Post-harvest losses and their economic impact on yam farmers' income systems in Wukari Local Government Area, Taraba State, Nigeria

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Abstract:
This study examined the economic impact of post-harvest losses among yam farmers in Wukari, Taraba State, Nigeria. The objectives were to describe the socio-economic characteristics of the farmers, identify factors influencing post-harvest losses, and assess their economic effects on farmers' income. Data were collected using structured questionnaires and analyzed through descriptive statistics and multiple regression. Findings revealed that 83.6% of yam farmers were male, 50% were married, and the average age was 40 years. Household sizes ranged from 2 to 7 persons (57.8%), and 92.9% were literate. Farmers had an average of 17 years of experience, with 85.7% cultivating 1–2 hectares of land. The regression analysis showed an R^2 value of 0.99, indicating that the model explained 99% of the variation in post-harvest losses. Pest attack ($p < 0.05$), poor transportation ($p < 0.01$), and sprouting ($p < 0.01$) significantly contributed to post-harvest losses. Financial loss was the most reported economic impact, affecting 36.8% of respondents, suggesting that post-harvest losses directly reduced farmers' income through spoilage and unsold produce. The study concludes that pest attack, inadequate transportation, and sprouting are key contributors to yam post-harvest losses in the area. It recommends increased engagement with agricultural extension agents to introduce improved post-harvest technologies. Additionally, government and stakeholders should provide credit access, subsidized inputs, and infrastructure development to mitigate losses and improve farmers' livelihoods.

Keywords: Post-harvest losses, yam, economic impact, regression analysis, Nigeria.

Introduction:

The phenomenon of postharvest losses of crops is an issue of great concern in the global community. This is essentially because, about one-third of the food produced in the world for human consumption every year, which is approximately 1.3 billion tones gets lost after harvest (FAO, 2018). Postharvest loss of food means the measurable quantitative and qualitative food losses in the postharvest chain or system. The postharvest system comprises interconnected activities from the time of crop harvest through storage, processing, marketing, and preparation, to the final decision by the consumer to eat or discard the food (kiaya *et al.,* 2014). Nigeria is presently richly endowed with all kinds of agricultural resources, including fishing, forestry, livestock, and arable land (Adeniyi, 2006). In the last few years, there has been significant growth in food crop production in Nigeria, out of which yam is highly consumed. Even though the production of yam has increased, the country still faces a huge challenge in significantly reducing the poverty rate as well as post-harvest losses. This problem is greatly associated with yam production which shows that the economy of the country is still largely dependent on agriculture (Kalu et al., 2023). Due to the economic importance of yam, it is a popular crop, mainly used for cereal and animal feed, and medicinal purposes. Yams are a staple food crop and an important source of income for many rural households in tropical countries, particularly in West Africa. This region accounts for approximately 72 percent of the global yam production, with Nigeria being the world's largest producer of yam (FAO, 2018).

Yams are not only important as a source of food, but they also play a crucial role in the economic and social development of rural communities. In Nigeria, yam production has a long history and is deeply embedded in the culture and traditional practices of many ethnic groups (FAO, 2018). In rural communities, yam production is typically handled by smallholder farmers who have limited resources and are often hindered by the lack of adequate storage facilities. This leads to significant post-harvest losses, resulting in reduced income for farmers and increased food insecurity for rural communities (Ezeaku, 2014). Post-harvest losses refer to the decrease in quantity and quality of agricultural produce during the post-harvest stage, from storage to the point of consumption (Ezeaku, 2014). These losses can occur due to various factors such as improper handling and packaging, poor storage facilities, transportation challenges and pests and diseases.

