Assessment of Household Postharvest Management Practices among Rural Women in Kwara State, Nigeria

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Abstract

Adequate postharvest handling is crucial for household food security and prevents unanticipated losses. This study aimed to assess postharvest practices among rural women in Kwara State. The study specifically outlined the respondents' socio-economic characteristics, identified postharvest activities at the household level, and investigated the sources of information on postharvest management practices among rural women. Using a three-stage random sampling technique, 160 respondents were selected from eight rural communities in Kwara State. The respondents' information was gathered using a structured interview schedule. Data was analyzed using descriptive statistics such as mean, standard deviation, frequency, and percentage, and the hypotheses were tested using Pearson Product-Moment Correlation (PPMC). The results showed that the respondents' average age was 46.3 years, 75.6% were married, and 43.8% had a secondary school certificate. Radio is the most popular source of information on postharvest practices (MS=2.74). The predominant postharvest practices utilized by rural women at the household level are sorting (MS=2.96), drying (MS=2.69), and storage (MS=2.63). A significant relationship exists between respondents' strategies for reducing postharvest loss of farm products and their age ($r = 0.246$, $p < 0.05$), education level ($r = 0.294$, $p < 0.01$), household size ($r = 0.352$, $p < 0.01$), access to extension agents ($r = 0.421$, $p < 0.01$) and information sources ($r = 0.213$, $p < 0.05$). Rural women used postharvest techniques, including sorting, threshing, cleaning, drying, storing, and marketing. Therefore, information on these postharvest practices should be communicated via radio to reach a significant number of rural women.

Keywords:
Food security, Household, Postharvest, Rural women

Introduction

Postharvest is the term used to describe the stage of crop production immediately after harvest. The postharvest system comprises several activities and processes that can be divided into two groups: technical and economic (Tibagonzeka et al., 2018). Technical activities in the postharvest system include harvesting, field drying, threshing, cleaning, additional drying, storing, processing, and quality control. Economic activities include marketing, information and communication, administration, management, and transportation.

Women play an important role in the agricultural value chain's postharvest handling and processing stage, where considerable food loss occurs (Nordhagen, 2021). Rural women provide most of the labour in postharvest activities, including handling, stocking, processing, packaging, and marketing. Due to lower access to resources and information, women may be at higher risk of experiencing high postharvest loss rates and have a lower ability to adopt loss reduction technologies.

In many African countries, women comprise nearly 50% of the agricultural labour force. Women are very active across various stages of food value chains, from on-farm processing to retail. Indeed, women tend to be over-represented in the agri-food sector

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compared to other industries. In West Africa, for example, 68% of employed women work in the food system, and women represent 83% and 72% of those employed in food processing and marketing, respectively. Upstream in the value chain, women tend to concentrate on postharvest handling and processing (Masamha et al., 2018). The high level of women's involvement in the postharvest stage confirms the relevance of considering gender when examining postharvest loss.

According to the African Postharvest Losses Information System (APHLIS) 2021, Nigeria's annual estimated postharvest losses were 2,234,843 tonnes for maize, 974,257 tonnes for rice, 828,876 tonnes for sorghum, and 188,573 tonnes for millet. On the other hand, postharvest technologies are interdisciplinary sciences and methods used on agricultural products for preservation, conservation, quality control /improvement, processing, packaging, storage, distribution, marketing, and use after harvest to meet consumer dietary and food needs. It is impossible to overstate the significance of postharvest procedures in agricultural production.

Proper postharvest handling practices are essential for maintaining food safety and quality while being transported to consumers and traded (Ndwata et al., 2022). Postharvest practices reduce postharvest losses and increase agricultural production. As a result, farmers and impoverished rural and urban consumers have access to more food, enhancing nutrition, adding value to farm products through new marketing channels, raising market prices, creating jobs, and supporting the long-term growth of other related economic sectors. Food losses and waste have been associated with technical limitations in harvesting, storage, processing techniques, and financial management in low-income countries (Ogundele, 2022). Food losses directly and negatively impact both farmers' and consumers' incomes.

