Current Innovation in Agriculture Science
Vol. 2, Issue 4, pp. 720-728
Research Article
ISSN (E): 3048-6009

Adoption of Cassava processing technologies among rural women of Kogi State, Nigeria

Shuaibu U, **Abdullahi A**, **Muhammad H U**, **Jibrin S** and **Abdulsalam Y**
Department of Agricultural Extension and Rural Development Federal University of Technology Minna, Niger state, Nigeria.

Received: 03 March 2025 | Accepted: 05 September 2025

DOI: https://doi.org/10.65791/cias.68

ABSTRACT

This study explores the adoption of cassava processing technologies among rural women in Kogi State, Nigeria, a region recognized as one of the country's leading cassava producers. It addresses critical challenges including low productivity, post-harvest losses, and gender-based disparities in technology access. Primary data were collected from 140 respondents across four agricultural zones to examine their socio-economic characteristics, adoption levels, perceived benefits, influencing factors, and constraints to adoption. Findings indicate that 90% of respondents possess formal education, while 66.4% access credit primarily through informal sources such as family and friends. High adoption rates were recorded for technologies such as mechanical peelers, automatic fryers, and starch extractors (100%), whereas the adoption of bagging machines was the lowest (51.4%). The most influential factors driving adoption included observability (mean = 3.34), cost-effectiveness (mean = 3.33), and relative advantage (mean = 3.17). Perceived benefits of these technologies include improved energy efficiency, enhanced product quality, and opportunities for product diversification. However, adoption is hindered by constraints such as inadequate training, high labour requirements, limited institutional support, and insufficient storage infrastructure. The study concludes that although the adoption level is relatively high, addressing these challenges is essential for sustained technology use. It recommends targeted training programs, expanded extension services, improved access to financing, investment in storage facilities, and the establishment of cooperative support networks to enhance the adoption and long-term sustainability of cassava processing technologies among rural women.

KEY WORDS: *Cassava*; *Women*; *Processing*; *Technologies*; *Rural*; *Kogi state*

1. Introduction

The main objective of using technology in agriculture is to boost yield, achieve higher efficacy and increase profitability. As a result, to reduce food and nutritional insecurity, a problem within our society at this time, smallholder farmers have to embrace advanced agricultural technologies to raise productivity of food crops (Sennuga *et al*., 2022). The creation of agriculture comes from the fusion of technological progress into the domains of agricultural production, storage, and processing, to increase efficiency. Cassava production and processing have benefited from upgraded technologies that include using improved varieties along with fertilizers, new

CONTACT Shuaibu U ushuaib22@gmail.com

tillage procedures, mechanization, herbicides and pesticides as well as proper spacing, motorized graters, motorized flakers and mechanical sifters. Enhancing farm productivity, which intrinsically raises farmers' income and alleviates poverty, is possible only through the adoption of these advanced technologies (Jegede *et al*., 2021).

Cassava (*Manihot esculenta*), a South American plant grown predominantly for its roots and is an important carbohydrate source for several Nigerian and developing country households (Osuafor *et al*., 2020; Amadi and Solomon, 2020). Research indicates that Nigeria stands as the top producer of cassava in West Africa. About 63 million tons of cassava (FAO, 2023) makes Nigeria the world's top producer (26% of the total global output). The volume of this item is greater than yam, sorghum, and rice, while more than 75 percent of the world's poor live in countryside areas, yet both resources and policies prioritize urban growth. A great deal of the rural community is dependent, both directly and indirectly, on small-scale food production and processing. (World Bank, 2020). The various methods for changing cassava roots into varied products are directed by local cultural and personal preferences. The poor storage qualities of cassava and the requirement to minimize or eliminate the toxic compound that render it unconsumable have made processing an important part of its use. Because of the losses incurred during processing, along with the high labor requirements, traditional methods of cassava processing are not very efficient. The problems remain primarily because there are inadequate post-harvest facilities. It has had a longstanding tendency to demonstrate that the process toward embracing new technology practices happens gradually.

