



Profitability and Socio-Economic Factors Influencing Rice Processing in Jalingo Local Government Area, Taraba State, Nigeria

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ABSTRACT

This study examined the socio-economic characteristics of rice processors, the availability of processing infrastructure, the cost and returns of rice processing, the influence of socio-economic factors on revenue, and the major constraints affecting rice processing in Jalingo Local Government Area (LGA), Taraba State, Nigeria. Primary data were collected from 60 rice processors using a structured questionnaire. The data were analysed using descriptive statistics, gross margin analysis, a Likert-type scale, and multiple regression analysis. The results showed that 73% of the respondents were male, 75% were aged 21–30 years, 50% had secondary education, and 73% had between one and five years of processing experience. Milling machines were the most frequently reported processing equipment, followed by sewing machines, weighing scales, and destoners. The cost and return analysis indicated an average reported revenue of ₦68,250.00 and total reported cost of ₦52,237.10 per 100 kg bag, yielding a gross margin of approximately ₦16,012.90. Regression results indicated positive and statistically significant associations between revenue and age, processing experience, and sex. The reported coefficient of determination was 0.6252, while the variance inflation factor was 1.11 and the Breusch–Pagan test yielded a p-value of 0.7069. Fluctuating market prices, inadequate power supply, high energy costs, outdated equipment, difficulty retaining experienced workers, and poor road networks were identified as important constraints. The study concludes that rice processing offers income-generating opportunities in Jalingo LGA, although infrastructure and operating-cost constraints may limit performance. It recommends improvements in electricity supply, access to modern processing equipment, transportation infrastructure, and technical training.

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INTRODUCTION

Rice processing is an important component of the agricultural value chain because it transforms paddy rice into marketable products through operations such as drying, cleaning, dehulling, milling, destoning, polishing, and packaging. The efficiency of these operations influences grain quality, marketability, post-harvest losses, and the income generated by processors. Ajala (2015) identified technological and operational challenges as important concerns in Nigerian rice processing, particularly among small-scale processors.

Rice processing also provides opportunities for employment, income generation, and value addition through linkages among producers, processors, transporters, traders, and consumers. Nevertheless, the economic benefits depend on the availability of appropriate machinery, reliable energy, adequate storage, transportation, and effective marketing arrangements. Research on rice processing in Nigeria has identified inadequate modern equipment, processing and storage difficulties, and price fluctuations as constraints to improved performance (Ajala, 2015; Dzahan, 2025).

The cost of processing is another important determinant of enterprise performance. Expenditure on paddy rice, energy, milling, labour, packaging, and transportation affects the difference between revenue and operating costs. Gross margin analysis is commonly used to assess this difference in agricultural enterprises, provided that revenue and variable

costs are measured consistently. In a study of rice processors in Benue State, Dzahan (2025) employed descriptive statistics, gross margin analysis, and regression analysis to examine processing losses and profitability.

Socio-economic characteristics may also be associated with differences in processing performance. Age, sex, educational attainment, and experience can be relevant to the allocation of labour, business management, access to information, and processing decisions.

In north-eastern Nigeria, post-harvest losses have been documented among rice value-chain actors, including processors. Hassan et al. (2025) reported that processing experience and access to credit were significantly associated with post-harvest losses among processors in the region. The authors also recommended improvements in rural roads, electricity, storage infrastructure, and technical training. These findings demonstrate the importance of examining processing conditions within the regional context.

Despite this evidence, the particular combination of processor characteristics, equipment availability, cost and returns, revenue determinants, and operational constraints in Jalingo Local Government Area requires location-specific assessment. This study therefore examines the socio-economic characteristics of rice processors, the state of processing infrastructure, the costs and returns of processing, the influence of socio-economic factors on processing

revenue, and the major constraints faced by processors. The findings are expected to provide evidence to inform business decisions and interventions aimed at improving processing efficiency and profitability.

MATERIALS AND METHODS

Study Area

The study was conducted in Jalingo Local Government Area (LGA) of Taraba State, Nigeria. Jalingo LGA is located in the northern part of Taraba State and serves as the administrative capital of the state. The LGA is approximately located between latitudes 8°47' and 9°01' N and longitudes 11°09' and 11°30' E, while Jalingo town, the headquarters of the LGA, is approximately situated at 8.90° N and 11.37° E. The LGA shares boundaries with Lau LGA to the north, Yororo LGA to the east, and Ardo-Kola LGA to the south and west. It covers approximately 195 km², although some recent administrative sources report a larger figure based on differing boundary definitions.

