integrity Research Journals

Journal of Agricultural Science and Practice
Volume 10(4), pages 77-87, August 2025
Article Number: E8D2980A4
ISSN: 2536-7072
https://doi.org/10.31248/JASP2025.538
https://integrityresjournals.org/journal/JASP

Full Length Research

Assessing the effect of false bottom technology on the economic performance of rice processing in Ekiti State, Nigeria

D. O. Itadare[1]*, S. O. Ojo[1], O. J. Iyanda[1], M. H. Falaye[2] and O. J. Taiwo[1]

[1]Department of Agricultural Sciences, College of Sciences, Afe Babalola University, Ado-Ekiti, P.M.B 5454, Ado-Ekiti, Nigeria.
[2]Confluence University of Science and Technology, Osara, Kogi State, Nigeria.

Corresponding author. Email: itadared@gmail.com

Received 11th June 2025; Accepted 27th August 2025

ABSTRACT: The quality disparity among different rice varieties in Nigeria has raised significant concerns. Despite increased production, the country still struggles to meet its rice demand. This study assessed the effect of False Bottom Technology (FBT) on the economic performance of rice processing in Ekiti State, Nigeria. Specifically, it examined the cost and returns, and determinants of economic performance of rice processing by adopters and non-adopters of False Bottom Technology. A set of questionnaires was administered to 135 respondents selected using a multistage sampling procedure. Descriptive and Inferential statistics, Budgetary Analysis Performance and Probit regression were used to analyze the data. This study revealed that 45.9% were adopters, while non-adopters were 54.1%. Female respondents were 43.8% higher than male, 40.74% of the respondents fell between 41-50 years of age, with a mean ($\bar{x}$) of 50. The cost and return analysis revealed that adopters have a higher Return on Investment (ROI) at 612%, while non-adopters have their ROI of 386%. Age, gender, education, household, experience, government policy, and compatibility with existing technology were significant factors of influence on adoption at 5% level of confidence. Government policy, with a mean ($\bar{x}$) of 3.51, ranks first and the scale/size of business at ($\bar{x}$) = 3.43 ranks second for constraints to use of the FBT. Despite adopters' efficiency, non-adopters exist. It is therefore recommended that public-private partnerships should set up monitoring and evaluation frameworks to track the adoption and impact of the false bottom technology after its introduction, to identify area-specific bottlenecks such as the impossible fabrication of an exact model, and to make improved adjustments alongside its distributions.

Keywords: Adopters, false bottom technology, non-adopters, paddy rice, rice processing.

INTRODUCTION

Rice is among the most important staple foods globally, and its significance is especially pronounced in Nigeria, where it constitutes a vital part of the daily diet and national economy (Okonkwo *et al.,* 2021). As Africa's leading rice producer, Nigeria has experienced a substantial rise in rice consumption, with the grain becoming central to both traditional and modern meals in many households (Akinbile *et al.,* 2023). In 2011, rice accounted for 6.6% of total household expenditure and approximately 10% of food expenditure (ThriveAgric, 2020). More recent data indicate that about 31% of Nigerian consumers' monthly food spending is allocated to rice (Obayelu *et al.,* 2022).

Despite its prominence, consumer preference for local rice remains relatively low. Omolehin *et al.* (2022) identified factors such as education, overall food expenditure, and the cost of local rice as major contributors to this trend. Additionally, preferences for imported rice are shaped by variables including taste, price, household size, age, and perceived quality. This indicates that, although rice plays a critical role in Nigerian consumption patterns, domestic production and processing are still undervalued by a significant portion of the population (Ugwuja and Chukwukere, 2021).

Nigeria has approximately 70.8 million hectares of arable land, supporting the cultivation of various staple crops, including rice, millet, yams, beans, cassava, guinea corn, and maize. The country's rice production has seen gradual growth, increasing from 3.7 million metric tons in 2017 to 4.0 million metric tons in 2018. However, this remains insufficient to meet the annual national demand of 6.7 million metric tons. As a result, only 57% of consumed rice is produced domestically, leaving a supply gap of nearly 3 million metric tons often filled through illegal imports or smuggling (Tsokar, 2022). In an effort to curb this dependence and stimulate local production, the Nigerian government banned rice importation in 2019.

Despite various policy interventions aimed at revitalizing agriculture, the sector continues to face substantial challenges. According to Olomu *et al.* (2020), recent government initiatives have yet to yield substantial results. Although the agricultural value chain holds the potential to catalyze broader economic growth and positively affect other sectors, ongoing systemic inefficiencies and market failures, particularly the absence or weakness of markets, have hindered progress. This highlights the urgent need for improved value-addition mechanisms to boost productivity and economic resilience within the sector.

Post-harvest processing is a crucial component of the rice value chain, directly influencing product quality and market appeal. As noted by Olayemi *et al.* (2021) and Carcea (2021), the transformation of paddy into polished rice involves the removal of impurities and has significant implications for the grain's aesthetic and commercial value. To enhance this process, the International Fund for Agricultural Development (IFAD), through its Value Chain Development Programme (VCDP), has promoted the adoption of modern rice processing technologies across six Nigerian states. These efforts aim to improve the quality and purity of locally processed rice to meet rising national demand.