Nigerian women play a pivotal role in addressing several bottlenecks within smallholder farming systems, particularly in activities such as weeding, harvesting, processing, and storage (Awoyemi *et al*., 2020). In the case of cassava, rural women are responsible for nearly all processing operations, and the introduction of improved processing technologies has significantly enhanced their efficiency. These evolved technologies not only streamline the processing stages but also reduce energy demands and improve sanitary conditions, thereby contributing to better-quality outputs. Against this background, the present study was designed to achieve several specific objectives: to describe the socio-economic characteristics influencing the adoption of cassava processing technologies among rural women in the study area; to determine the level of adoption of these technologies; to examine the factors affecting their adoption; to assess the perceived effects of technology adoption on cassava processing; and to identify the constraints limiting the effective utilization of cassava processing technologies among rural women.

2. Material and Methods

The study was carried out in Kogi State, which is in Nigeria. This state occupies a geographical size of 2774,747 sq km and has a population of 3,595,789 according to the NPC census in 2006 but is projected at 5,685,864 million as at 2022 according to the NBS. About 172000 farm families are indicated within the state, with 70% of this population in the rural areas and involved more or less in crop farming and animal husbandry (Kogi State Government, 2023). Kogi State lies in the north-central part of Nigeria, on geographical coordinates of 7° 49' N latitude and 6° 45' E longitude. Most areas of Nigeria are a

young sedimentary zone of Pleistocene to Recent and alluvial fan plain of the River Niger offer excellent soil for agricultural activities. Among the climatic factors there is average maximum temperature that makes 33.2 °C and the average minimum temperature is 22.8 °C.

This research adopted the multistage sampling method because Kogi State has four agricultural zones, namely zones A, B, C and D. The first phase (Phase I) consisted of an exploratory, non-probability sampling technique that entails the selection of one Local Government Area (LGA) per agricultural zone. Three towns/villages at random from each of the four LGAs, to give the study a total sample of 12 towns/villages. In detail, these areas were Jege village and Aiyede village, and Ife-Olukotun village from Yagba East LGA; Anyigba town and Abocho village, and Achigili village from Dekina LGA; Sarkin-Noma town and Agbaja village, and Lokon-goma from Lokoja LGA; and Ochadamu town, Ejule town, and Alloma village. A total of 140 rural women were selected as respondents for the study. Data were collected from primary sources using a well-structured questionnaire. Data were analyzed using descriptive statistics such as frequencies, percentages, mean scores, probit regression model and Kendall's coefficient of concordance.

3. Results and Discussion

3.1 Socio-economic characteristics

Age of the respondents: The results in Table 1 show that the majority (47.9%) of rural women were within the age bracket of 31–40 years, with an average age of 35 years. This implies that the rural women were in their middle and productive years, actively contributing to the processing and production of cassava products. At this age, they can still understand, adopt and use new technologies for all aspects of processing and production. This supports the findings of Ogonna *et al*., (2020), which stated that processors within this age range can still adopt new innovative technology in the cassava processing industry.

Marital status of the respondents: The marital status data in Table 1 shows that the majority (67.9%) of the women were married. This implies that most of the cassava processors were responsible for managing a household and meeting the needs of their families. As a result, they may be more inclined to adopt new technologies to generate additional revenue and increase productivity to meet household demands. This supports the findings of Falola *et al*. (2022), which noted that 73.3% of women involved in cassava processing were married, as married women typically prioritize the well-being of their families.

Processing experience: Table 1 reveals that the majority of the women (63.6%) had between 6 to 10 years of cassava processing experience, with an average of 7 years. This suggests that most respondents had a relatively solid level of experience. However, this finding contrasts with the results of Falola *et al*. (2022), which reported that most cassava processors (52.5%) had between 10 and 20 years of experience.

Access to credit facility: Access to credit helps rural women acquire new and improved tools and equipment for cassava processing. Table 1 shows that 66.4% of respondents had access to credit facilities, with an average sum of ₦18,107.14, while the remaining 33.6% did not, relying on personal savings to fund their activities. This finding contradicts Ibitunde *et al*. (2021), which

reported that the majority (71.7%) had no access to credit, limiting their ability to afford new technologies and potentially hindering their adoption of these innovations.