In Nigeria, post-harvest losses are a major challenge in the country's agricultural sector. It is estimated that the country loses about 13 million tons of food crops every year due to post-harvest losses, with yam being one of the most affected crops (Iorzua*et al* 2020). This loss translates to millions of dollars in revenue that should have been generated by farmers and contributes to the high rate of food insecurity in the country. In addition, post-harvest losses also have a negative impact on the country's economy as it reduces the country's export potential and lead to higher prices of food items in the market. This prospect raises the general expectation that, the available yam markets should provide an avenue whereby yam farming households can sale surplus yam produce so as to generate enormous financial income, which will translate into a good standard of living and also ensure the continuous availability of sufficient quality food for household consumption. (Mahraz, 2020)

The effect of post-harvest losses on yam production is a serious concern in Wukari Local Government Area, Taraba State. The area is one of the major producers of yam in the country, with a significant percentage of the population engaged in yam farming. However, the farmers in this area suffer huge losses due to inadequate storage facilities, pests and diseases, and poor post-harvest handling practices. These losses have a direct impact on the income and livelihood of the farmers who are already facing other challenges such as inadequate credit facilities, high cost of inputs, and limited access to markets Mohammed, (2019).

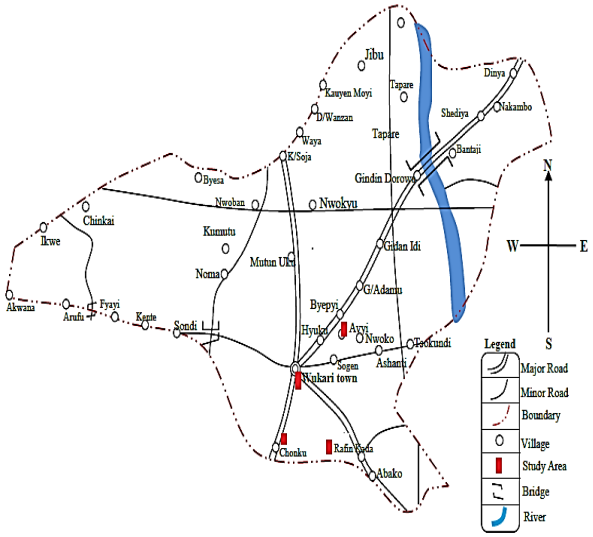
In Nigeria, yam is a very important crop both for food and as a source of income. However, the country has been facing a huge challenge of post-harvest losses in yam production, which has a negative impact on the economy and the livelihood of the farmers. The post-harvest losses in yam production in Wukari Local Government Area, Taraba State are quite high, (Fillie*t al*.,2019) and this has greatly affected the income of farmers and the food security of the local communities. The lack of storage facilities, inadequate knowledge on post-harvest handling techniques, and pests and diseases are some of the major factors contributing to these losses.

The aim of this research was to conduct an economic analysis of post-harvest losses among yam farmers in Wukari Local Government Area, Taraba State. Specifically, it (i) describes farmers' socio-economic characteristics, (ii) identifies factors contributing to post-harvest losses, and (iii) assesses the economic effects of these losses on farmers' income.

Methodology

Study Area

Wukari Local Government Area is one of the 16 local government areas in Taraba State, Nigeria. It is located in the southern part of the state and is known for its rich cultural heritage and diverse population. The area is predominantly inhabited by the JukunWapan people, who are known for their traditional customs and practices. The study will be conducted in Wukari local government area of Taraba State. Wukari local government is the headquarters of the historically famous Kwararafa Confederacy. Wukari is a multi-ethnic area, predominated by the Jukun people who are also call Wapan, with the composition of other major ethnic groups as Ichen, Kpanzon, Chamba, and Kutebs. Other ethnic groups that settled within the town and its environs are the Tiv, Hausa, Fulani, Yoruba, Igbo and others. The Wukari people are predominantly farmers, hunters and partly fishermen, while some are civil servants (Anyeze, 1983). Geographically, Wukari local government is situated in the southern part of Taraba state. Ibi local government area borders it to the north, east by Gassol local government area, from the south by Donga local government area of Taraba State, and to the west by Ukum local government area of Benue State. The local government area has a total area of 4,308 km2 (1,663 Square mile), located between latitude 7°51′ N 9°47′ E and longitude 10° E and 12°E. According to City population 2022, Wukari has a population of 374,800 people. Wukari lies on the Guinea Savannah zones vegetation, which is marked by mainly forest and tall grass. The plain and fertile land and the consistent annual flood of the rivers and streams within the area make the land conducive for seasonal farming and grazing, and all season's fishing. These activities informed the distribution of cultural and natural resources of the area, and also make Wukari a very rich agricultural land. The land is suitable for the cultivation of both arable and perennial crops such as yam, cassava, rice, sorghum, maize, millet, groundnut, cowpea, beans, banana, coconut, fruit trees, and vegetables, as well as animals such as cattle, sheep, goats and pig among nothers. It is also blessed with large volume of mineral deposits such as salt lead, zinc, limestone and others all untapped (Danjuma, 2005).