High-yielding cultivars and innovative production methods have significantly increased the potential of agriculture worldwide, and a large percentage of the population now has access to affordable food and increased income sources. However, food security and safety do not stop with the crop's harvest. The postharvest activities of transportation, storage, processing, and marketing account for a large amount of the final value of agricultural products.

Postharvest loss is a serious problem in sub-Saharan Africa, where up to 50 percent of crop production can be lost before produce reaches the consumer. With cereal losses alone having an estimated value of USD 4 billion per year, these losses threaten millions of food security and livelihoods (APHLIS, 2023). The optimization of the post-production management system enhances the quantity and quality of food available for consumption (Aulakh & Regmi, 2015). This helps to ensure food security by enabling pest-biological control to reduce postharvest losses. Postharvest management is crucial for opening up markets for producers and creating revenue-generating opportunities for farmers. A solid understanding of postharvest management of different agricultural products is essential for farming households to ensure food and nutrition security.

Women play critical agricultural roles in sub-Saharan Africa, especially in postharvest activities such as drying, storing, cleaning, and processing food. Research indicates that postharvest losses most likely have critical socio-cultural dimensions. Yet traditional loss reduction strategies typically focus on technological and economic solutions, ignoring social and gender issues (APHLIS, 2023). While some studies have examined postharvest technologies, few have explicitly focused on household-level practices by rural women in Kwara State. In view of the ongoing discussion, the following questions will be examined:

1. What are the socio-economic characteristics of the rural women in the study area?
2. What is the source of information for rural women regarding household postharvest practices?
3. What postharvest activities do rural women participate in at the household level?

The primary objective of this study was to assess postharvest practices at the household level among rural women in Kwara State, Nigeria. The study specifically outlined the respondents' socio-economic characteristics, identified postharvest activities at the household level, and investigated the sources of information on postharvest management practices among rural women.

The following hypotheses, stated in the null form, were tested to establish relationships between variables in the study.

1. There is no significant correlation between postharvest practices and selected socio-economic characteristics of rural women.
2. There is no significant correlation between rural women's information sources and postharvest practices.

Materials and Methods

This study was conducted in Kwara State, Nigeria. Ilorin is the state's capital, and there are sixteen Local

Government Areas (LGAs) in the state. From the meridian, it is located between latitudes 7° 45' and 9° 30' north and longitudes 2° 30' and 6° 35' east. Niger State borders Kwara State to the north, Oyo, Osun, and Ekiti States to the south, Kogi State to the east, and the Republic of Benin to the west. It is situated in the North Central geopolitical zone of Nigeria. There are two distinct seasons: dry and rainy. Temperatures typically fall between 30 °C and 35 °C. The estimated population of Kwara State is 3,599,975 (based on the 2006 census), and the state occupies 36,825 square kilometers of land. Kwara State's economy is based primarily on agriculture, with cotton, cocoa, coffee, kola nuts, tobacco, sesame, and palm produce serving as the main cash crops. Onions, rice, cassava, plantains, bananas, cocoyam, potatoes, fruits, vegetables, sugarcane, yams, maize, millet, and bananas are other crops grown. The state is home to about 1,258 rural settlements. The Kwara State Agricultural Development Project (KWADP) splits the state into four zones based on natural features, cultural practices, and project administrative ease. These are: Zones A, B, C, and D are occupied by Baruteen and Kiama LGAs, Edu and Patigi LGAs, Asa, Ilorin East, Ilorin South, Ilorin West, and Moro LGAs, and Ekiti, Ifelodun, Irepodun, Offa, Oyun, Isin, and Oke Ero LGAs, respectively. The study's population comprises all rural households in Kwara State, Nigeria.

A three-stage sampling technique was used to select the study area and participants. The first step was randomly selecting 50% of the four ADP zones. In the second stage, one LGA was randomly selected from each zone, and four communities were randomly selected within each LGA, to give eight communities, using the KWADP village listing as the sampling frame. Finally, twenty women were selected from each community using a systematic sampling procedure. A total of 160 respondents were chosen for the study.

