

SOCIO-ECONOMIC FACTORS INFLUENCING THE ADOPTION OF IMPROVED RICE PROCESSING TECHNOLOGIES BY FARMERS IN IBAJI LGA OF KOGI STATE, NIGERIA

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Abstract

The broad objective of this study was to assess the socio-economic factors influencing the adoption of improved rice processing technologies by farmers in Ibaji Local Government Area of Kogi State, Nigeria. Sample size of one hundred and twenty respondents were selected for the study using a multi-stage sampling technique. Descriptive statistic, ordered probit regression and 3 likert-scales were used. The analysis indicates that 52.5% of respondents were male and 47.5% female, with 37.5% of farmers aged 26 to 35 years, and an average age of 37. Most farmers had 1-5 children, and 61.7% attained secondary education or higher, while 25.8% had tertiary education. A significant majority (79.2%) were married, and 66.7% managed 1-2 hectares of land. Additionally, 70.0% had over 10 years of rice processing experience, with 35.8% earning between 451,000-550,000 Naira annually, averaging 500,000 Naira. Notably, 52.5% belonged to farmers' organizations, and 62.5% had no extension visits. The educational status has negative relationship with adopting improved rice processing technologies, significant at 1% confidence level. Major constraints identified included climate fluctuations, high agrochemical costs, and technology complexity. The study recommends that processors form groups for better bargaining power and that stakeholders recruit more extension agents to enhance rice processors' contact with extension services.

Keywords: socio-economic factors, adoption, improved rice processing technologies

Introduction

The world is technologically driven and it is generally accepted that the remedy to the problem of low food production lies on the adoption of improved technologies by farmers. Technologies in this context refer to the collection of techniques and skills. It is the current state of humanity's knowledge of how to combine resources to produce desired products to solve problems, fulfill needs, or satisfies wants; it includes the technical methods, skills, processes, techniques, tools and raw materials (Wikipedia, 2023).

Rice (*Oryza sativa*) is a crucial source of nutrition for humanity. Nearly half of the global population relies on rice as a fundamental food source (Shahbandeh, 2021). Rice is extensively cultivated in countries like Bangladesh, China, Japan, India, the Philippines, and many others. In Nigeria, rice stands as one of the country's primary staple crops. A significant proportion of Nigerians, regardless of their ethnic group, depend on rice for their daily sustenance (Raheem et al., 2021). Rice is gradually emerging as the most essential staple food in Nigeria due to its affordability as a source of carbohydrates for both human consumption and animal feed (Nwozor & Olanrewaju, 2020). It is noteworthy that globally,

West Africa leads in both rice production and consumption, estimated at 64.2 and 61.9 percent, respectively (FAO, 2020).

The quality and quantity of rice is a major concern for the future of rice sector. In spite of this, the Nigerian government has not been intervening as expected so as to meeting increasing demand. Lack of adequate intervention into rice processing thereby abandoning this aspect into the hands of rural women without skill and appropriate technologies has led to low adoption of full innovations of improved rice processing giving rise to slow growth of this product compared to population. The bid to accomplish the task of self-sufficiency in food and improvement in the quality of life of rural area necessarily entails the shifting from the drudgery of age long use of traditional physical labor to the utilization of technological innovation. It is worthy of note that, rice processing is dominated by women using traditional method especially in cleaning and parboiling that is full of drudgery and lots of constraints as well as small mills with processing capacity of 150 kilogramme per hour resulting to not producing enough to meet domestic consumption and poor quality to meet market specification. Encouraging small scale rice farmers and processors to adopt the use of improved equipment to process quality milled rice that would compete with imported milled rice would encourage local production of the commodity, because, using the equipment would make them to produce more products and require more paddy for processing. Therefore, the demand for paddy would be more and farmers would encourage to expand production. Processing paddy rice involves various operations to separate the endosperm from other components while minimizing fragmentation and impurities and preserving its nutritional value. These operations are essential for improving the quality of rice intended for consumption (Nwozor & Olanrewaju, 2020).

Processors encounter numerous challenges in producing high-quality rice due to the continued use of primitive methods (Nwachukwu et al., 2020). Consequently, locally produced rice often suffers from issues such as stones, breakages, and dark grains. For these reasons, it has become imperative for rice processors to acquire techniques that can enhance the quality of rice, ultimately contributing to improved food availability, increase income for farming households, and fostering international trade partnerships (Raheem et al., 2021). Enhanced rice quality will boost the demand for locally produced rice and increase income in local rice processing. Consequently, rice farmers and processors will be motivated to expand their production scale.

