



ADOPTION OF INTERNATIONAL FUNDS FOR AGRICULTURAL DEVELOPMENT INNOVATIVE PRACTICES BY RICE PROCESSORS IN NIGER STATE, NIGERIA

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ABSTRACT

This study examined the Adoption of International Fund for Agricultural Development (IFAD) value chain development innovative practices by Rice Processors in Niger State, Nigeria. A multi-stage sampling procedure was employed to select 117 rice processors for the study. Primary data were collected from rice processors using a structured questionnaire, complemented by an interview schedule, and analysed using descriptive statistics. The results revealed that the mean age of the respondents in the study area was 45 years, the mean household size was 9 people, and the mean processing experience was 18 years. The results further show that destoning (94.9%), collection of mature paddy rice (91.5%), and milling (removal of the bran layers) (85.5%) were the major innovative practices adopted by the rice processors in the study area and ranked 1st, 2nd, and 3rd, respectively. On the level of adoption by the rice processors, use of clean water (=4.41), packaging which preserves quality (=4.38), rank 1st and second respectively. The study applied factor analysis to identify the underlying constraints associated with the adoption of innovative practices, and the factors jointly accounted for approximately 61.5% of the total variance, suggesting they adequately represent the underlying dimensions of rice processors' constraints. In

conclusion, the study found that innovative practices, such as washing with clean water and proper packaging, were widely adopted by rice processors in the study area. Thus, the study recommended that IFAD-VCDP should expand their training programs to cover the entire State.

Keywords: Adoption; Innovations; IFAD-VCD; Rice Processors; Factor Analysis

INTRODUCTION

Innovation plays a crucial role in driving efficiency, reducing waste, and improving the quality of rice processing. It involves introducing new or significantly improved ideas, products, or methods that enhance productivity and streamline operations (Nonvide, 2021). Nonetheless, innovation refers to the introduction of new ideas, methods, or products to improve efficiency and outcomes. According to Neema (2023), innovation is the driving force behind economic development, as it involves the creative destruction of outdated methods in favour of more efficient and productive alternatives. In the agricultural sector, innovation encompasses advancements in mechanisation, digital tools, and processing techniques that enhance productivity and quality. For rice processors, innovation could mean adopting parboiling technologies to enhance rice's nutritional value, using energy-efficient dryers, or integrating value-adding practices to make their products more marketable. However, as noted by Nath *et al.* (2024), the adoption of agricultural innovations is often influenced by factors such as access to information, perceived risks, and financial constraints. On the other hand, rice processing is pivotal in ensuring food security and economic growth in Nigeria. Despite the country being one of Africa's largest rice producers, inefficient processing techniques continue to hinder the sector's full potential. According to the Food and Agriculture Organisation (FAO, 2020), post-harvest losses in Nigeria's rice industry are estimated at 20–30%, largely due to outdated processing methods. This inefficiency not only affects productivity but also reduces the quality and competitiveness of locally processed rice in the market (Abdul-Rahaman and Abdulai, 2022). Given the increasing global demand for high-quality rice, the adoption of innovative practices and modern technologies in rice processing has become imperative for processors in Niger State to remain competitive. Many reached the farmers, but few were adopted initially; even fewer were eventually adopted, and many discontinued. The reason for this may not be far-fetched.

The adoption of IFAD-VCDP innovative practices in rice processing is essential for improving efficiency, reducing post-harvest losses, and enhancing the competitiveness of locally processed rice. However, despite the availability of improved processing techniques, many rice processors in Niger State continue to rely on traditional and less efficient methods. Consequently, little was known about the adoption of improved rice-processing IFAD-VCDP innovations in the study area. The study was therefore conceived to address the following research objectives:

1. Describe the socio-economic characteristics of IFAD-VCDP rice processors in the study area.
2. Examine the sources of information on IFAD-VCDP innovative practices.
3. Examine the IFAD-VCDP innovative practices.
4. Examine the level of adoption of IFAD-VCDP innovative practices and
5. Examine the constraints associated with the adoption of IFAD-VCDP innovative practices in the study area.

Findings from this study would therefore provide researchers with valuable insights by contributing to the existing literature and offering policymakers evidence-based recommendations to enhance financial inclusion and the adoption of innovation among rice processors.