Table 1: Selection of respondents for the study

Zones	LGAs	Communities	Selected sample
Zone C	Asa	Ballah	20
		Ogele	20
		Otte	20
		Afon	20
Zone D	Irepodun	Omu-Aran	20
		Oro	20
		Agbamu	20
		Rore	20
Total	**2**	**8**	**160**

Source: Field survey, 2023

Instrument for data collection: Data for this study were collected using a well-structured interview schedule. Information on the socio-economic characteristics of respondents, the type of postharvest practices used at the household level, and sources of information on postharvest practices were collected. The data collected were analyzed using both descriptive and inferential statistics.

Results and Discussion

Socio-economic characteristics of respondents

Table 2 shows the socio-economic traits of the respondents. The respondents' average age was 46.3±14.36 years, with 30.6% between 41 and 50 years and 34.4% between 31 and 40. At forty-six, people are still considered to be nimble and economically active. Most (75.6%) of the respondents were married, and the average household size was six people. This implies that rural households in the study area are moderately sized and that women in the study area have household responsibilities. This finding also agrees with the report by Falola et al. (2020) that rural women in Kwara State are mostly married. An analysis of respondents' educational backgrounds revealed that 23.1% lacked formal education, 18.8% had primary education, and secondary (43.8%) and tertiary education (5.6%). The majority had secondary education, while others had one form of education or the other. This indicates a certain level of literacy. Given the technical know-how required for efficient sorting, grading, packaging, disease, and pest control at the household level, their desire to implement postharvest management may be influenced by their educational background. This is in line with the findings of Pelemo et al. (2019), who found that most rural farming families in Nigeria lacked a high literacy level. Trading accounted for 50.0% of the respondents' primary occupation, with 23.1% working in farming, 11.9% in the civil service, and 15.1% in artisan. On accessibility to extension agents, 58.1% of the respondents had access, while 41.9% had no access, indicating that a significant proportion of rural households had no access to extension agents. This could influence women's access to information on postharvest technologies. Earlier reports by Anang et al. (2020) and Ikoyo-Eweto et al. (2024) stated that there is a positive relationship between access to agricultural extension and adoption of improved farm technologies, which consequently impacts farmers' farm income. Farmers with extension agents' information on implementing new technology saw a 58–74% reduction in drudgery and a 77–90% increase

in labor efficiency. This saved money and freed up time for other domestic and agricultural duties (Mutungi et al., 2022; 2023). The majority (50.0%) of the respondents were members of cooperative associations, and 80.6% had access to credit facilities. Credit came from banks (11.9%), moneylenders (18.8%), cooperative societies (23.1%), and friends and family (26.9%). This suggests that primary credit sources are friends, families, and cooperatives. This finding supports earlier reports from studies that the primary funding source for smallholder female farmers is their families (FAO, 2012; Jack, 2013; Adigun, 2022). Inability of rural women to obtain credit from formal sources often left them at the mercy of the informal financial sector, through moneylenders, microfinance institutions, relatives, friends, and credit associations such as age grades and town union associations.

Table 2: Socio-economic characteristics of respondents (n=160)

Variables	Frequency	Percentage	Mean	Standard deviation
Age (years)				
≤ 30	18	11.3		
31 – 40	55	34.4	46.3	14.36
41 – 50	49	30.6		
Above 50	38	23.8		
Marital Status				
Married	121	75.6		
Single	13	8.1		
Widow	20	12.5		
Divorced	6	3.8		
Religion				
Christianity	66	41.3		
Islam	88	55.0		
Traditional	6	3.8		
Level of education				
No formal education	37	23.1		
Adult education	14	8.8		
Primary education	30	18.8		
Secondary education	70	43.8		
Tertiary education	9	5.6		
Household size (people)				
≤ 5	55	34.4	6.0	2.13
6 – 10	105	65.6		
Main Occupation				
Farming	37	23.1		
Trading	80	50.0		
Civil servant	19	11.9		
Artisan	24	15.1		
Access to extension agents				
Yes	93	58.1		
No	67	41.9		
Members of a cooperative association				
Yes	80	50.0		
No	80	50.0		
Access to credits				
Yes	129	80.6		
No	31	19.4		
Sources of credit				
Bank	19	11.9		
Money lender	30	18.8		
Cooperative	37	23.1		
Friends and relatives	43	26.9		

Source: Field survey, 2023

These have limited outreach due to the scarcity of loanable funds and are thus unable to give necessary support to women in their farming activities.