Source: (Oko *et al.,* 2017)

Fig. 1: Map of the study area

Sampling Procedure and Sample Size

Multistage random sampling technique was adopted in sampling respondents. In the first stage, five wards that were predominantly rural farming communities (Tsukundi, Akwana, Kente,Chonku and Rafin- kada) were purposively selected from the ten wards in the local government area and in the second stage, two villages were randomly selected. Lastly, 15 yam farmers were randomly selected in each village to make a total of 150 respondents.

Data Collection

This study made use of primary data, which was obtained through the use of structured questionnaire that was constructed and administered to the selected yam farmers in the research area. In this sense, the information supplied provided data that was required for the attainment of the set objectives

Data Analysis

Descriptive statistics were used to achieve objectives 1 and 3 of the study, while multiple regression analysis was used to achieve objective 2.

Model Specification

Multiple regression models was specified thus;

Mathematical approach of the model;

$Y = F(X_1,X_2,X_3,X_4,X_5,X_6,X_7,X_8,X_9,X_{10},X_{11},X_{12})$ Eq (1)

Econometric approach of the model;

$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+\beta_7X_7+\beta_8X_8+\beta_9X_9+\beta_{10}X_{10}+\beta_{11}X_{11}+\beta_{12}X_{12}+ei$ Eq(2)

Where;

Y = Yam Post-harvest loss (kg)
X_1 = Pest attack (Assessed by recording incidence or severity of pest damage on yam tubers, using a standardized scoring scale (e.g., 0 = no damage, 1 = minor, 2 = moderate, 3 = severe) during inspections); (1)
X_2 = Poor storage and processing facilitie (Measured through a qualitative index or checklist score of storage conditions and processing infrastructure adequacy, such as ventilation, sanitation, and equipment availability, converted into a rating scale (e.g., 1 to 5))s; (2)
X_3 = Temperature of the area (°C); (3)
X_4 = Diseases and infections (Measured by presence/absence or severity rating of specific fungal, bacterial, or viral infections on stored yam); (4)
X_5 = Long distance from farm to yam barn/market (km); (5)
X_6 = Poor transportation facilities (Rated via a service quality index based on vehicle condition, transit time, road accessibility, and handling methods, using surveys or observational checklists converted into a numeric scale); (6)
X_7 = Theft of yam (Kg of quantity stolen); (7)
X_8 = Poor handling of yam (Scored based on handling practices such as manual damage, dropping frequency, and use of protective packaging—evaluated through direct observation and assigned numerical ratings); (8)
X_9 = Sprouting (% of tubers sprouted); (9)
X_{10} =Destruction due to crisis (Measured by recording losses attributable to external crises (e.g., natural disasters, conflicts) as reported quantity lost or damage severity ratings.); (10)
X_{11} = Underdeveloped market (market accessibility indices such as number of buyers, frequency of sales, and infrastructure quality, scored via surveys or statistical data.; (11)
X_{12} = Excessive exposure of yam to sunlight (Per hour); (12)
b_0 = intercept;
$b_1 – b_{12}$= parameters estimate;
ei = error term,

Results and Discussion

Socio-economic Characteristics of the Respondents

The result on Table 1 showed that males (83.6%) were more involved in yam production than females (16.4%). This exception is more inherent with the activities associated with yam production, like clearing, making of mounds, staking, harvesting etc.