METHODOLOGY

The study was carried out in Niger State, Nigeria. Niger State, which is located between Latitudes 8022'N and 11030'N and Longitudes 3030'E and 7020'E. The State shares an international boundary with the Republic of Benin at Babanna, in Borgu Local Government Area. Kogi, Kwara, Nasarawa and FCT. Currently, the State covers an estimated 76,363 square kilometres, about 8% of Nigeria's total land area (Oni *et al.*, 2021). The projected population of the State as of 2022 was **5,824,772** at a 3.2% population growth rate (National Bureau of Statistics (NBS), 2022). The State is divided into three agricultural Zones, namely: Zone 1, with headquarters at Bida; Zone II, with headquarters at Kuta; and Zone III, with headquarters at Kontagora. The average annual rainfall of the State is 1,219 mm. The dry season runs from November to March. Temperature is fairly consistent, ranging from 26.1°C (June – February) to 30.3°C (March – April) (Awolabi and Adewumi, 2019). The major languages spoken are Nupe, Gbagyi, and Hausa, while the major occupation of the people is

farming. Major crops cultivated include rice, guinea corn, maize, yams, beans, groundnut, and sugarcane (Oyibo *et al.*, 2020). The State has large water bodies (the Rivers Niger and Kaduna) with numerous tributaries, as well as lakes and dams (Shiroro, Kainji, and Jebba).

This study adopts multi-stage sampling techniques. The first stage involves selecting three agricultural zones in the state. The second stage involves purposive selection of three (3) Local Government Areas (LGAs), namely, Bida, Shiroro and Kontagora in zones I, II and III, respectively, due to the preponderance of rice processing activities, particularly as International Fund for Agricultural Development – Value Chain Development Programme (IFAD-VCDP) intervention is concentrated. The third stage involves identifying all rice processing clusters in the selected LGAs to serve as the sample frame. The final stage involves the proportional selection of a sample of 117 respondents using Taro Yamane's formula (1967), as adopted by Olanrewaju (2019). Data were obtained from primary sources using a structured questionnaire. The questionnaire comprised open- and closed-ended questions and was used to elicit information on Innovative practices such as destoning, collection of mature paddy rice, milling, steaming, winnowing, drying, branding, packaging, sorting, and grading. Regarding the respondents' adoption of innovative practices, the following decision was derived from Rogers (2003). Respondent who scored between 1 – 8 was classified as an early adopter (mean less than 3), while

9 – 16 was classified as early majority (mean equal to or greater than 3)

Descriptive statistics were employed to summarise key variables in the study. Specifically, frequencies and percentages were used.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Rice Processors under IFAD-VCDP

Table 1 shows that the respondents' mean age was 45 years, indicating that the processors were still in their active, productive years. Hence, it can effectively adopt rice processing technologies. This result is in line with that of Onyeneke *et al.* (2022), who reported that the majority of the rice farmers in their study area were aged 31-50 in Ebonyi State, Nigeria. The majority (91.5%) of the rice processors were married, corroborating the findings of Ojo *et al.* (2023), who reported that the majority of rice processors in Southwest Nigeria were married and thus had adequate family labour

to support rice production. The mean household size of the farmers was nine (9) persons. This finding agrees with that of Addison *et al.* (2020), who reported that the respondents in their study area have a household size mean of 6 people. About (49.6%) of the rice processors had formal education, which includes primary, secondary and tertiary education, with an average number of years spent in school of 6 years, while more than half (50.4%) had no formal type of education. This implies that rice processors in the study area had either formal education or the other. More than half (53.8%) of the rice processors were engaged in rice processing as their primary occupation. This could be because the livelihood activities of the rural dwellers in the study area were farming and processing. The mean processing experience was 18 years. This substantiates the findings of Salawu *et al.* (2023), which reported that the average years of experience of rice processors in Kwara State, Nigeria, was 18 years.

All respondents (100.0%) had access to an extension agent, with an average of 7 visits per annum. This implies that processors in the study area had adequate access to extension services, which could facilitate the adoption of innovative rice-processing practices. In addition, the majority (99.1%) of the rice processors had access to training on improved rice processing. This finding contradicts that of Gandasari *et al.* (2021), who reported that the majority of rice processors in their study area had no access to extension services or training on innovative rice-processing practices.

Sources of Information on Innovative Practices from IFAD-VCDP

The results in Table 2 indicate that extension agents (78.5%), cooperative society (61.2%) and radio (47.1%) were the major sources of information on innovations among rice processors in the study area. The dominance of extension agents underscores their crucial role as a trusted, direct channel for disseminating knowledge about innovations and modern processing technologies. This finding is consistent with that of Nonvide (2021), who reported that extension services provided by extension agents remained vital for bridging the gap between researchers and end users by simplifying technical information for practical adoption. Cooperative societies were also identified as a significant source of information. Radio as an information source further underscores the mass media's role in disseminating rural innovation. Radio is particularly important in rural settings due to its affordability, wide reach, and ability to convey information in local languages (Olaifa *et al.*, 2024)