Types of postharvest practices engaged by rural women

Table 3 lists the various postharvest activities that rural women use at the household level to reduce waste of farm produce. Sorting came in first place (mean = 2.96), followed by drying (mean = 2.69) and storage (mean = 2.63). Additional postharvest handling practices include threshing (mean=2.08), cleaning (mean=2.53), marketing (mean=2.46), and transportation (mean=2.01). This suggests that women's primary postharvest activities in rural households were sorting, drying, storing, and cleaning. This further indicates that postharvest methods still used by rural farmers are indigenous. This is consistent with Edoh Ognakossan et al. (2016)'s report, which found that traditional storage methods are still widely used by African rural farmers. Regarding the drying method commonly used by farmers, De Groote et al. (2021) asserted that proper drying ensures that the grain will endure threshing and storage without deteriorating. Compared to drying grain directly on the ground, using simple plastic sheets reduced aflatoxin contamination in Kenya by nearly 50% (Pretari et al., 2019). Sorting (96.3%), Drying (80.6%), and Storage (73.8%) are always used, while transport (50.6%), packaging (41.9%), and marketing (38.8%) are sometimes used by the rural women.

Sources of information on postharvest practices

Results on information sources for postharvest practices by rural households are shown in Table 4. Radio (mean=2.74) was the most popular source of information among respondents, followed by family members (mean=2.54) and the Agricultural Development Programmes (ADPs) (mean=2.28). This finding suggests that the primary information sources on postharvest practices among rural households in the study area were the ADPs, radio, and family members.

Table 3: Types of postharvest practices engaged by rural women

Practices	Always	Sometimes	Rarely	Never	Mean	Rank
Sorting	154(96.3)	6(3.8)	0	0	2.96	1st
Drying	129(80.6)	13(8.1)	18(11.3)	0	2.69	2nd
Storage	118(73.8)	30(18.8)	6(3.8)	6(3.8)	2.63	3rd
Cleaning	97(60.6)	51(31.9)	12(7.5)	0	2.53	4th
Marketing	86(53.8)	62(38.8)	12(7.5)	0	2.46	5th
Threshing	80(50.0)	25(15.6)	43(26.9)	12(7.5)	2.08	6th
Packaging	51(31.9)	67(41.9)	36(22.5)	6(3.8)	2.02	7th
Transport	43(26.9)	81(50.6)	30(18.8)	6(3.8)	2.01	8th

Source: Field survey, 2023 *Percentages in parentheses

Table 4: Sources of information on postharvest practices among respondents

Postharvest practices	Always	Sometimes	Rarely	Never	Mean (SD)	Rank
Radio	118(73.8)	42(26.3)	0	0	2.74(.44)	1st
Family	99(61.9)	49(30.6)	12(7.5)	0	2.54(.63)	2nd
Agricultural Development Programme (ADP)	57(35.6)	91(56.9)	12(7.5)	0	2.28(.60)	3rd
Friends	75(46.9)	61(38.1)	18(11.3)	6(3.8)	2.28(.81)	3rd
Television	80(50.0)	56(35.0)	12(7.5)	12(7.5)	2.28(.90)	3rd
Newspaper	69(43.1)	49(30.6)	24(15.0)	18(11.3)	2.06(1.02)	4th
Workshops	31(19.4)	98(61.3)	25(16.3)	6(3.8)	1.96(.71)	5th
Agricultural shows	19(11.9)	111(69.4)	30(18.8)	0	1.93(.55)	5th
Farmers' group	56(35.0)	55(34.4)	19(11.9)	30(18.8)	1.86(1.10)	6th
Extension agents	18(11.3)	112(70.0)	12(7.5)	18(11.3)	1.81(.78)	7th
Research institutes	37(23.1)	62(38.8)	31(19.4)	30(18.8)	1.66(1.03)	8th
Internet	36(23.8)	30(18.8)	62(38.8)	30(18.8)	1.48(1.05)	9th
Magazine	20(12.5)	54(33.8)	50(31.3)	36(22.5)	1.36(.97)	10th
Social media	26(16.3)	42(26.3)	49(30.6)	43(26.9)	1.32(1.04)	11th
Journal	19(11.9)	56(35.0)	24(15.0)	61(38.1)	1.21(1.08)	12th
Bulletin	12(7.5)	69(43.1)	18(11.3)	61(38.1)	1.20(1.04)	13th