Table 1: Socio-economic characteristics of the rural women

Variables	Frequency (140)	Percentage (%)	Mean
Age (years)			
<20 years	15	10.7	35 years
21- 30 years	27	19.3	
31 - 40 years	67	47.9	
41 - 50 years	28	20.0	
50 years and below	16	7.2	
Marital status			
Married	95	67.9	
Single	25	17.9	
Divorced	8	5.7	
Widowed	12	8.6	
Cassava processing experience			
1 -5 years	34	24.3	7 years
6 - 10 years	89	63.6	
11 - 15 years	17	12.1	
Amount received			
No credit	47	33.6	18,107.14
1 – 20,000	3	3.6	
20,001–40,000	85	60.7	
Above 40,000	3	2.1	

Source: field survey, 2024

3.2 Level of adoption of cassava processing technologies

The respondents were asked to indicate their use of various cassava processing technologies by checking the appropriate boxes. The data revealed (Table 2) that mechanical peelers (100%), automatic fryers (100%), and starch extraction equipment recorded the highest adoption rates among rural women. These findings indicate a widespread integration of these technologies into cassava processing activities. Notably, this contrasts with the findings of Awoyemi *et al.* (2020), who reported minimal adoption of similar technologies at the usage level, highlighting possible regional differences, recent improvements in access, or evolving perceptions of technology usefulness among women processors.

However, flash dryers followed closely, with 98.6% of respondents adopting this technology. This indicates that flash dryers also have significant impact and relevance due to their advantages, including rapid drying, energy efficiency, and improved product quality (Ogbonna *et al*., 2022). This study contradicts the research by Jegede *et al*. (2021), which claimed that the usage and adoption of flash dryer technology were low. The bagging machine is another cassava processing technology among rural women. However, the findings from this research revealed that this technology had a lower level of adoption and usage (51.4%). The low adoption level could be attributed to poor extension education, lack of awareness, and the high cost of the technology. This aligns with the findings of Awoyemi *et al*. (2022), which also reported a very low adoption level of this technology.

3.3 The factors influencing the level of adoption of cassava processing technologies among rural women

The probit regression model was used to analyze the factors affecting the adoption of cassava processing technologies among rural women in the study area. Table 3, shows a Pseudo R^2 value

Table 2: Adopted technologies of cassava processing

Processing technologies	Frequency (140)	percentage	Rank
Mechanical peelers	140	100.0	1st
Automatic garri fryers	140	100.0	1st
Starch extraction machines	140	100.0	1sts
Flash dryers	138	98.6	4th
Hammer mills (for flour)	136	97.1	5th
Cassava washing machine	135	96.4	6th
Mechanical sifters	128	91.4	7th
Cassava slicers	121	86.4	8th
Drying racks	119	85.0	9th
Fermentation tanks	108	77.1	10th
Batch mixers	106	75.7	11th
Hydraulic pressers (for dewatering)	102	72.9	12th
Sorting machines (stalk remover)	96	68.6	13th
Mechanical graters (motorized)	93	66.4	14th
Fermentation racks	91	65.0	15th
Bagging machines	72	51.4	16th

Source: Field work, 2024

of 0.4640, indicating that 46% of the variation in technology adoption (the dependent variable) was explained by the independent variables. The LR chi² value of 88.13, significant at the 1% level (p = 0.0000), suggests that the model accurately predicts the relationship between the dependent variable and its influencing factors.

Eleven variables were proposed to influence the adoption of improved cassava processing technologies. Of these, six were found to be statistically significant: processing experience, level of education, cost of technology, income, complexity of technology, and extension contact.

Processing experience had a positive coefficient (0.0515) and was significant at the 1% level. This means that the more experience women had in cassava processing, the more likely they were to adopt new technologies. This finding aligns with Vihi *et al*., (2022), who also found a positive relationship between processing experience and adoption. Level of education also had a positive coefficient (0.7947973) and was significant at the 5% level. This suggests that higher levels of education increase the likelihood of adopting improved technologies, as education enhances literacy and exposure. This finding is supported by Uchemba *et al.* (2021), who similarly observed a positive impact of education on technology adoption.