Ekiti State has emerged as a key player in Nigeria’s rice production landscape, providing livelihoods for a substantial segment of the population (Ajayi *et al.,* 2020). However, traditional rice processing techniques in the region are fraught with inefficiencies, high post-harvest losses, and substandard product quality. This underscores the need for innovative technologies that can optimize output quality and operational efficiency (Danbaba *et al.,* 2019; PWC, 2018; Olayemi *et al.,* 2021).

One such innovation is the False Bottom Technology (FBT), which represents a potentially transformative approach to rice processing. This technology is designed to reduce waste, improve grain quality, and increase processing efficiency, ultimately enhancing profitability for processors (Adediran *et al.,* 2019). Nevertheless, adoption of FBT across regions has been uneven, warranting further investigation into the underlying causes.

False-bottom drum parboiling process involves using a perforated metal screen to keep the paddy from coming into direct contact with the vat bottom. The sieve is positioned at the bottom of the vat, with a large lid above it and water in between. The paddy is positioned on top of the sieve. When the fire is set and the water boils, vapour rises through the sieve, steaming the paddy.

The finished parboiled rice is unbroken, clean, and white. Since the VCDP's introduction in 2015, IFAD-VCDP has enhanced local rice quality and increased rice production targets by 55,513 tons via women rice processors (Adediran *et al.,* 2019).

Salami and Adisa (2023) investigated the adoption of false bottom parboiling technology (FBT) by rice processors in North Central Nigeria. The study discovered that the majority (60.5%) of rice processors strongly embraced the FBT.

Through the Federal Ministry of Agriculture and Rural Development (FMARD), the Federal Government of Nigeria (FGN) partners with Japan International Cooperation Agency (JICA) and implementation bodies like the Ajifa Mill (a modern cottage mill) and Kogi State Agricultural Development Project (Kogi-ADP) to introduce the JICA Improved Rice Processing Technologies through the 'Rice Post-harvest Processing and Marketing Pilot Project (RIPMAPP) to small-scale rice producers. The JICA Improved Rice Processing Technologies primarily entail the employment of a new technology known as False Bottom for parboiling rice paddy, clean drying slab, standard miller, and de-stoner in rice processing. The study also discovered that all JICA technologies were effective.

Understanding the socioeconomic characteristics of rice processors in Ekiti State is critical to identifying the factors that facilitate or inhibit the adoption of FBT. According to (Ruzzante *et al.,* 2021), key determinants of agricultural technology include economic status, educational level, access to resources, and previous exposure to agricultural innovations. These variables are expected to influence adoption decisions, as suggested by previous research. By examining these factors, the study aims to offer insights into the demographic and economic contexts that shape technology uptake in the region.

Evaluating the economic performance of FBT adopters compared to non-adopters is essential for understanding the financial implications of the technology. This involves a comparative assessment of cost structures, output levels, profitability, and overall economic returns. Such an analysis helps to reveal the advantages and potential trade-offs associated with adopting FBT, thereby informing policy decisions and future investments in agricultural innovation.

This study seeks to assess the impact of False Bottom Technology on the economic performance of rice processors in Ekiti State by comparing the costs and returns of adopters and non-adopters. While prior research has explored general issues related to rice processing and technology adoption in the region (Alabi *et al*., 2022; Okunola *et al.,* 2019), this study uniquely focuses on evaluating the specific contributions of FBT. The goal is to provide empirical evidence that can guide strategic interventions aimed at improving rice processing practices and strengthening Nigeria's agricultural value chain. Therefore, the study's specific research objectives are to:

1. describe the socio-economic characteristics of respondents in the study area;
2. examine the cost and returns of the adopters and non-adopters of the technology;
3. assess the determinants of the economic performance of adopters and non-adopters; and
4. Identify the constraints to use of technology in the study area.

MATERIALS AND METHODS

Sampling technique

Multi-stage sampling was used to select respondents for the study. The first stage of the multistage sampling procedure was the purposive selection of three Local Government Areas (Gbonyin, Oye, and Ijero), which are rice-producing and processing locations in Ekiti state (Olanrewaju *et al.,* 2017; Okunola *et al.,* 2019). For the second stage, a stratified sampling technique was used for adopters and non-adopters; the third stage was the purposive selection of three rice-producing towns/ communities from each Local Government Area in which the technology has been introduced and in use. The fourth stage was the snowball selection of fifteen (15) respondents from each accessible town/community due to insecurity, time, population, and self-funding; therefore, the total sample size was 135 respondents, 73 non-adopters and 62 adopters.

Analytical techniques

Descriptive and inferential statistics

Descriptive and Inferential statistics were used in the analysis of the first objective, that is, the socio-economic characteristics of respondents. Frequency, mean, percentage and standard deviation were used in analysing the data.

Budgetary analysis performance

This was used in the analysis of the second objective, i.e. cost and returns of the adopters and non-adopters. The return on investment, return on assets, net returns, and total output were used in analysing the data. The budgetary analysis was used to determine the costs and returns of the mills' enterprise in the study area. The tool was used to determine the net returns, income and returns on investment (ROI) from the milling enterprise. According to Olukosi and Erhabor (1988), Net Returns (NR) or Net Income (NI) is the difference between the total revenue (TR) and total cost of production. It measures the strengths and weaknesses of the firm. The model for estimating the NR is represented by the following equation;

NR= TR– (TVC + TFC) .... (1)

TC= TVC + TFC.. (2)

ROI= NR/TC... (3)

Where: NR = Net Returns (Naira), TVC=Total Variable Cost (Naira), TFC=Total Fixed Cost (Naira), TC = Total Cost (Naira), TR = Total Revenue or Income (Naira), ROI =Return on Investment (Naira).