Rice processing is enhanced by the regular adoption of appropriate technologies, especially under the IFAD-VCDP. Low adoption of the improved methods contributes to low quantity and poor output of milled rice. This study, therefore, chooses to assess the adoption situation of the farmers to contribute to knowledge by making available empirical information for policymakers and providing direction as to which interventions are to be appropriately focused. It is against this background that the study seeks to identify the socio-economic factors influencing the adoption of improved rice processing technologies such as rice thresher, wet cleaner, reciprocatory winnower, rotary steam heater, pneumatic cleaner and rice mills by farmers in Ibaji LGA Kogi State. The study addressed the following objectives:

- i. describe the socioeconomic characteristics of the farmers in the study area
- ii. determine the socio-economic factors influencing the adoption of the improved rice processing technologies by farmers in the study area
- iii. identify the constraints to the adoption of rice processing technologies by farmers in the study area

Methodology

The study area was Ibaji. Ibaji is a Local Government Area in Kogi State, Nigeria in the southern part of the state separated from Edo State to the west by the Niger River, and bordering Anambra State in the south. Its' headquarter is in the town of Onyedega on the Niger River in the northwest of the area at 6°53'00"N 6°41'00"E. Although Igalas are majority, Igbos in Ibaji local government are about 15% of the local government population. The northeasterly line of equal latitude and longitude passes through the LGA.

A multi-stage sampling procedure was adopted for this study. In the first stage, four farming communities namely Odogwu, Ejule-Ojebe, Ejule Onu, and Elele were purposively selected from Ibaji Local Government Area of Kogi State due to their active involvement in agricultural production. The estimated population of farmers in the selected communities comprised 45 farmers from Odogwu, 42 farmers from Ejule-Ojebe, 40 farmers from Ejule Onu, and 44 farmers from Elele, giving a total population of 171 farmers. The sample size for the study was determined using the Taro Yamane (1967). Therefore, a sample size of 120 respondents was obtained for the study. In second stage, simple random sampling technique was employed to select respondents from the four selected communities. Consequently, thirty (30) farmers were randomly selected from each community, giving a total of one hundred and twenty (120) respondents used for the study. The primary data for this study was obtained through the use of structured questionnaire. The socioeconomic characteristics and the constraints to adoption of improved rice technologies were analyze using Descriptive statistic and mean score. Ordered Probit Regression analysis was employed to determine the contribution of the socio-economic factors to the level of adoption of improved rice processing technologies by rice farmers in the study areas.

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e_i$$

Where:

Y_i = level of Adoption of improved rice processing technologies

β_0 = constant term

$\beta_1 - \beta_6$ = parameters to be estimated

$X_1 - X_6$ = explanatory variables

e_i = random error term

X_1 = Age (years)

X_2 = Literacy level (years)

X_3 = Household size (number of persons in the household)

X_4 = Processing experience (years)

X_5 = Membership of social groups (number of groups one belonged)

X_6 = Contact with extension agent (number of visits in 2024)

Results and Discussion

Socioeconomic Characteristics of the Rice Farmers

The results in Table 1 show that the male farmers were represented by 52.5%. Females were represented by 47.5%. This result is in agreement with the findings of Adejoh et al. (2017) who reported that the ratio of females to males was low. They further noted that male farmers were represented by 72.5% in adoption of improved rice processing technologies in the Federal Capital Territory of Nigeria.

The mean age of the farmers were 37 years old, implying that on average, most of the farmers are in their very active age. This suggests that most of the farmers possess the physical strength, energy, and capacity required for farming and rice processing activities. Farmers

within this age category are generally more innovative, receptive to new ideas, and willing to adopt improved agricultural technologies compared to older farmers. The result further indicates that the farmers are likely to have the ability to effectively utilise improved rice processing technologies, which could enhance productivity, efficiency, and income generation. This is in agreement with the finding of Nasiru et al. (2015) who reported that the mean age of respondents was 36 years which implies that only young farmers are left on the farm.