Table 1: Distribution according to the gender of yam farmers

Sex	Frequency	Percent
Male	117	83.6
Female	23	16.4
Total	**140**	**100**

Source: Field Survey, 2024

The result in Table 2, also showed that about half (50%) of the yam farmers were married, closely followed by those who are single (48.8%) and only 0.7% of them were widowed. This implies that more couples were among the households that are involved in yam production in Wukari. This may reduce the cost of labor since more of family labor might be used and this can in turn reduce post-harvest losses in yam production. This aligns with Onuegbu, et al 2020; Edoja et al., 2021 who avare that being married is a fundamental to reducing production cost per mandays as well post-harvest losses thereby contributing to the household income, and absence of one of the household heads influenced household decision-making.

Table 2: Distribution according to marital status of the yam farmers

Marital status	Frequency	Percent
Single	69	48.8
Married	70	50.0
Widow/widower	1	0.7
Total	**140**	**100**

Source: Field Survey, 2024

Table 3 presents the age distribution of the 140 yam farmers surveyed. The mean age was 40 years, indicating that most respondents were in their economically active years. Half of the sample (50.0 %, *n* = 70) fell within the 21–30-year age group, followed by those aged 51–60 years (29.3 %, *n* = 41). Smaller proportions were observed in the 31–40-year (5.0 %), 41–50-year (6.4 %), 61–70-year (6.4 %) and 71–80-year (2.9 %) categories. The age distribution thus appears bimodal, with substantial representation of both younger and older farmers. Such a structure suggests that yam production in the study area is supported by a combination of youth involvement and the continued participation of experienced elderly farmers. The dominance of respondents aged 21–30 years implies increasing youth engagement in yam farming and in their economically active years, possibly due to rising awareness of its profitability and renewed interest in agribusiness ventures (Table 3).

This finding contrasts with national evidence that portrays Nigerian smallholder agriculture as ageing (FAO, 2021; Ayanwuyi *et al.*, 2023), yet aligns with recent regional studies that report renewed youth participation in high-value root crops such as yam (Oluwatayo & Adedeji, 2022; Enweremadu *et al.,* 2024). Younger farmers often exhibit higher risk-taking propensity, faster adoption of improved technologies, and greater openness to innovation compared with older counterparts (Arslan et al., 2022; Edeh *et al.,* 2023). Consequently, the large proportion of youth in the sample could enhance the diffusion of improved yam varieties, post-harvest innovations, and digital extension services.

Table 3: Distribution according to age of the yam farmers

Age	Frequency	Percent
21 – 30	70	50.0
31 – 40	7	5.0
41 – 50	**9**	6.4
51 – 60	41	29.3
61 – 70	9	6.4
71 – 80	4	2.9
Total	**140**	**100**
Mean	40	

Source: Field Survey, 2024

Table 4 revealed that 35.7% of the yam farmers have a household size of 2-4 persons, 22.1% of them have household size of 5-7 persons, 17.9% of them have

household size of 8-10person, 10.7% of them have household size of 11 -13persons and 13.6% have household size of 14 – 16 persons with a mean household size of 7 persons. thisi suggest that household size plays a crucial role in determining labour availability, consumption needs and risk-sharing capacity in smallholder agriculture. Studies across sub-Saharan Africa have shown that larger households often provide greater access to family labour, thereby lowering hired-labour costs and enhancing the timeliness of critical farm operations (Akanbi et al., 2024; Etim & Udoh, 2022, Edoja et al., 2021). In yam-based systems, where land preparation, staking, and harvesting are labour-intensive, this labour advantage can translate into higher productivity and reduced transaction costs. Conversely, very large households may exert pressure on household resources and diminish per-capita welfare, particularly when farm sizes remain small and off-farm income opportunities are limited (Abdulai & Eshun, 2021; Edoja et al., 2021; Okoro et al., 2023).