Total Variable Cost: This includes the cost of energy, union fees, labour, rent, raw materials, etc.

Total Fixed Cost: These are costs that do not vary with the levels of output in the short run (Olukosi and Erabor, 1988). This includes expenses on land, equipment, building, and machinery.

Probit regression model

This was used to analyse the third objective in determining the determinants of economic performance of the adopters and non-adopters. It is a conditional probability of an observation belonging to a particular category, a dichotomous or binary outcome variable.

$P\ (Y=1|\ X_1\ X_2......X_K) = \Phi\ (ßo + ß_1X_1 + ß_2X_2 + ...+ ß_KX_K)$ ………………………………………………… (4)

Where: **P** is probability of Y between 0 and 1**, Y** is the dependent variable which is dichotomous for Adopters and Non-Adopters, **X** is the independent variable which represents the determinants X_1 = input size (kg), X_2 = educational status, X_3 = gender, X_4 = household size (number), X_4 = extension contact, X5 = access to credit, X6 = experience (years) and is the Cumulative standard normal distribution functionB_0 **U** represents the error term.

Likert (ranking) scale method

A five-point Likert-type scale was used for the fourth objective in scoring the constraint variables according to the perceived degree of severity from 1 to 5, represented by strongly disagree, disagree, neutral, agree, and strongly agree.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The socioeconomic variables of the respondents considered were presented in Tables 1a and b. According to the respondents' gender breakdown, there were 43.8% more female respondents than male respondents. This indicates that women in the research area are more likely to process rice. This is not far-fetched from the study by Tondo (2017), demonstrating that in the modern processors category, the males prevailed by 74.6%, but in the traditional approach, the females led by 75.4%. This gives us a hint at gender equality in the sector and illustrates the potential for more women in the distribution.

The age distribution showed that with a mean age of 50 years, the majority were between 41 and 50 years. This is consistent with Elum and Enemali's (2024) research on the difficulties faced by smallholder paddy farmers, which confirmed that the majority of respondents, or 57.5%, were between 41 and 50 years old. 97% of the respondents were married, which suggests a sense of accountability in the business. This is consistent with Agbatse's (2022) assessment of the capacity-building needs of actors in the rice value chain in Benue and Nasarawa states, Nigeria, which found that the majority of respondents were married at 78.9% and 67.8%.

Their ability to read, write, and communicate effectively was demonstrated throughout the state by the following percentages: 3.0% had non-formal education, 3.0% had adult education, 0.7% had some primary education, 20.7% had completed primary education, 9.6% had some secondary education, and 38.5% had completed secondary education. The spread of new information and methods that improve rice production may be facilitated by this high literacy rate. Tsado *et al*. (2014) similarly found that the majority (92.5%) of rice respondents in their study area had some form of formal education. The average size of the household was 6.38 ±. Family members who are available could assist the processors by acting as working hands. This result is consistent with that of Okunola *et al.* (2019), who found that processors' families ranged in size from four to seven members. The experience mean was 14.13±. According to Tsado *et al.* (2014), who studied the adoption of upgraded technology, 90% of respondents had been in the rice processing industry for more than five years, and 65.63% had five to fifteen years of experience (Abubakar *et al.,* 2023).

The majority of respondents, 83.7% (113 individuals), indicated that rice processing is not their primary or only occupation. Only 16.3% (22 persons) claimed that rice processing is their only occupation. This implies that the majority of respondents, 83.7%, might not be able to devote themselves entirely to rice processing since they work in other occupations. Managing several jobs could restrict the amount of time and resources available for processing rice, which would lower the enterprise's overall

Table 1a. Socio-economic distribution of the respondents.

Socio-economic parameters	Frequency	Percent
Gender		
Male	38	28.1
Female	97	71.9
Age		
30-40	16	11.85
41-50	54	40.74
51-60	47	34.81
>60	17	12.59
Marital status		
Single	2	1.48
Married	131	97.04
Others	2	1.48
Education		
Non-Formal	4	3.0
Adult	3	3.0
Some Primary Education	1	0.7
Completed Primary Education	30	20.7
Some Secondary Education	13	9.6
Complete Secondary Education	52	38.5
OND/NCE	27	20.7
BSC/HND	5	3.7
Household size		
3-6	78	57.78
7-12	57	42.22
Average household size (6.38±)		
Experience		
<=15	48	64.4
16-30	43	31.9
>30	5	3.7
Mean experience (14.13±)		
Primary (Only) occupation		
No	113	83.7
Yes	22	16.3
Other occupation		
Farming	60	44.4
Trading	59	43.7
Civil service	10	7.4
Artisan	6	4.4
Union		
No	49	36.3
Yes	86	63.7

Table 1a. Contd.