The marital status distribution revealed that majority of the rice farmers (79.2%) were married, while 20.8% of rice processing farmers were unmarried. This implies that rice farming and processing activities in the study area are predominantly undertaken by married individuals. The dominance of married respondents among the farmers could positively influence agricultural production and technology adoption in the study area.

The educational status reveals that rice farmers in the area have a high literacy rate since over 61.7% of the farmers had reached the secondary level and beyond. About 25.8% of total sample has tertiary education. This result was not in accord with the findings of Nasiru et al. (2015) who reported that the 77.8% of the respondents investigated do not have formal education.

Majority (62.5%) of the farmers in the studied area had no form of extension visit on improved rice processing technologies. This only 37.5% of the farmers were visited by extension agents: This result is in accord with the finding of Nasiru (2014) who reported that the performance of the extension agents was low. Inadequate extension visits limits farmers participation and adoption of agricultural program.

The results further showed that the majority (66.7%) of the rice farmers cultivated between 1 – 2 hectares farmland, while the mean farm size was 2 hectares. This implies that most of the respondents were small-scale farmers operating on relatively small landholdings. The predominance of small farm sizes may be due to limited access to land, capital constraints, and the traditional land tenure system prevalent in the study area. This is in line with the finding of Muhammed et al. (2017) who reported a mean farm size of 2 hectares for farmers investigated. The mean rice experience was 15 years having majority of the farmers (52.5%) to be members of farmers' organization that receives support in the form of cash and subsidies.

Household size results show that majority (48.3%) of the rice farmers had household size of between 1 - 5 members. The mean household size of the farmers was however 8 members. This is in agreement with the findings of Nasiru et al. (2015) who noted that the farmers investigated had household size of between 6 to 10 constituting 53.3%.

Finally, majority (35.8%) of the rice farmers in the area earn between within 451,000 to 550,000 naira annually with the mean income of 500,000 naira annually.

Table 1: *Distribution of Respondents Based on Socio-Economic Characteristics*

Socioeconomic variables	Frequency (n=120)	Percentage (%)	Mean
Sex			
Male	63	52.5	
Female	57	47.5	
Age			
17-25	30	25.0	
26-35	45	37.5	
36-45	27	22.5	37 Years Old
46-55	6	5.0	
Above 56	12	10.0	
Marital Status			
Married	95	79.2	
Unmarried	25	20.8	
Level of Education			
No formal education	4	3.3	
Primary education	11	9.2	
Secondary education	74	61.7	
Tertiary education	31	25.8	
Household size			
1-5 members	58	48.3	
6-10 members	10	8.3	8 Members
Above 10 members	52	43.3	
Farm-size in hectare			
1-2	80	66.7	
3-5	27	22.5	2 Hectares
Above 5	13	10.8	
Rice production Experience in years			
1-5	18	15.0	
6-10	18	15.0	
Above 10	84	70.0	15 Years
Extension Visit			
Yes	45	37.5	
No	75	62.5	
Income Generated in Naira			
250,000-350,000	35	29.2	
350,000-450,000	15	12.5	
450,000-550,000	43	35.8	500,000 Naira
Above 550,000	27	22.5	
Farmers Organization			
Yes	63	52.5	
No	57	47.5	

Source: Field Survey, 2025

Probit Model Analysis of The Influence of Socio-Economic Characteristics on The Adoption of Improved Rice Processing Technologies

Table 2 revealed the probit regression analysis of the influence of selected socio-economic characteristics on the adopted improved rice processing technologies. Result shows that age of the respondent has a negative relationship with the adoption of improved rice processing technologies and it is not significant. This implies that the more the farmers are younger in age, the more it decreases the likelihood of adopting improved rice processing technologies. This result agrees with Nwachukwu et al. (2020). Educational status has negative relationship with the adoption of improved rice processing technologies and it is significant at 1% confidence level. This implies that the more people are educated, the more they are likely to adopt improved rice processing technologies. Household size has positive influence on the adoption of improved rice processing technologies and it is not significant. This implies that the more the household size, the more the adoption of improved rice processing technologies. However, the variable was not statistically significant, indicating that household size did not exert a strong enough influence on the adoption decision of the farmers. Rice processing experience positively influences the adoption of improved rice processing technologies and it is not significant. This implies that the numbers of years of rice processing experience that the farmers have the likelihood on the adoption of improved rice processing technologies. This was contrary to the finding of Adisa et al., (2019) who noted that with the relatively low years of experience in rice processing technologies; farmers are likely not to adopt improved rice processing technologies.