Table 4: Distribution according to the family sizes of the yam farmers

House hold size	Frequency	Percent
2 -4	50	35.7
5 -7	31	22.1
8-10	25	17.9
11 – 13	15	10.7
14 – 16	19	13.6
Total	**140**	**100**
Mean	7	

Source: Field Survey, 2024.

Table 5 results revealed that 24.3% of the yam farmers attended primary education, 23.6%, of them attended secondary, 45.0% tertiary education and 7.1%,of them non formal education respectively. This implies that majority of the yam farmers were literate and can take productive decisions on farm as it concerns post-harvest losses of yam. According to Gedefa, (2010), the ability to write and read is important for farmers to participate in farming activities because it increases the ability to acquire and effectively use the available information and resources

Table 5: Distribution according to the level of education of the yam farmers

Level of education	Frequency	Percent
Primary	34	24.3
Secondary	33	23.6
Tertiary	63	45.0
Non formal education	10	7.1
Total	**140**	**100**

Source: Field Survey, 2024

For Table 6, the result showed that 35.7% of the farmers had 2-5 years of farming experience, 10.7%, 3.6%, 7.9%, 2.9%, 15.7% and 23.6% had 11-15 years, 16-20 years, 21-25 years,26 -30 years and 31 – 35 years farming experience respectively. The mean farming experience was 17 years. This implies that the yam farmers in the study area were experienced farmers.

The result in Table 7 showed that the farmers in the study area had small farm holdings scattered in more than one location. 51.4% of the respondents had farm size of 1ha, 34.3% of them had farms 2ha in size, with 3.6 % of them having 4h while 10.7% of them having 3h of farm lands.

Table 6: Distribution according to the years of experience of the yam farmer

Years of experience	Frequency	Percent
1 -5	50	5.7
6 – 10	15	10.7
11 -15	5	3.6
16 – 20	11	7.9
21 – 25	4	2.9
26 – 30	22	15.7
31 - 35	33	23.6
Total	**140**	**100**
Mean	17	

Source: Field Survey, 2024

Table 7: Distribution according to the farm size of the yam farmers

Farm size in Hectare(s)	Frequency	Percent
1	72	51.4
2	48	34.3
3	5	3.6
4	15	10.7
Total	**140**	**100**

Note: Farm size is measured in **hectares (ha)**

Source: Field Survey, 2024

Factors influencing post-harvest losses

Table 8 presents the result of the major causes of post-harvest losses. From the result, pest attack (x_1) was significant with ($p<0.05$) and has positive effect on post-harvest losses. The more pests attack the yam the more it leads to post harvest losses. Long Distance from Farm(x_5) was significant with ($p<0.1$) and has a negative relationship with yampost-harvest losses - suggesting a potential inverse relationship with losses. This contrasts with more commonly reported patterns where longer transport distances tend to increase damage and spoilage (Smith et al., 2022). One possible inference is that longer distances in this study region might coincide with improved handling or storage infrastructure that mitigates deterioration risk, a hypothesis supported by related work highlighting the role of efficient logistics in reducing spoilage (Kumar & Banerjee, 2023). These complex dynamic warrants further investigation to clarify under what conditions distance might reduce losses.

. Poor transportation facilities (x_6) were significant with ($p< 0.01$) and has a positive effect on yam post-harvest losses. Increase in poor transport facilities lead to increase in post-harvest losses. Sprouting (x_9) was significant with ($p <0.01$) and has direct effect on post-harvest losses. Increase in sprouting, lead to increase in post-harvest losses. Excessive exposure of yam to sunlight(x_{12}) was significant with ($p< 0.01$) and has a negative effect on post-harvest losses. The coefficient of determination R^2 was 0.99 implying that 99.0% of the variation in the independent variables was accounted for by the dependent variable. These findings align with recent studies in postharvest technology and agricultural economics, confirming that biotic stressors and logistical challenges are primary drivers of loss magnitude (Adeoti & Akinola, 2023; Zhang *et al*., 2024).