Socio-economic parameters	Frequency	Percent
Access to credit		
No	36	26.7
Yes	99	73.3
Total	135	100.0
Source of credit		
Commercial Bank	6	4.4
Agric-Bank	8	5.9
Cooperative Society	64	47.4
Esusu	16	11.9
Relatives and Friends	5	3.7
Personal Savings	36	26.7
Total	135	100
Adopt		
No	73	54.1
Yes	62	45.9
Total	135	100.0
Own or Rent		
Non User	73	54
Own	44	32.6
Rent	18	13.3
Total	135	100.0
Association		
No	92	68.1
Yes	43	31.9
Total	135	100.0
Sell wholesale or retail		
No	20	14.8
Yes	115	85.2
Total	135	100.0

efficiency. This raises questions about the depth of their involvement in the value chain. Part-time processors may be less inclined to adopt capital-intensive technologies like FBT, as their decision-making is influenced by risk minimization, competing labour demands, and lower dependence on rice income. This potentially dilutes the incentive to invest in long-term efficiency improvements, and may partially explain why adoption rates remain modest despite the apparent profitability. For other occupations of the processors, farmers of different enterprises made up the largest percentage (44.4%), implying that business diversity aids and ensures that processing is done. Approximately 63.7% of respondents said they were members of a union that processes rice. Similar to this, Abdul-Rahaman and Abdulai (2020) stressed the significance of union membership in their research, emphasizing how social networks have a major and positive impact on market performance and value chain participation.

Access to credit was available to 99 respondents, or 73.3% of the sample. This suggests that the majority have a source of funding to maintain their business, which is consistent with the findings of Ogebe *et al.* (2022), who found that access to credit enables rice farmers to upgrade farming technologies and buy inputs, both of which increase the borrowers' productivity in their study. A significant portion, 47.4% and 26.7%, respectively, obtain their credit from personal savings and cooperative societies. This aligns with Tsado *et al.* (2014), who found that the majority of their rice processing respondents, at 97.5%, belonged to various cooperative societies. A frequency of 30 respondents, accounting for 22.22%, had their incomes between ₦100,001 and ₦ 500,000, while 24 and 73 respondents, at 20% and 17.77%, had incomes between ₦500,001 and 1,000,000 and greater than ₦1,000,000, respectively.

Adoption of False Bottom Technology reveals that 54.1% confirmed to be non-adopters of the technology, while a frequency of 62 respondents, at 45.9% confirmed to be adopters of the False Bottom Technology. Out of 62 users of the FBT, 44 respondents, at 32.6% claim to be owners of the technology, and the remaining 19 respondents at 13.3% claim to utilize the technology by rent. 92 respondents, or 68.1% of the sample, confirmed that they are not members of any organizations that encourage the usage of False Bottom Technology. A frequency of 115 respondents at 85.2% confirmed they sold their processed goods in wholesale or retail form. The highest proportion of the respondents, with a percentage of 47.4%, processed more than 1000 kg of paddy in a week.

Costs and returns of non-adopters and adopters

Table 2 displays the cost-returns analysis of the non-adopters and adopters of the false bottom technology below. The results show that for non-adopters, the respondents have an average total revenue of N25,608,141 annually and an average total cost of N5,262,167, net returns of N20,345,973, and a return on investment (ROI) of 386%. For the adopters, the respondents have an average total revenue of N31,827,276 annually and an average total cost of N4,467,345, net returns of N27,359,930, and a return on investment (ROI) of 612%. The ROI shows the strength of an enterprise; the higher the ROI, the better the enterprise. The processing enterprise in the study area using the false bottom technology was found to be highly profitable. The higher return on investment shows productive and efficient utilization of the technology by the respondents.

Table 1b. Socio-economic distribution of the respondents.

Socio-economic	Frequency	Percent	Non-Adopters	Adopters
Income (₦)				
<100,000	8	5.93	1	7
100,001-500,000	30	22.22	9	21
500,001-1000,000	24	17.77	14	10
>1000,000	73	54.07	48	25
Total	135	100.0	72	63
Average input (kg)				
<100	16	11.85	1	16
100-500	43	31.85	22	21
501-1000	12	8.88	10	2
>1000	64	47.4	40	24
Total	135	100		

Source: Author's Field Survey, 2024.

Table 2. Cost and return distribution of respondents.

Items	Non-adopters [Average value (N) (per annum)]	Adopters [Average value (N) (per annum)]
Total Revenue	25,608,141.67	31,827,276.19
Total Variable Cost	5,234,009	4,437,830.476
Depreciated Fixed Cost	28,158.80556	29,514.79365
Total Fixed Cost	28,158.80556	29,514.79365
Total Costs (TFC+TVC)	5,262,167.806	4,467,345.27
Net Income (TR-TC)	20,345,973.86	27,359,930.92
ROI (NI/TC)	386%	612%

Source: Author's field survey, 2024.

Factors determining the usage of technology

Table 3 shows the factors determining the usage of the false bottom technology. The rule of thumb says z-statistics must be exactly 2 or higher for variables to be significant at 5% at a 1.960 critical value. The intercept Bo, which shows the determinant of usage of the technology when other factors are zero, is -14.379, which shows a negative or inverse relationship with adoption of the false bottom technology, revealing that without other factors, processors will tend not to adopt the technology, and is not significant.

Age

The coefficient of the age of the respondents was found to be positive and significant at the 5% level of significance with a Z-statistic of 2.956 and a significant value of 0.003. The result revealed that as the age of the respondents increases, their tendency to adopt the false bottom technology increases and vice versa. This could be attributed to the fact that aged respondents will always prefer a convenient method of processing over and above the old and tedious method, especially in the processing phase. This result is in tandem with Kolapo *et al*. (2020), who found that age positively influences the adoption of locust bean processing technology in their study.

