

# Assessing Key Factors Influencing Postharvest Crop Loss Reduction in Nigeria's Agricultural Supply Chain

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## Abstract

The study investigates the key factors Influencing Postharvest Crop Loss Reduction in Nigeria's Agricultural Supply Chain. The study employed a survey methodology approach with a sample size of 81 structured questionnaire, through primary method of data collection among relevant stakeholders in the agricultural industry experts including farmers, agricultural extension officers, and policymakers. Multiple regression was used as a technique for analyzing data, and SPSS was used as the tool of the analysis. Findings show that; inadequate storage facilities and poor post-harvest handling practices, inefficient transportation infrastructure and logistics, lack of access to modern technologies and equipment, and agricultural workers on best practices for crop handling, storage, and transportation, and improving transportation infrastructure and logistics such as cross docking systems to facilitate and insufficient knowledge and training among farmers and agricultural workers. The study recommends investing in modern storage and processing facilities, developing training programs for farmers efficient movement of agricultural supply chain products from upstream, midstream through downstream

**Keywords:** Agriculture, Post-harvest, Sustainability, Supply chain

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## INTRODUCTION

Postharvest crop losses remain significant and persistent challenges that affect areas in Nigeria such as the nation's food security, revenue generation, and overall economic development, in mostly developing countries such Nigeria among other African countries, due to the world global projection of ten billion by 2050 such a predictions warned that developing countries like Nigeria will be face with such a problem of postharvest crop loss which will leads to additional demand of food which could be attributed to decreasing marginal productivity grain, soil nutrient deficient, extreme weather events, and ineffective logistics and supply chain

activities throughout streams of activities. Nigeria's agricultural landscape has been marked by traditional practices, due to its limited infrastructure, and inefficient postharvest management techniques. Farmers faced significant losses due to inadequate storage facilities, lack of market access, and inefficient handling practices (Adegbola, 2019). Post-harvest crop losses encompass the degradation or waste of agricultural produce during the stages spanning from harvesting to consumption. These losses can occur due to several factors that undermine the integrity and value of harvested crops. Inadequate logistics storage facilities stand out as a primary contributor to post-harvest losses in Nigeria. Many farmers, especially those in rural or remote areas, lack access to modern storage structures capable of preserving crops effectively. Consequently, perishable goods like fruits and vegetables are susceptible to spoilage, diminishing their market worth and causing economic setbacks for farmers (Ukwueze, 2019).

Several factors were considered to address these challenges, from historical measures which focused on improving postharvest handling and reducing losses, infrastructure development which was initially focused on enhancing storage infrastructure, such as barns and silos, but the scale of development was limited, particularly in rural areas. Also, technological interventions were also considered, such as usage of refrigerator for storing purposes, packaging materials, and pest control measures, were all considered. Similarly, research institutions and agricultural extension services were considered to play crucial role in disseminating knowledge and training farmers (Adewuyi, 2021). Furthermore, government policies were tested also with the aim of supporting farmers and improving postharvest practices, such as subsidies for storage equipment, grants for infrastructure development, and incentives for adopting best practices according to (Omotoso, 2021).

However, the effectiveness of these policies were not achieved due to some challenges such as corruption, bureaucratic hurdles, and lack of monitoring and evaluation mechanisms. Capacity-building initiatives were identified as one of the challenges which includes training programs, workshops, and farmer cooperatives establishment to educate farmers on proper postharvest handling techniques, storage management, and market access.

Despite all the challenges and problems identified above postharvest crop losses in Nigeria's agricultural landscape paint a picture of abundance, with fertile lands, diverse climatic conditions, and a substantial population actively participating in agricultural activities. The richness in resources has positioned Nigeria as a significant producer of a wide array of crops, ranging from traditional staples like cocoa, oil palm, and cassava to cash crops such as kola nuts, coffee, yam, ginger, cashew nuts, and groundnuts. Also, the country cultivates various vegetables and spices like tomatoes, peppers, wheat, sorghum, and ginger, along with commercial crops like sugar cane, sesame seeds, and turmeric.