According to the 2006 Population and Housing Census, Jalingo LGA had a population of 140,318, comprising 71,997 males and 68,321 females. For the purpose of providing a contemporary demographic context, a recent population projection estimates the population of Jalingo LGA at approximately 240,300 in 2026. This figure is an estimate rather than a new population census result and should therefore not be interpreted as an official 2026 census count. Jalingo LGA is ethnically heterogeneous. The major ethnic groups reported in the area include the Fulani, Jibu/Kona, and Mumuye, while other groups include the Hausa, Jenjo, Wurkum, and Nyandang. Hausa is widely used as a medium of communication for social and economic interaction. The ethnic diversity of the area reflects the historical development

of Jalingo as an important administrative, commercial, and agricultural centre.

The area is predominantly agrarian, with crop production constituting an important economic activity. The major crops cultivated include rice, maize, groundnut, beans, cassava, yam, sorghum, millet, and vegetables. Evidence from agricultural studies in Jalingo indicates substantial production of rice and maize, while rice is also cultivated under floodplain and small-scale irrigation systems. A study of Fadama activities in Jalingo reported that maize and rice were among the most commonly cultivated grains among participating farmers. Rice production is particularly relevant to the present study because the availability of paddy provides the raw material for local processing activities. Studies of Jalingo's floodplain areas have also identified the potential of local water resources for irrigation and sustainable crop production.

The physical environment of Jalingo consists largely of undulating plains interspersed with mountain features. The area is drained by rivers and streams, including Mayo-Gwoi and Lamurde, which form part of the drainage system connecting the area to the River Benue. The climate supports agricultural production, with a distinct rainy season and dry season. The combination of fertile agricultural land, floodplain areas, water resources, and access to urban markets makes Jalingo suitable for crop production and associated agricultural value-chain activities.

Agriculture in Jalingo is complemented by trading, transportation, processing, and other commercial activities associated with the state's capital. The presence of major markets and commercial centres provides opportunities for the movement of paddy rice and processed rice products between farmers, processors, wholesalers, retailers, and consumers.

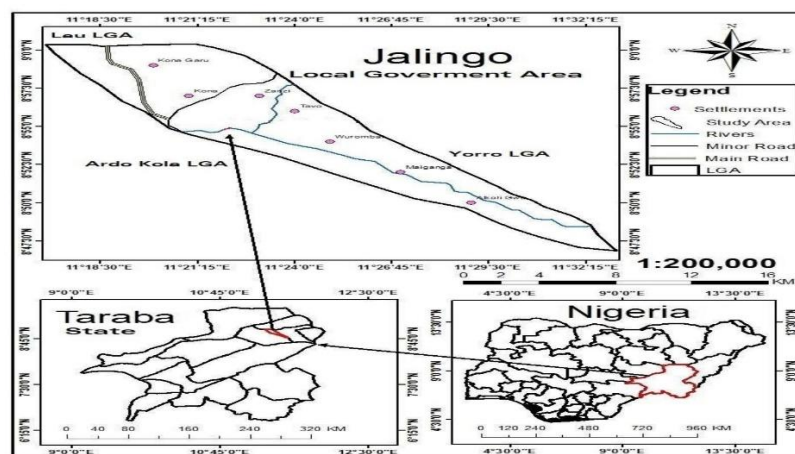


Figure 1: Map of Taraba State showing Jalingo Local Government Area

Source: Taraba State Ministry of Land and Survey, Jalingo (2021), as reproduced in Muhammad et al. (2022)

Sampling Procedure

A multi-stage sampling procedure was employed to select respondents for the study. The first stage involves the random selection of 5 wards in Jalingo LGA. In the second stage,

simple random sampling was employed to select 2 villages from each ward to give a total of ten (10) villages. From the ten (10) villages selected a total of 60 farmers were randomly selected based on the proportionate size of the villages

Table1: Selected Respondent for the Study

Selected ward	Names of Villages	Number of Farmers Selected
Maji Dadi	Unguwan Musa	12
	Tudun Wada	9
Mayo-Gwoi	Jauro Mashu	11
	Malam Joda	10

Selected ward	Names of Villages	Number of Farmers Selected
Sarkin Dawaki	Tsamiya Street	13
	KofanBaraya	8
Barade	Anguwan Adamu Baba	7
	Garin Magami	10
Kona	Mile Six	11
	Nukkai	9
Total		60

Source: Field Survey, 2026.

Method of Data Collection

The primary data was obtained through the use of a well design questionnaire which was administered to the respondents.