Gender

The coefficient of gender was found to be positive and statistically significant at the 5% level of significance, with a z-statistic of 2.536 and a probability or significance value of 0.011. The results reveal there was a positive relationship between gender and the adoption of the false bottom technology in the study area. Knowing that the majority were female agrees with Atere *et al.* (2022) in their study, where it was indicated that there is a significant relationship between the adoption of improved rice processing technologies and gender (women), and making gender relationships with the adoption of technology suitable and positive.

Table 3. Determinants of usage distribution of the respondents.

Parameter	Estimate	Std. Error	Z	Sig.
Age	0.129	0.0438	2.956	0.003
Gender	1.805	0.7116	2.536	0.011
Education	0.544	0.2138	2.544	0.011
Household Size	-0.451	0.1811	-2.490	0.001
Processing Experience	-0.196	0.0511	-3.835	0.000
Support services	1.778	0.8636	2.058	0.040
Compatibility with existing technology	1.549	0.8904	1.739	0.082
Intercept	-14.246	19005.2042	-0.0007	0.999

PROBIT model: PROBIT (p) = Intercept + BX (Covariates X are transformed using the base 10.000 logarithm.) [**Source:** Author's Field Survey, 2024].

Education

The coefficient of education was found to be positive and statistically significant at the 5% level of significance, with a z-statistic of 2.544 and a probability or significance value of 0.011. The results reveal there was a positive relationship between the education of the respondents and the adoption of the False Bottom Technology (FBT) in the study area. As the education level increases, the adoption of the false bottom technology increases, and vice versa. A unit increase in the year of education will lead to a 0.544 increase in the adoption of FBT technology among the respondents in the study area. This result is in agreement with the study of Tsado *et al. (*2014), where it was affirmed that education helps in comprehending the technology to be adopted.

Household size

The household size coefficient is -0.451, which shows there is a negative or inverse relationship between household size and the adoption of false bottom technology. This implies that as family size increases, the tendency to adopt reduces by 0.451 value, with a z-statistic of -2.490 at a significance value of 0.01. This implies that as household size increases, the possibilities of not adopting the technology increase, as the processors will have more hands to work with as labour. This result agrees with Adejoh *et al.* (2017)*,* as they affirmed that there was a decrease in the adoption of improved rice processing technology due to household size by 1%.

Experience

The coefficient of the level of experience of the respondents was found to be significant and negatively related at a 5% level of significance with a Z-statistic of -3.835 and a significance value of 0.000. The result implies that experience has an inverse relationship with adoption: the more experience, the less the willingness to adopt innovations. In this case, this shows that despite the expected direct relationship between experience and age, there was a difference between both variables' influence on adoption, as getting older showed an increase in adoption, but having more experience did not. This could be due to risk-avoiding behaviour and satisfaction at the level of production of experienced actors, regardless of the ease such technology brings, unlike the fresh actors who are less concerned about uncertainties related to the technology and more risk-oriented. Weinberg (2004) suggests that advancements in technology play a significant role in explaining shifts in experience premium. Further, this indicates a positive relationship between the level of human capital already possessed and the adoption of technology. Additionally, finding evidence supporting the idea that younger workers tend to be more adept at adapting to and utilising new technologies, unlike experienced older individuals.

Support services

Support Services has a coefficient of 1.778, which shows there is a positive and direct relationship between government policies that support usage and the adoption of false bottom technology at a significance level of 5%. This implies governmental policy and support services are key to the implementation of any innovation because they create an enabling environment. The more these strategies and actions are implemented, the higher the tendency to adopt innovations such as the FBT technology. The increase is directly proportional to adoption at a value of 1.778 with a z-statistic of 2.058 at a significance value of 0.04. Assaye *et al.* (2023) concluded in their study that policies at the farm level that impact the adoption of one enhanced agricultural technology can lead to positive outcomes for other technologies as well.

Compatibility with existing technology

Compatibility with existing technology has a coefficient estimate of 1.549, which is a positive and direct relationship with adoption of technology, with a z-statistic

Table 4. Constraint to the use of the FBT distribution of the respondents.

Constraints	5	4	3	2	1	Mean	Rank
Government policy and support	41(30.4)	26(19.3)	36(26.7)	25(18.5)	7(5.2)	3.51	1st
Scale/Size of business	31(23)	44(32.6)	35(25.9)	2(1.5)	23(17)	3.43	2nd
Market demand	45(33.3)	22(16.3)	21(15.6)	28(20.7)	18(13.3)	3.33	3rd
Inaccessibility to technology	33(24.4)	34(25.2)	33(24.4)	3(2.2)	32(23.7)	3.24	4th
Non availability of the technology	45(33.3)	15(11.1)	34(25.2)	0	40(29.6)	3.16	5th
Technical knowhow	25(18.5)	18(13.3)	57(42.2)	3(2.2)	32(23.7)	3.01	6th
High commodity price	29(21.5)	20(14.8)	23(17)	18(13.3)	45(33.3)	2.78	7th
Cost of technology	26(19.3)	22(16.3)	2518.5)	3(2.2)	59(43.7)	2.65	8th
Cultural and Traditional beliefs	15(11.1)	5(3.7)	20(14.8)	26(19.3)	69(51.1)	2.01	9th

Source: Author's Field Survey, 2024.

of 1.739 at a level of significance of 10%; this implies that the increase in compatibility with other technological fractions in the rice processing enterprise increases adoption by a value of 1.549. Similarly, Assaye *et al.* (2023) attested that improved rice production technology packages are complementary, i.e., farm-level policies that affect the use of one improved agricultural technology can have a positive effect on the other technologies.