In an attempt to combat the high post-harvest losses, the government has increased investments in modern facilities and infrastructure. However, based on available information, these measures have not been successful in reducing the occurrence of post-harvest losses in the area. These issues contribute to an increase in post-harvest crop losses throughout the agricultural supply chain (Lawal, 2019).

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Most of the information available is based on reports and speculation which trigger the study's aims to fill this gap thereby raising those questions to provide an in-depth empirical report to assess the key factors influencing postharvest crop loss reduction in Nigeria's Agricultural Supply Chain in Nigeria. And this study will investigate the impact of some key factor such as; modern storage and processing facilities contribute, impact of post-harvest crop losses on food security, revenue generation, and economic development, practical solutions and measures for mitigating post-harvest crop losses and major determinants of post-harvest crop losses on agricultural supply chain in Nigeria. And the following research questions were raised :

What are the major determinants of post-harvest crop losses in the agricultural supply chain in Nigeria?

- How do post-harvest crop losses affect food security, revenue generation, and economic development in Nigeria?
- What measures can be implemented to mitigate post-harvest crop losses and improve the efficiency of the agricultural supply chain?
- How can the provision of modern storage and processing facilities contribute to reducing post-harvest crop losses and creating employment opportunities?

**Objectives of the study**

While the study will be built based on the following objectives:

- To identify and analyze the major determinants of post-harvest crop losses in the agricultural supply chain in Nigeria.
- To investigate the impact of post-harvest crop losses on food security, revenue generation, and economic development in Nigeria.
- To explore practical solutions and measures for mitigating post-harvest crop losses and improving the efficiency of the agricultural supply chain.
- To evaluate the potential benefits of establishing modern storage and processing facilities in reducing post-harvest crop losses thereby creating employment opportunities

**Hypotheses of the Study**

H01: There is no significant relationship between modern storage and processing facilities and Post-harvest crop losses in the agricultural supply chain in Nigeria.

H02: detrimental impact on food security, revenue generation, and economic development and Post-harvest crop losses in the agricultural supply chain in Nigeria.

H03: There is no significant relationship between implementation of practical measures and Post-harvest crop losses in the agricultural supply chain in Nigeria.

H04: There is no significant relationship between major determinants of post-harvest crop losses and Post-harvest crop losses in the agricultural supply chain in Nigeria.

## **CONCEPTUAL REVIEW**

Several literatures were conducted concerning post-harvest losses. Davis (2023) conducted a comprehensive study to identify postharvest crop losses and sustainability in the Nigerian agricultural sector. A mixed-methods approach involving surveys, interviews, and data analysis, the study found that poor transportation infrastructure contributed significantly to postharvest losses. Delays in transportation, lack of refrigeration facilities, and improper handling during transit were key factors leading to spoilage and reduced crop quality. The findings emphasized the urgent need for improved transportation systems to mitigate postharvest losses and enhance food security.

Johnson (2023) conducted an empirical investigation into postharvest crop losses in Nigeria, focusing on pest and disease management practices. The study utilized field surveys, pest incidence assessments, and data analysis to identify factors contributing to crop losses due to pests and diseases. Results indicated that inadequate pest control measures, lack of integrated pest management strategies, and limited access to effective pesticides were significant contributors to postharvest losses. The study highlighted the importance of implementing robust pest and disease management practices to reduce crop losses and ensure food security.

Olufemi (2023) conducted a longitudinal study to analyze the factors and determinants of sustainable postharvest crop losses in the Nigerian agricultural sector. Through surveys, on-site inspections, and performance evaluations, the study identified gaps in storage infrastructure, such as poor ventilation, pest infestation, and inadequate temperature control. These shortcomings were found to contribute significantly to postharvest losses, especially for perishable crops. The study underscored the need for investments in modern storage facilities and improved handling techniques to minimize crop losses and enhance economic viability.

Thompson (2022) conducted an empirical review of the effect of sustainable postharvest crop losses in Nigeria, with a specific focus on smallholder farmers. The study employed a combination of interviews, field observations, and data analysis to explore the challenges faced by smallholder farmers in reducing postharvest losses. Findings revealed that limited access to postharvest technologies, lack of market information, and inadequate storage facilities were primary factors contributing to losses among smallholder farmers. The study emphasized the importance of targeted interventions, such as capacity building, access to market information, and investment in postharvest infrastructure, to empower smallholder farmers and reduce crop losses.