Analytical Framework

The analytical tools that were used to achieve the objectives of this study are descriptive statistics, gross margin analysis and multiple regression analysis.

Descriptive Statistics

Descriptive statistics such as frequency, means and percentages was used to achieve objectives i and ii of the study.

Likert Scale

Likert scale was used to achieve objectives v of the study. A four-point Likert scale was adopted. The scale is given as 1 strongly agree, 2 agree, 3 disagree and 4 strongly disagree. The mean of score was calculated as follows

$$Xs \frac{Ex}{N} \quad (1)$$

Where:

$\bar{x}$ = mean score

X = weight on scale

N = total number of weights

E = summation

$$\text{Therefore, the mean } \bar{x} = \frac{1+2+3+4}{4} = \frac{10}{4} = 2.5 \quad (2)$$

The mean score of each challenge was computed by multiplying the total number of responses for a particular challenge with the weight attached to the response choosen and then divided by the total number of respondents.

$$\text{That is } Xs \frac{EFn}{N} \quad (3)$$

Where

F = number of responses

n = weight attached to scale

N = total number of respondents

The rating was carried out thus, challenges with score above 2.5 was considered very severe while the ones with less than 2.5 were regarded as not severe respectively.

Gross margin analysis

Gross margin analysis was use to achieve objective (iii). Gross margin is the difference between the gross farm income (GI) and the total variable cost (TVC), that is, $GM = GFI - TVC$

Where:

GM = Gross Margin (Naira/kg).

GFI = Gross Farm Income (/Naira/kg)

TVC = Total Variable Cost (Naira//kg)

Regression Analysis

This was used to achieve objective iv of the study. The regression equation is expressed as follows:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + U$$

Where;

Y = Return to the processor (N)

X_1 =Age of the farmer (years)

X_2 = processing experience (years)

X_3 = Sex

U = Error term b_0 = Constant term

b_1 to b_3 = Coefficients of parameters estimated

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Rice Processors in Jalingo LGA

As presented in Table 2, male respondents constituted 73.3% of the sampled rice processors, while females accounted for 26.7%. This indicates that men represented the larger proportion of respondents in the study area; however, the finding describes the sampled processors and does not imply that rice processing is exclusively a male activity. In a study of rice processing in Benue State, Dzahan (2025) similarly reported that most sampled processors had formal education, although the distribution of educational attainment and experience differed from the present study.

The age distribution in Table 2 further shows that 75.0% of the respondents were between 21 and 30 years, 16.7% were aged 31–40 years, and 8.3% were within the 41–50-year age group. This suggests that the sampled rice-processing enterprise was dominated by relatively young respondents. Regarding educational attainment, secondary education was the most common level, accounting for 50.0% of respondents, followed by those with no formal education (23.3%), primary education (20.0%), and tertiary education (6.7%). The relatively high proportion of respondents with formal education may be useful for understanding their potential capacity to access and interpret business information, although educational attainment alone does not establish the level of managerial competence.

As also indicated in Table 2, 71.7% of the respondents had between one and five years of processing experience, while 28.3% had six to ten years of experience. This suggests that most respondents had relatively limited experience in the enterprise. Hassan et al. (2025) found that processing experience was significantly associated with post-harvest losses among rice processors in north-eastern Nigeria, highlighting the relevance of experience to processing outcomes.

Table 2: Socio-Economic Characteristics of Rice Processors in Jalingo LGA

Variable	Frequency	Percentage (%)
Sex		
Male	44	73.3
Female	16	26.7
Age (years)		
21–30	45	75.0
31–40	10	16.7
41–50	5	8.3
Educational attainment		
Primary education	12	20.0
Secondary education	30	50.0
Tertiary education	4	6.7
No formal education	14	23.3
Processing experience (years)		
1–5	43	71.7
6–10	17	28.3

Source: Field Survey, 2026.

Availability of Rice Processing Equipment

As presented in Table 3, milling machines ranked first, with a reported frequency of 60 (22.0%), indicating their central role in rice processing among the sampled respondents. Sewing machines ranked second, with a frequency of 45 (16.5%), followed by weighing scales at 38 (14.0%) and destoners at 35 (12.9%). Colour sorters accounted for 30 (11.0%), drums for 29 (10.7%), wheelbarrows for 20 (7.4%), and polishers ranked last, with a frequency of 15 (5.5%).