Table 1: Socio-economic characteristics of rice processors under IFAD-VCDP

Variable	Frequency	Percentage (%)	Mean
Age			
Below 31 years	6	5.1	45 years
31-40 years	29	24.8	
41-50 years	56	47.9	
Above 50 years	26	22.2	
Marital status			
Widow(er)	8	6.8	
Divorced	1	0.9	
Single	1	0.9	
Married	107	91.4	
Household size			
1-5 persons	19	16.2	9 members
6-10	66	56.4	
11-15	22	18.8	
Above 15	10	8.5	
Education			
No-formal	59	50.4	6 years
Primary	13	11.1	
Secondary	16	13.7	
Tertiary	29	24.8	
Primary occupation			
Farming	22	18.8	
Civil servant	12	10.3	
Processing	63	53.8	
Artisanal	20	17.1	
Processing experience			
1-10 years	18	15.4	18 years

11-20 years	69	59.0	
21-30 years	17	14.5	
Above 30 years	13	11.1	
Access to extension			
Yes	117	100.0	
No	0	0	
Number of visits			
1-5	55	47.0	7 visits
6-10	47	40.2	
11-15	15	12.8	
Access to trainings			
Yes	116	99.1	

Source: Field Survey, 2025

Table 2: Respondents' sources of information on innovative practices in rice processing

Sources	*Frequency	Percentage	Rank
Extension agents	95	78.5	1 st
Cooperative society	74	61.2	2 nd
Radio	57	47.1	3 rd
Workshop and seminar	50	41.3	4 th
Family and friends	43	35.5	5 th
Print media	40	33.1	6 th
Television	29	24.0	7 th

Source: Field Survey, 2025. *Multiple responses were allowed.

Types of Innovative Practices in Rice Processing by IFAD-VCDP

Table 3 shows that de-stoning (94.9%), collection of mature paddy rice (91.5%), milling (removal of the bran layers) (85.5%), and washing with clean water (84.6%) were the major types of innovative practices in rice processing in the study. This aligns with Adetola and Akindahunsi (2020), who found that adoption of quality-enhancing technologies was driven by market demand for cleaner and safer products. A collection of mature paddy rice as an innovative practice highlights the recognition of quality control that begins with harvesting practices. Processing immature paddy often results in broken grains, reduced milling recovery and lower consumer preference. Milling (removing the bran layers) is another crucial innovation that has had a high adoption rate among rice processors. Modern milling technologies help to improve recovery rates, ensure uniform grain quality, and extend the shelf life of processed rice (Obianefo *et al.*, 2023). This implies that processors are shifting from traditional pounding methods to mechanised milling, which is more efficient and market-oriented.

Level of Adoption of Innovative Practices in Rice Processing by IFAD-VCDP Rice Processors

The results in Table 4 show that washing with clean water (=4.41), packaging which preserves quality (=4.38), drying Slab (=4.37) and de-stoning (=4.36) were the major innovative practices adopted by IFAD-VCDP Rice processors. The high mean score for **washing with clean water** underscores its importance as a fundamental step in producing safe, hygienic, and high-quality rice as part of the training received by IFAD-VCDP. Washing removes dirt, dust, and impurities, thereby reducing contamination and improving consumer acceptability. This finding aligns with the observations of Okoye *et al.* (2020), who reported that clean water use in processing enhances the safety and market value of agricultural products, which aligns with the IFAD intervention goal.

Table 3: Types of innovative practices in rice processing by IFAD-VCDP

IFAD Innovative practices	*Frequency	Percentage	Rank
De-Stoning	111	94.9	1 st
Collection of mature paddy rice	107	91.5	2 nd
Milling (removing the bran layers)	100	85.5	3 rd
Washing with clean water	99	84.6	4 th
Re-drying on a cold dry weather	99	84.6	4 th
Steaming (40 - 45 minutes)	97	82.9	6 th
Winnowing	97	82.9	6 th
Boiling water at about 80 degree centigrade	96	82.9	6 th
Re-wash thoroughly	96	82.9	6 th
Drying (6hrs) depending on the intensity of the sun	95	81.2	10 th
Polishing to enhance texture and appearance	95	81.2	10 th
Branding	95	81.2	10 th
Soaking in warm water (8 - 10hrs)	94	80.3	13 th
Packaging which preserves quality	94	80.3	13 th
Sorting and grading for uniformity	70	59.8	15 th

Source: Field Survey, 2025.