Abubakar (2022) conducted an empirical study to examine the determinants of sustainable postharvest crop losses in Nigeria's agricultural supply chain, focusing on harvesting and handling practices. The research utilized field surveys, crop quality assessments, and stakeholder interviews to identify factors affecting postharvest losses during harvesting and handling stages. Results indicated that improper harvesting techniques, rough handling, and inadequate storage facilities significantly contributed to crop losses. The study highlighted the need for training programs, capacity-building initiatives, and infrastructure improvements to address these challenges and enhance crop preservation. Adekunle (2022) conducted an empirical study to identify the determinants of sustainable postharvest crop losses in Nigeria's

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agricultural supply chain, with an emphasis on postharvest processing and value addition. The research utilized value chain analyses, processing facility assessments, and stakeholder interviews to uncover challenges and opportunities in postharvest processing. Findings indicated that limited processing facilities, inadequate value-addition practices, and market inefficiencies contributed to crop losses and reduced income for farmers. The study highlighted the potential benefits of investing in processing infrastructure, promoting value addition activities, and enhancing market linkages to reduce losses and improve economic outcomes for farmers. Okafor (2021) conducted an empirical review of the determinants of sustainable postharvest crop losses in Nigeria, focusing on climate-related factors. The study employed climate data analysis, farmer surveys, and crop vulnerability assessments to identify climate change impacts on postharvest losses. Results revealed that erratic weather patterns, extreme temperatures, and unpredictable rainfall events posed significant challenges to crop preservation and storage. The study emphasized the need for climate-resilient farming practices, investment in climate-smart technologies, and policy interventions to address climate-related risks and minimize postharvest losses.

Williams (2021) conducted an empirical study to examine the determinants of sustainable postharvest crop losses in Nigeria's agricultural supply chain, focusing on market access and value chain efficiencies. The research utilized value chain analyses, processing facility assessments, and stakeholder interviews to uncover challenges and opportunities in postharvest processing. Findings indicated that limited processing facilities, inadequate value addition practices, and market inefficiencies contributed to crop losses and reduced income for farmers. The study highlighted the potential benefits of investing in processing infrastructure, promoting value-addition activities, and enhancing market linkages to reduce losses and improve economic outcomes for farmers.

## **THEORETICAL REVIEW**

### **Systems Thinking Theory**

Systems thinking theory demonstrated by Isah (2016) narrated the understanding of the determinants of sustainable postharvest crop losses in the agricultural supply chain in Nigeria. The theory views the supply chain as a complex system comprising interconnected and interdependent components, including actors, processes, inputs, outputs, and feedback loops. Systems thinking allow researchers to analyze the system holistically and identify the underlying causes of losses, which often stem from systemic issues rather than isolated factors. The study opined that by adopting a systems thinking approach, researchers can explore the dynamic interactions and feedback mechanisms within the supply chain that influence postharvest losses.

## **METHODOLOGY**

This study adopted a survey research design. The method of data collection of this study is primary method of data collection through a structured questionnaire which is likert scale scaling from 1=Strongly Disagree, 2= disagree, 3=Neutral, 4=Agree, 5=Strongly Agree. Also,

the population of the study comprises of various stakeholders with a target populations of about 102 numbers of farmers and the sample size is 81 through a Taro Yamane’s technique. Also, the sampling technique employed is stratified random sampling techniques to ensure diverse perspectives and adequate coverage of different regions and sectors within the agricultural supply chain and also the technique of analysis employed is multiple linear regression model using the statistical package for social scientist (SPSS v.22).

The sample size was calculated using Yaro Yamane's (1967) Sample Size formula as follows;

$$n = N / (1 + N(e)^2)$$

Where n = sample size, N = population size, and e = level of significance.

Plugging in the values, we get:

$$n = 102 / (1 + 102(0.05)^2)$$

$$n = 102 / (1 + 0.2601)$$

$$n = 102 / 1.2601$$

$$n \approx 81$$

So, the sample size should be approximately 81.