Constraint to the use of the FBT technology

Table 4 highlights various constraints to the adoption of false bottom technology among rice processors in the study area. These constraints are ranked according to their mean score to identify their order of importance to the respondents. Lack of government policy and support ranks highest with a mean score of 3.51, indicating that the absence of government policy and support significantly hampers the adoption of this technology. Without supportive policies from the government, processors may lack the necessary resources and incentives to integrate new technologies into their operations.

Scale or Size of Business (Mean: 3.43) ranks 2nd, showing that the size of the businesses affects technology adoption. Larger operations and demands may find the locally fabricated technology inadequate for their scale of operation, hindering effective integration. This constraint indicates that the size of a rice processor's operation significantly affects the likelihood of adopting False Bottom Technology. Larger enterprises often deal with higher production volumes and more rigorous quality demands. Many locally fabricated FBT units are designed for small- to medium-scale operations and may not meet the technical or capacity requirements of larger processors. As such, the scalability limitations of locally available FBT systems hinder adoption among large-scale businesses. This is similar to Dissanayake *et al*. (2022) in their study that identified size of farm as one of the factors that affect adoption decision, usually a positive correlation.

Market Demand (Mean: 3.33) ranks third, suggesting that consumer preferences for traditional methods, which give an already accustomed aesthetic feature to the rice, can impact technology adoption. The demand for rice processed without the false bottom technology affects processors' decisions to invest in new methods. As a result, processors may be reluctant to adopt FBT if it alters these perceived attributes, even if the new method improves efficiency. This creates a tension between innovation and consumer expectations, influencing processors' investment decisions.

Inaccessibility of Technology (mean: 3.24) ranks fourth on the list of constraints, indicating that difficulties in accessing the technology deter its adoption. Local fabrications of the technology often do not match the capacity of the originally introduced designs, limiting their usefulness. Additionally, distribution channels for acquiring the technology remain weak. This logistical and technical inaccessibility limits potential users' exposure to and confidence in adopting the innovation.

Non-availability of Technology (Mean: 3.16) ranks fifth on the list. This constraint highlights the challenges posed by the unavailability of technology. The inability to access or replicate the original design restricts its widespread use. This constraint emphasizes the outright absence of FBT in many processing hubs. In areas where the technology has not been introduced or promoted, processors have no opportunity to observe, test, or purchase it. The lack of a clear supply chain or certified vendors further constrains its dissemination, particularly outside pilot communities or intervention zones.

Technical know-how, with a mean score of 3.01, ranks sixth. This implies that a neutral stance is taken regarding technical know-how. While it is not a major barrier, a lack of expertise could still impede effective adoption. For adopters, technical challenges such as improper installation may reduce the benefits of the technology. A lack of structured technical support or demonstration sessions may be contributing to this uncertainty.

High Market Price (Mean: 2.78) ranks seventh, suggesting that the high price of commodities is a neutral factor. Although not a major barrier, it still impacts the decision-making process regarding technology use. While elevated rice prices might increase profits and theoretically encourage investment, they may also signal market volatility. This uncertainty can make processors hesitant to take financial risks, especially for unfamiliar or untested technologies. According to Cornelius (2021) in their study that farmers face major obstacles such as information and training (75.1%), market constraints (61.7%), and input availability (52.3%). These are similar cases to the report from this study.

Cost of Technology (Mean: 2.65) ranks eighth, indicating that the cost of the technology itself is not considered a significant barrier. Most respondents disagree that cost is a constraint, suggesting it is less of an issue compared to other factors. This could be as a result of existing cost-sharing arrangements like cooperatives or donor programs, or the use of rented/shared equipment. It suggests that other factors, such as availability and functionality, are more pressing barriers than price alone.

Cultural and Traditional Beliefs (Mean: 2.01) ranks lowest, showing that cultural and traditional beliefs are not significant barriers to technology adoption in this case. Most respondents do not consider these beliefs a hindrance, indicating a growing openness to innovation among rice processors, provided the technology meets practical needs and yields observable benefits. This case is unique to this study and differs from Tanko and Ismaila (2021), who, after demonstrating that adopters had a smaller technology gap than non-adopters, identified cultural and religious practices as critical determinants of technical efficiency, recommending an integrated approach of factoring culture and religion into agricultural technology diffusion to improve technical efficiency.

Conclusion

To begin with**,** this study has offered advice by assessing the impact of the false bottom technology on the economic performance of rice processing in Ekiti State, Nigeria. This study assessed the non-adopters and adopters of the technology. A number of 45.9% were adopters, while non-adopters were 54.1%. Female respondents were 43.8% higher than male; 40.74% of the respondents fell between 41 and 50 years of age, with a mean ($\bar{x}$) of 50. Adopters have a higher ROI at 612%, while non-adopters have their ROI of 386%, which makes adopters more profitable in the business. Age, gender, education, household size, experience, government policy, and compatibility with existing technology were significant factors that influenced the adoption of the False Bottom Technology. Constraint to the use of the technology was accounted for mostly by government policy and support, which implies the importance of policies that support usage and spread of the technology, and scale/size of the business, which is evident even as non-adopters have a larger scale of business.