Membership of organization has negative relationship with the adoption of improved rice processing technologies and it is not significant. Extension visit influence negatively to the adoption of improved rice processing technologies and it is not significant. This implies that the more extension agent visits the farmers, the more likely they will adopt improved rice processing technologies. Report from the field indicated poor extension contact, but several researches, reported that, regular and effective extension contact will increase the awareness and adoption levels of the improved rice processing technologies.

Table 2: *Distribution of the Probit Model Analysis of The Influence of Socio-Economic Characteristics on the Adoption of Improved Rice Processing Technologies*

Variables	coefficient	S.E	Wald X²	Sig.
(Intercept)	- 3.912	2601.5049	.000	.999
Age	-.385	.1995	3.730	.053
Educational Status	-.891	.2467	13.042	.000***
Household Size	6.091	2601.5047	.000	.998
Rice Processing Experience	.303	.2969	1.042	.307
Member of Organization	-12.747	5203.0094	.000	.998
Extension visits	-.876	.5755	2.317	.128
(Scale)	1 ^a			

Source: Field Survey, 2025

Likelihood Ratio X²=92.272

Note. *** indicates significant at 1%

Constraints Encountered to the Adoption of Rice Processing Technologies Faced by Farmers

Results on Table 3 revealed that the tediousness of the technology ranked 1st with a mean score of 2.55, fluctuation in climate conditions ranked 2nd with a mean score of 2.16, and high cost of agrochemicals ranked 3rd with a mean score of 2.03 were regarded as significant constraints influencing the adoption of improved rice processing technologies among farmers in the study area. Furthermore, lack of tractor hire service ranked 4th with a mean score of 1.80, while lack of infrastructural facilities ranked 5th with a mean score of 1.78,

inaccessibility to cooperative organisation ranked 6th with a mean score of 1.69, and lack of extension services ranked 7th with a mean score of 1.61 were considered less severe because their mean scores fell below the decision mean and were therefore regarded as not significant constraints. In addition, lack of awareness of improved technologies ranked 8th with a mean score of 1.46, while inability to read and write ranked 9th with a mean score of 1.32 were not major limitations among the respondents, possibly because many farmers had prior knowledge and exposure to rice processing activities in the study area. According to Nasiru et al. (2015), major constraints identified by the respondents in their study include; insufficient capital (88.9%) which prevent them from purchasing equipment, and adopting improved technologies, lack of good market (94.4%) which brings set back in their processing activities. Inadequate extension contacts (72.2%) which prevent exchange of useful information and knowledge about agricultural innovations. Lack of sufficient equipment and sabotage by male counterparts as was identified by 55.6% of the respondents; also discourage them from adoption of the technologies. This result corroborates with the finding of Ajala and Gana (2015) who observed that low capital, lack of financial incentive, low return, high cost of processing equipment, seasonal and low paddy, poor pricing, lack of technical knowledge and inadequate training as constraints to the production of rice by farmers and parboilers in Nigeria.

Table 3: *Distribution of the Respondents Based on the Constraints Encountered in Their Adoption of Improved Rice Processing Technologies*

Constraint Item	Mean Score	Ranking
Tediousness of the technology	2.55	1 st
Fluctuation in climate conditions	2.16	2 nd
High cost of agrochemicals	2.03	3 rd
Lack of tractor hire service	1.80	4 th
Lack of infrastructural facilities	1.78	5 th
Inaccessibility to cooperative organization	1.69	6 th
Lack of extension services	1.61	7 th
Lack of awareness of improved technologies	1.46	8 th
My inability to read and write	1.32	9 th

Source: Field Survey, 2025

Conclusion and Recommendations

The results from the study revealed that rice farmers were younger in age, more educated, and had smaller farm size. The low adoption of technologies by respondents may be due to high purchase costs and other constraining socioeconomic variables of the respondents. It can thus be inferred that the adoption potentials of the respondents can generally be enhanced if those constraints are accordingly addressed by the various stakeholders. These constraints include tediousness of the technology, fluctuation climate conditions and high cost of agrochemicals and recommends processors should organize themselves into groups so that, they can have good bargaining power against the middlemen since they produce better quality stone free rice.

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