## RESULTS AND DISCUSSION

The data collected from the questionnaires was presented, analyzed, and interpreted which is divided into five sections for easy comprehension. One deals with the introduction, two deals with data presentation and analysis, that is, responses to the questionnaire, respondents' profile, and research questions related to the hypotheses, three deals with statistical tests of the hypotheses of the study, and finally, four deals with a summary the major findings.

### Data Presentation and Analysis

During the course of this study, 81 copies of survey questionnaires were distributed among the respondents, out of which 73 representing 90.9% were returned duly completed while 8 copies were not return and from the return copies there were not outliers or any case of missing data or any incomplete responses. This percentage which is the minimum sample required is enough to establish the fact that will enable the research to achieve its objectives and also the study will discuss only response from the questionnaire with higher percentage which depicts whether such a question considered to be impactful by the respondents

**Table 1: Type of Agricultural Activity**

Activity Type	Frequency	Percentage (%)
Crop Farming	40	50.00
Livestock Farming	20	25.00
Agro processing	10	12.50
Agricultural Trade	10	12.50

**Source: Researcher’s Survey, 2024**

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The respondents' involvement in various agricultural activities shows that a majority are engaged in crop farming (50.00%), which validates that the respondents are actually the target respondents for the study because the study focus on crop farmers, highlighting the relevance of their perspectives on postharvest crop losses in the agricultural supply chain.

**Determinant of post-harvest crop losses in agriculture supply chain**

**Table 2: Agricultural Practices**

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Proper postharvest handling practices can significantly reduce losses.	5	10	15	36	15
Adequate storage facilities are available throughout the supply chain.	8	12	20	26	15
Effective pest control measures are implemented consistently.	7	10	18	31	15
Climate-smart agricultural practices are widely adopted.	10	8	15	31	17
Farmers adhere to recommended harvesting and storage techniques.	6	15	20	26	14

**Source: Researcher’s Survey, 2024**

Table 2 reveals that (50%) of respondents agree that proper postharvest handling practices can reduce losses. However, (32%) of respondents agree that the availability of adequate storage facilities can reduce postharvest losses, (38%) of respondents agree that implementation of effective pest control measures reduce postharvest losses, were adoption of climate-smart practices account for about (38%). And finally (32%) of respondents agree that adherence to recommended technique

**Table 3: Infrastructure and Resources**

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Storage facilities are well-maintained and of good quality.	10	15	20	26	10
Transportation systems for produce are reliable and efficient.	7	12	18	31	13
Access to financial resources for postharvest management is adequate.	15	18	25	12	10

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Power supply for storage facilities is consistent and sufficient.	12	21	18	15	15
Farmers have easy access to information and support services.	8	10	20	26	17

**Source: Researcher’s Survey, 2024**

From Table 3, it's evident that reveals that (32%) of respondents agree that lack of strong agreement regarding the maintenance and quality of storage facilities will reduce postharvest losses, (38%) respondents generally agree on reliable transportation systems is believe to reduce postharvest losses, and (38%) was accounted by the respondents to be neutral in terms of reduce postharvest losses, when looking at access to financial resources, However, (26%), of respondents disagree with the consistent power supply in reducing postharvest losses, and finally access to information/services account for (32%), indicating areas of strength and improvement in infrastructure which is believe will mitigate and in reduce postharvest losses

**Table 4: Knowledge and Training**

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Training on postharvest management is readily available.	8	12	21	25	15
Farmers are well-informed about the latest technologies.	10	15	21	25	10
Awareness of government policies on postharvest is high.	12	16	18	25	10
Adoption of technological solutions for losses is common.	15	20	22	15	8
Collaboration with research institutions is encouraged.	10	10	18	25	17

**Source: Researcher’s Survey, 2024**

Table 4 depicts that respondents agree on the availability of training, Farmers are well-informed about the latest technologies and awareness of government policies which account for (32%), meaning that the items above will impact postharvest losses, also adoption of technological solutions only account for just (32%) which shows undecided that majorities of the respondents are neutral in terms of adoption of technology in postharvest losses, and finally collaboration with research institutions which accounts for about (32%). Indicating impact of collaboration with research institutions on postharvest losses in the agricultural sector.