Cost of technology had a negative coefficient (-1.0169) and was significant at the 1% level. This indicates that the high cost of the technology discourages adoption. Awoyemi *et al*. (2022) also found that high costs were a major barrier to the adoption of improved processing tools. Annual income had a negative coefficient (-0.2941721) and was significant at the 1% level, indicating that women with lower income were less likely to adopt the technologies. This finding contradicts

Table 3: The factors influencing the level of adoption of cassava processing technologies

Variables	Coefficient	Std error	Z-value	P-value
Age	0.0515183	1.522033	0.03	0.973
Processing experience	0.5737073	0.1286726	4.46***	0.000
Compatibility	-0.3153063	0.5253846	-0.60	0.548
Level of education	0.7947973	0.4080829	1.95**	0.051
Triability of the technology	0-.2996967	0.3551987	-0.84	0.399
Relative advantage of the technology	0.6029463	0.5186993	1.16	0.245
Cost of the technology	-1.016922	0.2721163	-3.74***	0.000
Annual income	-0.2941721	0.0749174	-3.93***	0.000
Complexity of the technology	-0.1163602	0.0369332	-3.15***	0.002
Processing for family consumption	-0.4178169	0.2989091	-1.40	0.162
Extension contact	0.0957691	0.0425498	2.25**	0.024
Constant	3.684319	1.4089	2.62***	0.009
Number	140			
LR chi^2 (11)	88.13***			
Prob > chi^2	0.0000			
Pseudo R^2	0.4640			
Log likelihood	-50.910219			

Source: Field survey, 2024. Note: **, *** are Significance at 5% and 1% respectively.

Vihi *et al*. (2022), who found a positive relationship, suggesting that women with higher incomes were more likely to adopt innovations. Extension contact had a positive coefficient (0.0957691) and was significant at the 5% level, showing that rural women who had regular visits from extension agents were more likely to adopt new processing technologies. This contrasts with the findings of Uchemba *et al*. (2021), who reported no influence of extension visits on adoption rates among cassava processors. In summary, factors such as experience, education, and access to extension services positively influenced the adoption of cassava processing technologies, while high costs and lower income levels acted as barriers.

3.4 Constraints associated with the adoption of cassava processing technologies

The constraints limiting the adoption of improved cassava processing technologies are presented in Table 4. The findings indicate that the most critical barriers include lack of training on the use of new technologies (mean = 7.85), high labor demands involved in cassava processing (mean = 6.79), limited technical and financial support (mean = 6.46), absence of processor networks (mean = 6.34), and lack of adequate storage facilities (mean = 6.33). Conversely, poor extension services (mean = 4.81) and environmental barriers to using new technologies (mean = 4.33) were ranked as the least significant constraints.

The findings highlight that human capacity gap, particularly inadequate trainings which are the most significant barriers to the adoption of improved cassava processing technologies among rural women. Without the necessary knowledge

Table 4: Constraints associated with the adoption of cassava processing technologies

Constraints	M	Rank
Lack of training of how to use new technologies	7.85	1st
High labor demand in cassava processing	6.79	2nd
Limited technical and financial support for cassava processors	6.46	3rd
Lack of cassava processors network	6.34	4th
Lack storage facilities for cassava products	6.33	5th
Poor local market for processed products	6.25	6th
Difficulty in integrating new technologies into their existing practices	6.00	7th
Opaque value chain in cassava processing enterprise	5.51	8th
Fewer forums for relationship building (such workshops and seminar) among cassava processors	5.34	9th
Poor extension services	4.81	10th
Environmental barriers against using new technology	4.33	11th
N	140	
Kendalls W[a]	0,118	
Chi-square	165.136	
Df	10	
Asymo.sig	.000	

Source: Field survey, 2024

and skills to operate these technologies effectively, even the most beneficial innovations remain underutilized. Similarly, the high labour demands associated with cassava processing further discourage adoption, especially among women who often juggle multiple responsibilities. Limited access to both technical guidance and financial resources compounds these challenges, creating a cycle of low investment and minimal technological advancement. The lack of structured networks among cassava processors also hinders knowledge sharing, collective bargaining, and access to group-based support systems.

The relatively lower rankings of poor extension services and environmental barriers suggest that while these factors are present, they may not be the primary deterrents in the study area. However, their continued neglect could hinder future interventions if left unaddressed. Overall, the results underscore the importance of a multi-dimensional approach to technology adoption - one that goes beyond just availability, and addresses knowledge dissemination, financial accessibility, labour efficiency, and infrastructural development. Addressing these constraints holistically is essential for promoting inclusive and sustainable cassava processing among rural women in Kogi State.