The distribution in Table 3 suggests that milling and packaging-related equipment were prominent among the equipment reported by respondents. Weighing scales, destoners, colour sorters, and polishers are also important for

product measurement, removal of impurities, grain-quality improvement, and preparation of rice for the market. Nevertheless, the reported frequencies indicate the occurrence of equipment responses and do not, by themselves, establish whether the equipment was modern, functional, adequately maintained, or used at full capacity.

These findings are consistent with Ajala (2015), who identified equipment-related and operational difficulties as important challenges facing rice processors in Nigeria. Similarly, Hassan et al. (2025) highlighted the need to improve processing conditions and supporting infrastructure to reduce post-harvest losses in north-eastern Nigeria.

Table 3: Availability of Rice Processing Equipment

Equipment	Frequency	Reported percentage (%)	Rank
Milling machines	60	22.0	1
Sewing machines	45	16.5	2
Weighing scales	38	14.0	3
Destoners	35	12.9	4
Colour sorters	30	11.0	5
Drums	29	10.7	6
Wheelbarrows	20	7.4	7
Polishers	15	5.5	8
Total	272	100.0*	

Source: Field Survey, 2026.

Average Cost and Returns Per 100 Kg Bag of Paddy Rice

As presented in Table 4, the purchase of paddy rice constituted the largest reported cost component, amounting to ₦38,700.00 per 100 kg bag, equivalent to approximately 74.0% of the reported total cost. Other cost components included firewood (₦2,375.50), destoning (₦2,080.75), milling (₦1,950.00), transportation (₦1,840.50), labour (₦1,485.00), polishing and colour sorting (₦1,445.35), and packaging (₦1,060.00). These figures indicate that raw-material procurement accounted for the largest share of processing expenditure, suggesting that fluctuations in paddy prices could substantially affect the returns available to rice processors.

The reported revenue from the sale of processed rice was ₦68,250.00 per 100 kg bag of paddy rice, while the stated

total cost was ₦52,237.10, implying a gross margin of ₦16,012.90. However, as shown in Table 4, the individual cost components sum to ₦50,937.10 rather than the reported total of ₦52,237.10. Consequently, the reported gross margin should be treated as provisional until the discrepancy is reconciled with the original survey records. If the sum of the listed cost components is correct, the resulting margin would be ₦17,312.90 instead. This distinction is important because the reliability of gross margin analysis depends on the accurate measurement of revenue and variable costs.

The importance of raw-material costs, processing expenditure, and value addition is consistent with previous research on rice processing in Nigeria (Ajala & Gana, 2015; Dzahan, 2025).

Table 4: Average Cost and Returns Per 100 Kg Bag of Paddy Rice

Cost or return item	Amount (₦/bag)	Reported percentage of total cost (%)
Variable costs		
Purchase of 100 kg paddy rice	38,700.00	74.0
Firewood	2,375.50	4.5
Milling	1,950.00	3.7
Destoning	2,080.75	3.9
Polishing/colour sorting	1,445.35	2.7
Packaging	1,060.00	2.0
Labour	1,485.00	2.8
Transportation	1,840.50	3.5
Total cost (as reported)	52,237.10	97.1
Revenue		
Sale of processed rice	68,250.00	
Gross margin implied by reported totals	16,012.90	

Source: Field Survey, 2026.

Socio-Economic Factors Associated with Rice-Processing Revenue

As presented in Table 5, age, sex, and processing experience had positive and statistically significant coefficients in the estimated regression model. Age had a coefficient of 0.1455 and was statistically significant at the 5% level ($p = 0.010$). This suggests that age was positively associated with processing revenue, conditional on the model specification and variable measurement. Similarly, processing experience had a positive coefficient of 0.1140 and was statistically significant at the 5% level ($p = 0.036$), indicating that experience was also associated with variations in revenue among the sampled processors.

Sex had a positive coefficient of 0.2485 and a reported p-value of 0.000, which should be presented as ($p < 0.001$). This indicates a statistically significant association between the sex variable and processing revenue. However, the direction of this association depends on the coding of the variable; therefore, it is not possible to conclude whether male or female processors generated higher revenue without

confirming the coding scheme and the functional form of the regression model.

The coefficient of determination ($R^2 = 0.6252$) indicates that the model explained approximately 62.52% of the observed variation in processing revenue, while the remaining 37.48% was associated with factors not captured by the model. The mean variance inflation factor (VIF) of 1.11 suggests that multicollinearity among the explanatory variables was unlikely to be a serious concern. In addition, the Breusch–Pagan test yielded a p-value of 0.7069, providing no statistically significant evidence of heteroskedasticity at the 5% level.