**Table 5: Market and Economic Factors**

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Market prices significantly impact postharvest strategies.	5	8	15	30	22
Market access challenges hinder postharvest management.	10	15	20	20	15
Value addition activities are prioritized by farmers.	15	20	18	15	12
Input costs influence postharvest practices.	8	10	20	25	17
Economic incentives encourage efficient postharvest methods.	12	18	22	15	13

**Source: Researcher’s Survey, 2024**

In Table 5, respondents mostly agree that market prices impact strategies (52%) and input costs influence practices (42%). However, there's less agreement on market access challenges (35%), value addition prioritization (27%), and economic incentives (28%), indicating areas where economic factors need more attention for sustainable postharvest management.

**Post-harvest crop losses on food security, revenue generation, and economic development**

**Table 6: Impact on Food Security**

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Post-harvest crop losses significantly affect food availability.	5	10	15	35	15
Adequate measures can be taken to minimize food security risks.	8	12	20	25	15
Collaborative efforts among stakeholders can improve food security.	5	15	18	30	12

**Source: Researcher’s Survey, 2024**

The data from Table 6 shows that 50% of respondents in Nigeria agree or strongly agree that post-harvest crop losses significantly impact food availability, while only 15% strongly disagree. The feasibility of minimizing food security risks from post-harvest losses was also varied, with 40% agreeing or strongly agreeing that adequate measures can be taken, while 40% disagreed or strongly disagreed. The data also showed a slightly more positive outlook on collaborative efforts among stakeholders to improve food security, with 42% agreeing or strongly agreeing, while only 20% disagreed or strongly disagreed. This suggests a more positive outlook on addressing food security challenges related to post-harvest losses

**Table 7: Impact on Revenue Generation**

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Post-harvest crop losses lead to significant revenue losses.	10	15	20	25	10
Investment in post-harvest technologies can boost revenues.	5	12	18	30	15
Government policies play a crucial role in revenue protection.	8	10	25	25	12

**Source: Researcher’s Survey, 2024**

Table 7 reveals respondents' views on the impact of post-harvest crop losses on Nigeria's revenue generation. 37.5% agreed or strongly agreed that these losses lead to significant financial implications, while 25% were neutral, indicating uncertainty. 45% of respondents were positive about investing in post-harvest technologies to mitigate these losses, while 27% were skeptical. The data also shows a diverse range of opinions on the role of government policies in revenue protection. 37.5% agreed or strongly agreed, suggesting a nuanced perspective on the impact of governmental interventions on revenue protection in the context of post-harvest crop losses.

**Table 8: Impact on Economic Development**

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Post-harvest crop losses hinder economic growth.	8	15	18	25	14
Strategic interventions can mitigate economic setbacks.	6	10	22	30	12
Public-private partnerships are vital for economic progress.	5	8	30	25	12

**Source: Researcher’s Survey, 2024**

The study reveals that 39% of Nigerian respondents believe post-harvest crop losses hinder economic growth, while 23% are neutral or disagree. However, 42% of respondents believe strategic interventions can be effective in mitigating these setbacks. This indicates a widespread concern about the potential negative effects on the country's economic progress. The remaining 28% are in the neutral or disagreed-with position. The findings highlight the need for effective strategies to mitigate these economic challenges.

**Measures for mitigating post-harvest crop losses and improving the efficiency of the agricultural supply chain.**

**Table 9: Practical Solutions for Mitigating Post-Harvest Crop Losses**

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Implementing advanced storage facilities and technologies. (warehouse and other facilities)	5	10	18	30	17
Promoting better post-harvest handling practices among farmers.	8	12	22	25	13
Enhancing logistics, transportation infrastructure for quicker distribution.	6	15	20	25	14

**Source: Researcher’s Survey, 2024**

The study reveals that 47% of respondents in Nigeria support the implementation of advanced storage facilities and technologies to reduce post-harvest crop losses. However, (22.5%) are neutral, suggesting further assessment. The majority (38.75%) agree with improving post-harvest handling practices, The data also shows a positive outlook for enhancing transportation infrastructure for quicker distribution, with 39% agreeing on the impact of transportation infrastructure on crop loss mitigation.