4. Conclusion

The study concludes that the adoption of improved cassava processing technologies among rural women in Kogi State is moderately high. These technologies have significantly enhanced cassava processing by increasing production rates, reducing physical drudgery, and improving overall efficiency. Their use has enabled rural women to optimize processing activities, diversify products,

and improve the quality of outputs. However, several barriers continue to impede full adoption. Chief among these are the lack of technical training, high labor demands, limited access to technical and financial support, absence of organized processors' networks, and inadequate storage facilities. Addressing these challenges is essential for sustaining and scaling up the benefits of cassava processing technologies. Therefore, it was recommended that continuous, hands-on training programme should be designed and implemented by the government to equip rural women with the necessary technical skills to effectively operate and maintain cassava processing technologies. These programs should be context-specific and delivered in local languages where necessary.

5. Reference

Awoyemi, A. O., Adesokan, O. J., Kayode, A. O., Omotesho, K. F., & Osasona, K. K. (2022). *Cercetări Agronomice în Moldova*, *53*(3), 314–320.

Falola, A., Ayinde, O. E., & Oyekale, A. S. (2022). Adoption of cassava processing technologies and its impact on income and employment in Nigeria. *Journal of Agricultural Extension and Rural Development, 14*(3), 78–86. https://doi.org/10.5897/JAERD2022.1352

Food and Agriculture Organization. (2023). *FAO statistical yearbook 2023*. Food and Agriculture Organization of the United Nations.

Ibitunde, I. O., Ajayi, F. O., Bamiwuye, O. A., & Sulaiman, O. A. (2021). Women's involvement in cassava processing in Ijebu Ode Local Government Area, Ogun State, Nigeria. *Journal of Agriculture*, *33*(3). Department of Agricultural Extension and Rural Development, Osun State University, Osogbo.

Jegede, M. E., Sennuga, S. O., & Olorunniyi, A. A. (2021). Improved management practices among rice farmers in Abuja. *Journal of Food Science and Nutrition*, 1–7.

Amadi, N. S., & Solomon, U. E. (2020). Survey of technologies used in cassava processing in Ikwere Local Government Area of Rivers State. *Asian Journal of Agricultural and Horticultural Research*, *7*(2), 26–34. https://doi.org/10.9734/AJAHR/2020/v7i230098

Ogbonna, M. O., Okoye, B. C., & Aniedu, O. C. (2022). Adoption of improved cassava processing technologies among rural women in South-Eastern Nigeria. *Journal of Agricultural Extension and Rural Development*, *14*(5), 123–131. https://doi.org/10.5897/JAERD2022.1401

Ogonna, N., Onyenweaku, C. E., & Ukoha, O. O. (2020). Determinants of adoption of improved cassava processing technologies among small-scale processors in Southeast Nigeria. *African Journal of Agricultural Research, 15*(6), 891–899. https://doi.org/10.5897/AJAR2020.14670

Osuafor, L. N., Ezeano, C. I., & Ekwueme, J. N. (2020). Assessment of adoption level of cassava processing technologies among women in Anambra State, Nigeria. *International Journal of Agricultural Policy and Research*, *8*(4), 110–118. https://doi.org/10.15739/IJAPR.20.011

Sennuga, S. O., Kolawole, O. D., & Lawal, N. O. (2022). Adoption of improved agricultural technologies among smallholder farmers in Nigeria: Constraints and policy implications. *Journal of Agricultural Extension, 26*(2), 45–56. https://doi.org/10.4314/jae.v26i2.5

Uchemba, V. U., Nenna, G. M., Obianefo, A. C., & Chukwuemeka, O. O. (2021). Adoption of improved cassava production technologies among small-scale farmers in Anambra State, Nigeria. *Journal of Plant Sciences*, *9*(4), 119–127.

Vihi, S. K., Chomini, E. A., Tor, L. G., Jesse, B., Dalla, A. A., Bassey, E. A., & Owa, G. T. (2022). Factors influencing adoption of improved cassava-garri processing technologies among rural women in Vandeikya Local Government Area of Benue State, Nigeria.

World Bank. (2020). *World development report 2020: Trading for development in the age of global value chains*. World Bank.