Table 8: Factors influencing post-harvest losses

Variables	Coefficient	T- value	S.E	P value
(constant)	0			
Pest Attack (X_1)	0.018234**	2.291658	0.007957	0.023559
Poor Storage and Processing (X_2)	0.000704ns	0.090029	0.007825	0.928405
Temperature of the area (X_3)	0.121144ns	4.631064	0.026159	8.82E-06
Disease and Infections (X_4)	0.13264ns	5.629691	0.023561	1.09E-07
Long Distance from farm (X_5)	-0.04975*	-1.84291	0.026997	0.067655
Poor Transportation Facilities (X_6)	0.035198***	3.725691	0.009447	0.000291
Theft of Yam (X_7)	0.118688ns	11.33529	0.010471	4.74E-21
Poor Handling of Yam (X8)	0.000893ns	0.112687	0.007929	0.910456
Sprouting (X_9)	0.088312***	3.473629	0.025424	0.000701
Destruction due to crisis (X_{10})	0.025675ns	6.627967	0.003874	8.58E-10
Under Developed Markets (X_{11})	0.019163ns	1.053432	0.018191	0.294128
Excessive Exposure of Yam to Sunlight (X_{12})	-0.04446***	-3.33876	0.013318	0.001102
R^2	0.99			
R – Adjusted	0.98			

Source:Field Survey Data, 2024

1%(***),5%(**) and 10 %(*) level of significance respectively; ns = not significant.

Effect of Yam-Post Harvest Losses on yam Farmers

Table 9: shows the Economic Impact of Yam-Post Harvest Losses on Yam Farmers the most significant economic impact reported by yam farmers is financial loss, affecting 36.80% of respondents. This means a substantial portion of farmers faces direct financial setbacks due to post-harvest losses, which could be linked to reduced revenue from unsold or spoiled yam the second most common issue is low investment, affecting 25.00% of farmers. This suggests that post-harvest losses limit farmers' financial resources, which hinders their ability to reinvest in their farming operations. Post-harvest losses lead to difficulties in repaying loans for 22.13% of respondents. This highlights the broader financial strain on farmers, as they may struggle to meet their debt obligations due to reduced income from their produce. Finally, 16.21% of farmers report inadequate seedlings as a consequence of post-harvest losses. This issue could stem from reduced financial capacity to purchase quality seedlings for the next planting season.

Table 9: Economic Effect of Yam-Post Harvest Losses on yam Farmers

Ability to invest	Frequency	Percent	Rank
Financial loss	93	36.80	First
Low investment	63	25.00	second
Unable to repay loan	56	22.13	third
Inadequate seedling	41	16.21	forth

Source: Field survey, 2024

Reduction in Income

Table 10 shows the distribution of respondents regarding whether they have experienced a reduction in income. , 124 (88.6%) reported a reduction in income, while 16 (11.4%) did not experience any reduction. This data suggests that a significant majority of the sample population has faced income reduction

Table 10: Reduction in income

Reduction in income	Frequency	Percent
Yes	124	88.6
No	16	11.4
Total	**140**	**100**

Source:Field survey 2024

Estimation of reduction

Table 11 presents data on the estimated reduction in post-harvest losses among yam farmers, segmented into different ranges of monetary values. The majority of farmers (65%) report reductions in the range of 1 – 100,000, with 40% falling into the 1 – 50,000 brackets and 25% in the 51,000 – 100,000 brackets Fewer farmers (18.5%) report reductions in higher ranges, with the smallest percentage (7.1%) reporting reductions in the 201,000 – 250,000 range. The mean estimated reduction is 85,657.34, which represents an average reduction in post-harvest losses. Kiaya, (2014), found that most farmers face substantial losses but also highlights that improvements in storage and processing technologies can mitigate these losses. It also underscores the need for more widespread adoption of better practices and technologies.