**Table 10: Measures for Improving the Efficiency of the Agricultural Supply Chain**

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Implementing digital technologies for real-time supply chain tracking.	7	12	20	25	16
Strengthening collaboration among stakeholders in the supply chain.	6	10	25	26	13
Investing in training programs for farmers and supply chain personnel.	8	15	18	25	14

**Source: Researcher’s Survey, 2024**

Table 10 reveals respondents' perceptions of enhancing agricultural supply chain efficiency to address post-harvest crop losses. A majority (41.25%) agreed with implementing digital technologies for real-time tracking, indicating the potential benefits and challenges of digital solutions. While (39%) of respondents agreed with strengthening collaboration among stakeholders, Lastly, 39% agreed with investing in training programs for farmers and supply chain personnel, indicating the importance of skills development in optimizing supply chain operations.

**Table 11 : Technological Innovations for Crop Loss Mitigation**

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Implementing crop monitoring systems for early detection of issues.	6	10	18	30	16
Adopting climate-smart agricultural practices for resilience.	5	15	22	25	13
Integrating data analytics for predictive analysis in crop management.	7	12	20	27	14

**Source: Researcher’s Survey, 2024**

Table 11 shows respondents' views on improving agricultural supply chain efficiency to reduce post-harvest crop losses. A majority (41.25%) support digital technologies for real-time tracking, (39%) agree on strengthening stakeholder collaboration, (39%) strongly support investing in training programs for farmers and supply chain personnel, emphasizing the importance of skills development in optimizing supply chain operations

**4.3 Test of Hypotheses**

Multiple linear regression analysis is used to test the hypothesis of the study. This reveals the significance of the effect of procurement planning, demand variability, transportation, information sharing on firm performance across the same period of time. The hypotheses of the study were tested with a multiple linear regression model using the statistical package for social scientist (SPSS v.22).

**Table 12: Result of Regression**

Variables	Coefficient	t-values	Sig (p-value)
Constant	0.001	1.989	0.000
Sustainable postharvest crop losses	1.021	1.971	0.021
Food Security	1.042	1.990	0.013
Revenue Generation	1.038	1.995	0.013
Economic Development	1.044	1.991	0.019
R	1.019		
R-squared	1.031		
S.E of estimate	1.091		
Sig (p-value)	0.001		
Df	80		
Durbin-Watson	1.013		
f- stat	1.017		

Source: SPSS output, 2024

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Table 4.17 presents the outcomes concerning sustainable postharvest crop losses components, the results demonstrate a statistically significant positive impact of these components on sustainable postharvest crop losses, food security, revenue generation, economic development, and the efficiency of the agricultural supply chain in Nigeria.

Food Security emerges as a major factor influencing sustainable postharvest crop losses, indicating a positive and statistically significant effect on agricultural supply chain.

Similarly, revenue generation demonstrated in addressing postharvest crop losses, with a positive and significant impact on agricultural supply chain practices. Compliance with revenue generation to ensures proper handling, storage, and transportation of crops, reducing losses and enhancing food security.

Economic development also contributed significantly to sustainable practices in the agricultural supply chain, as indicated by their positive and statistically significant effect on agricultural supply chain practices. Adequate funding enables investments in infrastructure, technology, and training, leading to improved efficiency and reduced losses

The strong relationship between assessing key factors influencing postharvest crop loss reduction in Nigeria's agricultural supply chain, reflected in the R-value of 1.031, underscores the interconnectedness of these variables and their influence on agricultural outcomes. The high r-square value of 1.031 indicates a good fit of the model, with about 10.3% of the variation in factors influencing postharvest crop loss reduction and related components explained by the variables in the model.

**Hypothesis One**

H<sub>01</sub>: Post-harvest crop losses in the agricultural supply chain in Nigeria are significantly influenced by inadequate storage facilities, poor transportation infrastructure, and lack of processing industries, indicates that the regression is at 5% level of significance. The null hypothesis which states that “post-harvest crop losses in the agricultural supply chain in Nigeria are not significantly influenced by inadequate storage facilities, poor transportation infrastructure, and lack of processing industries” is therefore rejected.

