1): 42 – 54, 2024 ISSN:1998-0507 doi: <https://ejesm.org/doi/v17i1.4>.
- [28] Osabuohien, E., Okorie, U. and Osabohien, R. (2018). Rice Production and Processing in Ogun State, Nigeria: Qualitative Insights from Farmers' Association. In Obayelu E. (Eds). *Food Systems Sustainability and Environmental Policies in Modern Economics* (pp. 188-215), Hershey, PA: IGI Global. DOI: 10.4018/978-1-5225-3631-4.ch009
- [29] Oyebanji, O. (2024). Value Addition and Profitability of Local Rice Processing in Obafemi-Owode Local Government Area of Ogun State, Nigeria. *Ethiopian Journal of Environmental Studies & Management* 17(1): 42 – 54.
- [30] Ricepedia, (2019). Rice as Food the Global Staple Rice Consumers. Retrieved 14th June, 2019 from <http://ricepedia.org/rice-as-food/the-global-staple-rice-consumers>.
- [31] Ujang, P.; Shigeki, I. and Susumu, U. (2012). Power Availability and Requirements for Small-Scale Rice farm Operations: A Case in Riau Province, Indonesia. *Am. J. Agric. Sci. Eng. Technology*, 1, 27–36.
- [32] Uzoamaka, C. N. and Ikenna, C.U. (2020). constraints faced by rice processors in milling and branding of homegrown rice in Enugu State, Nigeria. *Journal of Agricultural Extension /General Extension and Teaching Methods*. 24(1): 231-236.