***Multiple responses recorded**

Table 4: Level of adoption of innovative practices in rice processing by IFAD-VCDP Rice Processors

Variables	Mean (\bar{x})	Rank	Remark
Washing with clean water	4.41	1 st	Early Majority
Packaging which preserves quality	4.38	2 nd	Early Majority
Drying Slab	4.37	3 rd	Early Majority
Re-wash thoroughly	4.37	3 rd	Early Majority
De-stoning	4.36	5 th	Early Majority
Weighing machine	4.36	5 th	Early Majority
Boil water at about 80 Degree	4.35	7 th	Early Majority
Milling (removing the bran layer)	4.35	7 th	Early Majority
Soaking in warm water (8 - 10hrs)	4.35	7 th	Early Majority
Winnowing	4.34	10 th	Early Majority
False Botton	4.34	10 th	Early Majority
Drying (6hrs) depending on the intensity of the sun	4.34	10 th	Early Majority
Re-dry on a cold dry weather	4.33	13 th	Early Majority
Black closer	4.32	14 th	Early Majority
Steaming (40 - 45 minutes)	4.30	15 th	Early Majority
Branding	4.29	16 th	Early Majority
Collection of mature paddy rice	4.27	17 th	Early Majority
Alluminium pot (30)	4.25	18 th	Early Majority
Steaming tank (300kg)	4.22	19 th	Early Majority
Publishing to enhance texture and appearance	4.17	20 th	Early Majority
Alluminium pot (50)	4.12	21 st	Early Majority
Alluminium pot (20)	3.97	22 nd	Early Majority
Steaming tank (600kg)	3.67	23 rd	Early Majority
Sorting and grading for uniformity	3.62	24 th	Early Majority
Rubber Roller Machine	2.89	25 th	Early adopter
Automated machine	2.87	26 th	Early adopter
Briquettes machines	2.61	27 th	Early adopter

Source: Field survey, 2025. Note: Mean cut-off ≥ 3.0

Constraints associated with the adoption of Innovative Practices by IFAD-VCDP

These factors jointly accounted for approximately 61.5% of the total variance in the results, suggesting that they adequately represent the underlying dimensions of processors' constraints. These results imply that rice processors perceived the economic burden of adopting modern rice processing technologies as the most pressing challenge. High acquisition and maintenance costs, the inclusion of post-harvest losses and poor storage in this factor indicate that rice processors also view these losses as economic in nature, further reinforcing the centrality of financial limitations. This substantiates the findings of Otekunrin *et al.* (2019), who reported that high costs of improved agricultural technologies and limited access to credit facilities were the major barriers to adoption among Nigerian rice processors. The second factor addresses institutional and infrastructural deficiencies. Variables with strong loadings here included poor and inconsistent power supply (eigen value=0.831). The third factor concerns behavioural, knowledge, and attitudinal barriers. Major constraints here included lack of technical skills and training (eigen value=0.634). This is in line with that of Bello *et al.* (2021), who reported that awareness and extension training are key determinants of technology uptake, highlighting that limited exposure reduces farmers' willingness to adopt

Table 5: Constraints associated with adoption of innovative practices by IFAD-VCDP Rice Processors

Constraint	Highest eigenvalues	Assigned Factor
Economic-Related Factor (ERF)		
High cost of Automated milling systems	0.831	ERF
High cost of Digital destoners	0.822	ERF
Policy-Related Factor (PRF)		
Poor and inconsistent power supply	0.663	PRF
Infrastructure deficits	0.731	PRF
Cultural/Attitudinal Related Factor (CRF)		
Lack of technical skills and training	0.634	CRF
Limited knowledge of modern milling techniques	0.656	CRF

Source: Field Survey, 2025

RECOMMENDATIONS

The study revealed that IFAD-VCDP innovative practices, such as washing with clean water, packaging that preserves quality, drying slabs, and de-stoning, were widely adopted by rice processors in the study area. This study has also made significant contributions to knowledge by providing empirical evidence on the adoption of IFAD-VCDP innovations in Niger State, Nigeria. Unlike most previous studies that focus largely on rice production technologies, The findings show that these IFAD-VCDP innovations are not only widely adopted but linking adoption practices directly to rice processors' income, the study provides a deeper understanding of how IFAD-VCDP innovations at the processing stage contribute to increase in quality of milled rice in the study area, increased income, improve market linkage, improvement livelihood status, and in fact most of the rice processors are now millionaires through IFAD-VCDP intervention in the State, these also had reduce poverty line of participating beneficiaries.

Based on the findings of the study, the following recommendations have been drawn:

1. Regular training and demonstrations by extension agents through IFAD-VCDP should be intensified to enhance rice processors' technical knowledge and adoption of IFAD-VCDP innovations.
2. Rice processors should be encouraged by the extension agent, through IFAD-VCDP, to join cooperative societies for collective training and support for interventions.
3. More intervention support in terms of infrastructures and women-friendly climate-resilient rice processing equipment to ensure high-quality and market-driven rice products

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