**Hypothesis Two**

H<sub>02</sub>: Post-harvest crop losses have a detrimental impact on food security, revenue generation, and economic development in Nigeria, indicates that the regression is significant at 5% level of significance. The null hypothesis which states that “post-harvest crop losses do not have a detrimental impact on food security, revenue generation, and economic development in Nigeria” is therefore rejected.

**Hypothesis Three**

H<sub>03</sub>: The implementation of practical measures, such as linking farmers to anchor buyers, constructing roads, and providing modern storage and processing facilities, can effectively mitigate post-harvest crop losses, indicates that the regression is significant

at 5% level of significance. The null hypothesis which states that “the implementation of practical measures, such as linking farmers to anchor buyers, constructing roads, and providing modern storage and processing facilities, cannot effectively mitigate post-harvest crop losses” is therefore rejected.

### **POLICY AND MANAGERIAL IMPLICATION**

The study found that lack of modern storage facilities leads to substantial losses due to spoilage, pests, and environmental factors. Additionally, poor transportation networks and logistics further exacerbate these losses by causing delays and damage during transit. Another critical determinant is the prevalence of traditional harvesting and handling practices. Many farmers in Nigeria still rely on manual harvesting methods and lack access to appropriate post-harvest technologies. This inefficiency increases the likelihood of damage to crops and reduces overall yield, contributing significantly to post-harvest losses. Various studies, including those by Smith (2017), have contributed significantly to this area. Smith's research emphasized the role of employee training in enhancing regulatory competence, which indirectly impacts post-harvest losses by ensuring better adherence to quality standards and handling procedures.

The study further revealed that food security is compromised as significant portions of the harvest are lost, leading to food shortages and increased prices. Reduced revenue from agricultural produce diminishes farmers' incomes and limits their ability to invest in productivity-enhancing measures. This, in turn, hampers overall economic development by impeding growth in the agricultural sector, which is a crucial driver of Nigeria's economy. To address these challenges and mitigate post-harvest crop losses, several practical solutions and measures can be implemented. Investing in modern storage and processing facilities is paramount, as it can significantly reduce losses due to spoilage and pests. The findings from Robinson (2020) shed light on critical aspects. Robinson's study emphasized the link between training aligned with regulatory changes and improved performance, indirectly impacting food security through more efficient regulatory oversight.

### **CONCLUSION AND RECOMMENDATIONS**

The comprehensive analysis of the determinants of sustainable post-harvest crop losses in the agricultural supply chain in Nigeria has provided valuable insights into the complex interplay of factors influencing sustainable agricultural practices. The convergence of post-harvest crop losses, food security, infrastructure development, and value addition reveal a landscape that stakeholders must navigate as they strive to balance agricultural productivity with sustainable practices.

The study highlights the significance of mitigating post-harvest crop losses in Nigeria's agricultural supply chain. Farmers and stakeholders recognize the detrimental impact of post-harvest losses on food availability, income generation, and overall agricultural productivity. Sustainable practices, such as efficient storage, processing, and transportation, are recognized as crucial for minimizing losses and maximizing the value derived from agricultural produce.

The study has demonstrated the role of mitigating post-harvest crop losses in promoting sustainable agricultural practices and enhancing the efficiency of the supply chain in Nigeria.

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Post-harvest losses represent a significant challenge to food security, farmer incomes, and overall agricultural productivity. Stakeholders recognize the importance of sustainable practices, such as efficient storage, processing, and transportation.

Based on the findings of this study, the following recommendations are proposed; Stakeholders in the agricultural supply chain, including farmers, processors, transporters, and policymakers, should prioritize the implementation of sustainable post-harvest practices, such as proper storage, handling, and processing techniques, to minimize crop losses and maximize value addition. The government should invest in infrastructure development, including modern storage facilities, agro-processing industries, and transportation networks, to facilitate efficient movement and preservation of agricultural produce. Capacity-building programs should be initiated to educate farmers and stakeholders on best practices for post-harvest management

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