Building on these findings, the study shows there were still non-adopters, despite the results and economic performance of the adopters of the technology. The majority of the non-adopters gain from their businesses because they process more kilograms of paddy compared to adopters, who are more of a medium-scale enterprise but get a better price for quality. The research conclusions show that the use of False Bottom Technology positively improves the economic performance of rice processing, and quality improvement was proven. It is therefore advised that processors align with this technological trend for better quality.

Recommendations

In light of these conclusions, this study recommends that training programs and development initiatives should be addressed to rice processors regularly to equip them with the knowledge and skills to effectively implement and utilize false bottom technology in operations. Also, researchers and fabricators of the technology should recreate the technology with the capacity to convince non-adopters it will suit their scale/size of business to meet their demands. In order for the government to achieve quality control and grading in the market, incentives and interventions should start from actions like commissioning the fabricators and empowering the people; this implementation of the false bottom technology will help offset initial investment costs and encourage adoption. Public-private partnerships should set up monitoring and evaluation frameworks to track the adoption and impact of the false bottom technology after its introduction, to identify area-specific bottlenecks such as the impossible fabrication of an exact model, and to make improved adjustments alongside its distributions. Lastly, training programs and development initiatives should be addressed at rice processors on a regular basis to equip them with the knowledge and skills to effectively implement and utilize false bottom technology in their operations.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

Abdul-Rahaman, A., & Abdulai, A. (2020). Social networks, rice value chain participation and market performance of smallholder farmers in Ghana. *African Development Review*, *32*(2), 216-227.

Abubakar, H. N., Umar, B. F., Gbanguba, A. U., Dauda, N. S., Garba, Y., Hamisu, S., & Abubakar, M. B. (2023). Adoption of Improved Rice Processing Technologies: A case of Small-scale Processor Groups under IFAD-Value Chain Development Program in Niger State, Nigeria. *Badeggi Journal of Agricultural Research and Environment*, *5*(1), 60-71.

Adediran, A., Olorunnisola, A., Yisa, F., & Ahmed, M. (2019). Impact of IFAD-VCDP promoted modern rice processing techniques on the livelihood of women processors and climate change mitigation in Kontagora, and Shiroro, Niger state, Nigeria. MDP-IFAD Project *Research Report.* https://www.researchgate.net/publication/341463298.

Adejoh, S., Madugu, N., & Shaibu, U. (2017). An Assessment of the adoption of improved rice processing technologies: A case of rice farmers in the Federal Capital Territory, Abuja, Nigeria. *Asian Research Journal of Agriculture*, *5*(4), 1-9.

Agbatse, A. (2022). Assessment of capacity building needs of rice value chain actors in Benue and Nasarawa States, Nigeria. Repository.mouau.edu.ng. Retrieved May 27 2024 from https://repository.mouau.edu.ng/work/view/assessment-of-capacity-building-needs-of-rice-value-chain-actors-in-benue-and-nasarawa-states-nigeria-7-2

Ajayi, A. T., Oyewale, P. O., & Ogunleye, O. R. (2020). A historical appraisal of local rice production and its impact on the agro-economic sector of Ekiti State 1945–2015. *African Journal of Economics and Sustainable Development*, *3*(1), 33-47.

Akinbile, C. O. (2023). Nigeria is Africa's leading rice producer, but still needs more - reusing wastewater for irrigation would boost farming. The Conversation. Retrieved from https://theconversation.com/nigeria-is-africas-leading-rice-producer-but-still-needs-more-reusing-wastewater-for-irrigation-would-boost-farming-206787

Alabi, O. O., Adebowale, A. A., Adio, M. O., Fasuan, Y. O., Obabire, I. E., & Fakunle, O. O. (2022). Adoption of modern post-harvest rice handling technologies in Ekiti State, Nigeria. *Journal of the Austrian Society of Agricultural Economics*, *18*(5), 1053-1059.

Assaye, A., Habte, E., & Sakurai, S. (2023). Adoption of improved rice technologies in major rice producing areas of Ethiopia: a multivariate probit approach. *Agriculture & Food Security*, *12*, Article number 9.

Atere, O. B., Obabire, I. E., Adeleye, I. A., Fasuan, Y. O., & Olanrewaju, I. (2022). Adoption of improved rice processing technologies by women in Irepodun/Ifelodun local government area of Ekiti state, Nigeria. *Global Scientific Journal*, 10(7), 2640-2652.

Carcea, M. (2021). Value of wholegrain rice in a healthy human nutrition. *Agriculture*, *11*(8), 720.

Danbaba, N., Idakwo, P. Y., Kassum, A. L., Bristone, C., Bakare, S. O., Aliyu, U., Kolo, I. N., Abo, M. E., Mohammed, A., Abdulkadir, A. N., Nkama, I., Badau, M. H., Kabaraini, M. A., Shehu, H., Abosede, A. O., & Danbaba, M. K. (2019) Rice postharvest technology in Nigeria: An overview of current status, constraints and potentials for sustainable development. *Open Access Library Journal*, 6: e5509.