These findings can be considered alongside previous research on rice-processing outcomes. Dzahan (2025) examined factors associated with post-harvest losses and profitability among rice processors in Benue State, while Hassan et al. (2025) reported significant relationships between processing experience, access to credit, and post-harvest losses among processors in north-eastern Nigeria.

Table 5: Socio-Economic Factors Associated with Rice-Processing Revenue

Variable	Coefficient	Standard error	Reported test statistic	Reported p-value
Age	0.1455	0.0547	2.66	0.010
Sex	0.2485	0.0337	7.38	0.000
Processing experience	0.1140	0.0530	2.15	0.036
Constant	3.2497	0.1302	24.96	0.000
R-squared	0.6252			
Mean VIF	1.11			
Breusch–Pagan test p-value				0.7069
Number of observations	60			

Source: Field Survey, 2026.

Constraints Affecting Rice Processors

As presented in Table 6, fluctuating market prices recorded the highest mean score (3.50), indicating that price instability was the most prominent reported constraint among the sampled rice processors. Inadequate power supply ranked second, with a mean score of 3.10, followed by high energy costs (2.80). Difficulty retaining experienced workers and poor road networks each recorded a mean score of 2.70, while the use of outdated equipment had a mean score of 2.60. These findings suggest that market uncertainty, energy-related challenges, labour retention, transportation, and processing technology were important concerns for rice-processing enterprises in Jalingo Local Government Area. Price fluctuations can make purchasing and selling decisions less

predictable, while unreliable electricity and high energy costs may increase operating expenses. Similarly, poor roads can raise transportation costs, and outdated equipment may limit processing efficiency and product quality.

The findings are broadly consistent with Ajala and Gana (2015), who examined challenges facing rice processing in Nigeria and highlighted operational and processing-related difficulties. Hassan et al. (2025) also emphasized the importance of improved roads, electricity, storage facilities, and training in addressing post-harvest losses among rice processors in north-eastern Nigeria. Similarly, Dzahan (2025) identified the importance of improved processing facilities, infrastructure, and training in reducing post-harvest losses and improving processors' economic outcomes. Although these

studies provide relevant contextual support, their findings should not be treated as direct confirmation of the ranking observed in Jalingo because the studies may differ in location, methods, and measured outcomes.

As further shown in Table 6, inadequate access to credit recorded a mean score of 2.40, inadequate storage facilities scored 2.10, and poor-quality paddy supply recorded the

lowest mean score of 1.75. These scores indicate that respondents assigned relatively lower ratings to these constraints than to market prices and energy-related problems. However, a lower mean score does not necessarily imply that a constraint is unimportant to every processor; its effects may vary according to business size, access to resources, and operating conditions.

Table 6: Constraints Affecting Rice Processors

Constraint	Reported mean score	Reported classification
Fluctuating market prices	3.5	Severe
Inadequate power supply	3.1	Severe
High energy costs	2.8	Severe
Difficulty retaining experienced workers	2.7	Severe
Poor road network	2.7	Severe
Use of outdated equipment	2.6	Severe
Inadequate or poor access to credit	2.4	Not severe
Inadequate storage facilities	2.1	Not severe
Poor-quality paddy supply	1.75	Not severe

Source: Field Survey, 2026

CONCLUSION

The study examined the socio-economic characteristics, processing infrastructure, cost and returns, socio-economic factors associated with revenue, and constraints affecting rice processors in Jalingo LGA, Taraba State. The findings showed that the sampled processors were predominantly male and young adults, with secondary education representing the most common educational attainment. Milling machines were the most frequently reported processing equipment, while polishers had the lowest reported frequency.

The reported cost and return estimates suggest that rice processing can generate a positive gross margin. However, the discrepancy between the listed cost items and the reported total cost requires verification before the profitability estimate can be considered final. The regression results showed positive and statistically significant associations between the reported dependent variable and age, sex, and processing experience, although the precise interpretation depends on the model specification and variable coding.

Fluctuating market prices, inadequate electricity supply, high energy costs, outdated equipment, labour-retention difficulties, and poor road networks were identified as important constraints. These findings suggest that improving the operational environment of rice processors may require coordinated attention to infrastructure, equipment, energy costs, and technical capacity.

Based on these findings, government and relevant agencies should improve electricity access and rural road infrastructure, while financial institutions, cooperatives, and agricultural development agencies should facilitate affordable credit and equipment financing to enable processors to acquire and maintain modern machinery. Rice processors should also be supported with timely market-price information and appropriate technical training to improve business decisions, processing efficiency, and profitability.

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