Source: Field survey, 2023 *Percentages in parentheses

This indicates that agricultural information dissemination is domiciled in the ADPs, who may broadcast the information through radio programmes. Family members also share helpful information to enhance knowledge and reduce postharvest losses. This aligns with a study by Haumba and Kaddu (2021) that discovered that Kisoga farmers mostly rely on oral communication to get information. This could be due to the cost and easy accessibility of information. Internet and power (electricity) required to access information online may not be available in some rural communities.

Test of Hypotheses

H01: Respondents' strategies for minimizing postharvest loss of farm products do not significantly correlate with their socio-economic characteristics.

According to the PPMC analysis of the relationship between respondents' postharvest practices and socio-economic characteristics presented in Table 5, factors that showed a positive significant correlation with strategies for reducing postharvest loss of farm products were age ($r = 0.246$, $p < 0.05$), education level ($r = 0.294$, $p < 0.01$), household size ($r = 0.352$, $p < 0.01$), and access to extension agents ($r = 0.421$, $p < 0.01$). According to this research, rural households will embrace better postharvest management practices to reduce postharvest loss of farm products if they are older, have more years of education, have more family members, and have easier access to extension services. The findings corroborate earlier studies' reports that age and years of education significantly influence women's decision to use various management practices (Adesope et al. 2010, Adeniyi et al. 2023, and Olooto et.al. 2023).

Table 5: Pearson Product-Moment Correlation (PPMC) results of the relationship between socio-economic characteristics and methods of reducing postharvest loss of farm product by respondents

Postharvest practices	Coefficient (r)	Sig. (p)
Age	0.246*	0.025
Level of education	0.294**	0.007
Marital status	0.093	0.401
Religion	0.212	0.055
Household size	0.352**	0.001
Access to extension agents	0.421**	0.000
Membership in a cooperative association	0.088	0.430
Access to credit	-0.105	0.344

**, *Significant at 0.01 and 0.05 levels respectively

Source: Data analysis, 2024

H02: There is no significant correlation between respondents' postharvest practices and their information sources**.**

The results in Table 6 revealed a positive and significant correlation between the respondents' sources of information and the postharvest practices they employed. This suggests that the respondents' postharvest practices will improve due to greater access to information sources. Access to information is crucial for farmers to understand the benefits of postharvest practices and how to implement them effectively. Limited access to information, such as inadequate extension contact or poor access to information sources, can significantly hinder the adoption of improved practices. According to Olajide et al. (2019), farmers who receive information from multiple sources, including extension services, fellow farmers, and media (radio, television), are more likely to adopt improved postharvest technologies.

Table 6: PPMC results of the relationship between sources of information and methods of reducing postharvest loss of farm products by respondents

Postharvest practices	R-value	Sig.(p-value)
Sources of information	0.213*	0.019

*Correlation is significant at the 0.05 level

Source: Data analysis, 2024

Conclusion

From the findings of this study, it was concluded that rural women used various postharvest techniques, including threshing, cleaning, drying, storing, marketing, and sorting. Also, information sources for rural households include friends and family, the Agricultural Development Project (ADP), and radio broadcasts about postharvest practices.

Recommendations

The conclusions drawn from this study provide a strong basis for actionable recommendations to reduce postharvest losses and improve food and nutrition security among rural households in Kwara State. There is a need for capacity building among rural women, who play a central role in handling and managing farm produce at the household level. Relevant agricultural extension organizations should design and implement training programmes tailored for rural women, focusing on practical postharvest technologies that can be adopted with minimal cost. Extension information should be disseminated through radio programmes and the existing Agricultural Development Programme (ADP) structures in Kwara State to reach a larger

audience across rural communities. Radio remains a robust and accessible tool in rural areas, capable of reaching both literate and non-literate populations. Since rural women are the primary handlers of agricultural produce at the household level, interventions prioritizing them will yield the most significant impact. Empowering women through knowledge and resources for improved postharvest management will reduce losses, strengthen household food supply, and improve family nutrition outcomes.

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