Table 11: Estimation of reduction

Estimation of reduction	Frequency	Percent
1 – 50 , 000	56	40.0
51,000 – 100,000	35	25.0
101,000 – 150,000	23	16.4
151,000 – 200,000	16	11.4
201,000 – 250,000	10	7.1
Total	**140**	**100**
Mean	**85,657.34**	

Note: Unit of measurement is in Naira

Source: Field Survey, 2024

Ability to meet financial obligations

Table 12 illustrates the financial challenges faced by yam farmers in meeting their financial obligations. 65.7% of farmers report difficulty in paying off loans, indicating a significant financial strain.34.3% of farmers is unable to settle household expenses, which shows another dimension of economic hardship. The high percentage of farmers struggling to pay loans suggests that post-harvest losses have a severe impact on their financial stability. These losses may reduce overall income, making it challenging to manage debt. The substantial proportion of farmers unable to meet household expenses further reflects the broader economic difficulties caused by insufficient income due to post-harvest losses.

Table 12: Ability to meet financial obligations

Ability to meet financial obligations	Frequency	Percent
Difficult to pay loan	92	65.7
Unable to settle houses expenses	48	34.3
Total	**140**	**100**

Source: Field survey, 202**4**

Difficulties in selling of yam due to post harvest losses

Table 13 illustrates that a significant majority of yam farmers (97.1%) face difficulties in selling their yams due to post-harvest losses (PHL). Only a small fraction (2.9%) report not having such difficulties. The overwhelming percentage indicates that post-harvest losses are a critical issue impacting the ability of farmers to market their produce effectively. Parmar, *et al 2017* investigates how post-harvest losses affect yam farmers' market access and sales. It finds that significant post-harvest losses lead to difficulties in selling produce.

Table 13: Difficulties in selling of yam due to PHLS

Difficulties in selling of yam due to PHLS	Frequency	Percent
Yes	136	97.1
No	4	2.9
Total	**140**	**100**

Source: Field Survey, 2024

Ability to compete with others

50.0% of farmers attribute their competitive disadvantage to the poor quality of their product. This suggests that post-harvest losses contribute to the deterioration of yam quality.35.7% of farmers cite reduced income as a factor impacting their competitiveness. Lower income can limit their ability to invest in better farming practices or technologies. 14.3% of farmers mention reduced yield as a contributing factor. The predominant factor affecting competitiveness is the poor quality of the product, which is often a direct result of post-harvest losses. If yams are damaged or spoil, their quality deteriorates, making them less desirable in the market. Reduced income and yield also play roles, but their impact is less pronounced compared to quality issues. Reduced income can be a consequence of poor product quality and decreased yield, creating a cycle that further impedes competitiveness. Mutungi *et al 2012* explores how post-harvest losses affect yam quality and the ability of farmers to compete in the market. It finds that poor product quality due to losses significantly hampers competitiveness and market performance

Table 14: Ability to compete with others

Ability to compete with others	Frequency	Percent
Poor quality of product	70	50.0
Reduced income	50	35.7
Reduced yield	20	14.3
Total	**140**	**100**

Source: Field survey, 2024

Strategies to cope

Table 15 reveals that yam farmers predominantly use savings (70.0%) as a strategy to cope with post-harvest losses, with credit (20.7%) and insurance (7.1%) being less common. The low use of insurance suggests a need for better access to and awareness of risk management tools. Savings are the most prevalent strategy; there is significant potential for expanding the use of insurance and credit to help farmers manage post-harvest losses more effectively. 70.0%of farmers rely on savings as their primary coping strategy. This indicates a preference for using personal savings to manage the financial impacts of post-harvest losses.20.7% use credit as a means to cope, suggesting that borrowing is another important strategy but less common compared to savings. 7.1% have insurance, indicating a low level of adoption of formal risk management tools. 2.1% of farmers do not employ any coping strategies, reflecting a small portion of the sample.