Dissanayake, C. A. K., Jayathilake, W., Wickramasuriya, H. V. A., Dissanayake, U., & Wasala, W. M. C. B. (2022). A review on factors affecting technology adoption in agricultural sector. *Journal of Agricultural Sciences–Sri Lanka*, *17*(2), 280-296.

Elum, Z. A., & Enemali, C. O. (2024). Challenges faced by paddy smallholder farmers in Ayamelum Local Government Area of Anambra State, Nigeria. *Journal of Agriculture and Environment*, *19*(2), 25-35.

Idowu, A. C. (2021). Constraints to Farmers' Adoption of Agricultural Technology: A Case of Sawah Eco-technology among Farming Households in Kebbi State Nigeria. *Dutse International Journal of Social and Economic Research*, *6*(1), 119-127.

Kolapo, A., Omopariola, O. E., Adeoye, A. O., & Kolapo, A. J. (2020). Adoption of improved processing technology among African locust bean processors in south-west, Nigeria. *International Journal of Agricultural Research, Innovation and Technology*, *10*(1), 123-128.

Obayelu, O. A., Agbohin, J. A., & Obisesan, O. O. (2022). Consumers' preference for local rice brands in Ibadan Metropolis, Nigeria. *Food and Agri Economics Review*, *2*(1), 12-17.

Ogebe, F., Olagunju, O., & Abah, D. (2022). Access to credit and rice production efficiency of rural households in Benue State, Nigeria. *Nigerian Journal of Agriculture and Agricultural Technology*, *2*(1), 102-115.

Okonkwo, U. U., Ukaogo, V., Kenechukwu, D., Nwanshindu, V., & Okeagu, G. (2021). The politics of rice production in Nigeria: The Abakaliki example, 1942-2020. *Cogent Arts & Humanities*, *8*(1), 1880680.

Okunola, A. A., Adekanye, T. A., Adewumi, A. D., & Asamu, F. (2019). Assessment of rice processing operations in Ekiti State, Nigeria. *International Journal of Civil Engineering and Technology*, *10*(2), 2197-2204.

Olanrewaju, R. M., Tilakasir, S. L., & Oso, C. (2017). Climate change and rice production: A case study in Ekiti State, Nigeria. Journal of Agricultural Sciences, *12*(2), 95-107

Olayemi, S. S., Temitope, A. B., & Ayo, O. A. (2021). Assessment of the Constraints Associated with the Processing of Paddy Rice: A Case Study of Smallholder Farmers in Gwagwalada, Abuja. *Journal of Current Trends in Agriculture, Environment and Sustainability*, *2*(1), 1-7.

Olomu, M. O., Ekperiware, M. C., & Akinlo, T. (2020). Agricultural sector value chain and government policy in Nigeria: issues, challenges and prospects. *African Journal of Economic and Management Studies*, *11*(3), 525-538.

Omolehin, R. A., Fakayode, S. B., Oyewole, S. O., & Alabi, O. O. (2022). Rice and Non-Rice Staple Consumption Preference among Urban and Rural Communities of Ekiti State, Nigeria. *Tropical Journal of Natural Product Research*, *6*(11), 1876-1881.

Price Water House Coopers and Lybrand (PWC) (2018). Boosting rice production through increased mechanisation. Review of Nigeria's rice industry. Price Water House Coopers. Pp. 6-7. Retrieved 21st December 2023 from https://www.pwc.com/ng/en/assets/pdf/boosting-rice-production.pdf.

Ruzzante, S., Labarta, R., & Bilton, A. (2021). Adoption of agricultural technology in the developing world: A meta-analysis of the empirical literature. *World development*, *146*, 105599.

Salami, O. S., & Adisa, R. S. (2023). Adoption of false bottom technology among trained rice processors in North Central, Nigeria. *International Journal of Agricultural Economics, Management and Development, 11*(1) 51-61.

Tanko, M., & Ismaila, S. (2021). How culture and religion influence the agriculture technology gap in Northern Ghana. *World Development Perspectives*, *22*, 100301.

Thriveagric (2020). Statistics: Rice Production in Nigeria. Retrieved from https://medium.com/thrive-agric/rice-production-in-nigeria-7ef4918ced6a.

Tondo, D. T. (2017). Comparative economic analysis of rice processing methods in Benue State, Nigeria. *International Journal of Environment, Agriculture and Biotechnology*, *2*(6), 2776-2782.

Tsado, J. H., Adeniji, O. B., Ajayi, O. J., Ojo, A. O. & David, Y. (2014). Adoption of improved rice processing technologies among women in Niger State. *Journal of Agriculture and Agricultural Technology*, *5*(1), 34-38.

Tsokar, D. (2022). Nigeria at a Glance. FAO in Nigeria, Food and Agriculture Organisation of the United Nations. Retrieved from https://www.fao.org/nigeria/fao-in-nigeria/nigeria-at-a-glance/en/

Ugwuja, A. A., & Chukwukere, C. (2021). Trade protectionism and border closure in Nigeria: The rice economy in perspective. *Unizik Journal of Arts and Humanities*, 22(1), 78-106.

Weinberg, B. A. (2004). *Experience and technology adoption* (No. 1051). IZA Discussion Papers.