Table 15: strategies to cope

Strategies to cope	Frequency	Percent
Insurance	10	7.1
Savings	98	70.0
Credit	29	20.7
None	3	2.1
Total	**140**	**100**

Source: Field survey, 2024

Adoption of new technology

Table 16 shows that a very small percentage of yam farmers (6.4%) have adopted new technology, while the vast majority (93.6%) did not. This lack of adoption could be due to various factors, including financial constraints, lack of access to technology, insufficient training, or resistance to change. Such barriers can prevent farmers from benefiting from technologies that could potentially reduce post-harvest losses and improve productivity

Table 16: Adoption of new technology

Adoption of new technologies	Frequency	Percent
Yes	9	6.4
No	131	93.6
Total	**140**	**100**

Source: Field Survey, 2024

Suggested Areas of Government Intervention for Improving Yam Production Table 17 showed that (52.1%) of the respondent think that providing subsidies would be the most effective, 18.6% of the respondents feel that direct financial support would be helpful. This could include grants, low-interest loans, or other forms of financial aid to support their needs. 10.0% of the respondents believe that providing farm implements (such as tools, machinery, or seeds) would be beneficial. This suggests a need for better equipment to improve yam productivity. 6.4% of respondents see the development of infrastructure like storage facilities as an important area for support. Good infrastructure can enhance productivity and efficiency. 11.4% of respondents think that improving road infrastructure would help. Better roads can facilitate easier transport of yam and access to markets. 1.4% of respondents consider the establishment of research institutes as a key area of support. Research institutes can help by providing new knowledge and innovations.

Table 17: How Government could help

How do you think Government could help	Frequency	Percent
Subsidy	73	52.1
Financial support	26	18.6
Supply farm implements	14	10.0
Provision of infrastructure	9	6.4
Good road	16	11.4
Establishment of research institute	2	1.4
Total	**140**	**100**

Source: Field Survey, 2024

Conclusion

This study examined the economic implications of post-harvest losses among yam farmers in Wukari Local Government Area of Taraba State, Nigeria. The findings demonstrate that post-harvest losses are predominantly driven by pest attacks, poor transportation facilities, and sprouting, while longer transport distances and excessive exposure to sunlight also contribute significantly. These variables collectively explain 99% of the variation in losses, as evidenced by the robust regression model. The magnitude of these losses directly reduces farmers' income by diminishing the quantity and quality of marketable yam, consequently constraining their ability to reinvest, service loans, and meet household expenditures. Notably, 88.6% of respondents reported income reductions, with average estimated monetary losses of ₦85,657.34 per production cycle, underscoring the profound financial strain imposed by post-harvest inefficiencies. These results align with contemporary research emphasizing the critical role of logistics, storage, and biotic stressors in post-harvest loss dynamics in root and tuber crops across sub-Saharan Africa.

Addressing these challenges requires coordinated multi-stakeholder interventions involving federal and state agricultural ministries, local government bodies, agricultural development programmes, and relevant non-governmental organisations. Key strategies include enhancing agricultural extension services to promote improved post-harvest handling and storage technologies, coupled with the provision of accessible credit facilities to empower farmers to invest in modern infrastructure. Subsidising pest control measures and transport equipment is also essential to reduce losses effectively. Furthermore, investment in rural infrastructure—particularly feeder roads, storage centres, and processing facilities—through public–private partnerships will improve supply chain efficiency. Collaborative research with academic and research institutions should focus on developing affordable, climate-resilient storage solutions tailored to yam physiology. These integrated approaches not only have the potential to mitigate post-harvest losses but also to stabilise farmer incomes, enhance food security, and contribute to broader agricultural sustainability and poverty alleviation efforts in Nigeria and analogous regions.

This study provides a rigorous empirical foundation to inform policy and programme design aimed at reducing post-harvest losses in yam production systems. Continued investigation into nuanced factors such as the influence of transport distance and environmental exposures will further refine interventions, promoting resilient and sustainable yam value chains.

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