# JAMD

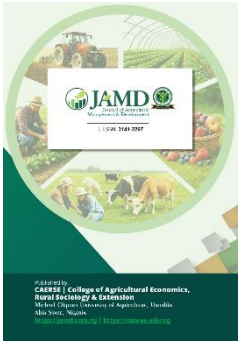
Journal of Agricultural Management & Development

E-ISSN: 3141-2297
Volume 1 Issue 1, April, 2026

ISSN 3141-2297
9 773141 229005

Published by:
**CAERSE | College of Agricultural Economics, Rural Sociology & Extension**
Michael Okpara University of Agriculture, Umudike
Abia State, Nigeria
https://jamd.com.ng | https://mouau.edu.ng

Journal of Agricultural Management & Development
E-ISSN: 3141-2297
Volume 1 Issue 1, April, 2026



# Post-Harvest Handling Decisions Among Smallholder Leafy Vegetable Farmers in Kuje Area Council, Federal Capital Territory (FCT), Nigeria

Otitoju[1], M.A and Olohungbebe[2], S.A.

## ARTICLE INFO

***Author(s) Affiliation(s):***
[1]Department of Agricultural Economics
University of Abuja, Nigeria
Email: moradeyo.otitoju@uniabuja.edu.ng
Orchid ID: 0000-0002-3444-1870

[2]Department of Agricultural Economics
University of Abuja, Nigeria
Email: ahmad.olohungbebe@uniabuaja.edu.ng
Orchid ID: 0000-0002-1646-7890

***Keywords:***
Leafy vegetables, Multinomial Logit Model, Post-Harvest Decisions



Journal homepage: www.jamd.com.ng

## ABSTRACT

Despite the nutritional and economic significance of leafy vegetables to smallholder livelihoods, empirical evidence gap exists on the specific post-harvest handling decisions made by leafy vegetable farmers in Nigeria and thus requires adequate attention. This study examined post-harvest handling decisions among smallholder leafy vegetable farmers in Kuje Area Council, Federal Capital Territory (FCT), Nigeria. Using a multi-stage sampling procedure, primary data were obtained from 132 sampled farmers and analysed with descriptive statistics and a multinomial logit (MNL) regression model. Results indicated that majority (52.3%) of farmers reported immediate selling after harvest, followed by cold-room storage before selling (22.7%), packaging before selling (16.7%), and processing or value addition (8.3%). Parameters such as age ($\beta = -0.036$; $-0.111$), household size ($\beta = -0.115$), personal income ($\beta = 3.58\times10^{-7}$; $5.98\times10^{-7}$), training in post-harvest techniques ($\beta = 1.350$; 2.288), access to credit ($\beta = -0.210$; $-1.464$), and participation in publicly funded agricultural projects ($\beta = 1.592$) were the key determinants of post-harvest decision choice of the sampled farmers. Likewise, factors such as farmer risk aversion (mean = 3.18), inadequate supporting infrastructure (mean = 3.06), and the absence of a coherent post-harvest policy framework (mean = 3.04) were the most binding constraints affecting post-harvest decision of the farmers. The study concludes that targeted extension training, improved access to credit, and community-level cold-chain investment for perishable vegetables are necessary to enhance post-harvest decision-making capacity of smallholder leafy vegetable farmers in Nigeria.

## Introduction

Food and nutrition security in sub-Saharan Africa is jeopardised not only by production deficits but also by substantial post-harvest losses (PHLs) incurred along the value chain of leafy vegetables. The Food and Agriculture Organization (FAO, 2008) estimated that up to 50% of vegetable production in African countries is lost between harvest and consumption, despite the recognised nutritional value of leafy

vegetables in household diets and their importance as a source of income for smallholder farming households. Minimising post-harvest losses between harvest and consumption is widely acknowledged as a more cost-effective and environmentally sustainable strategy than expanding production alone (Kader & Rolle, 2004).

Post-harvest loss is defined as measurable quantitative and qualitative reductions in produce occurring at any point along the post-harvest chain, from harvest to final consumption (Delucia & Assemato, 1994). For highly perishable commodities such as leafy vegetables which includes pumpkin leaf (*Telfairia occidentalis*), African spinach (*Amaranthus hybridus*), okra (*Abelmoschus esculentus*), bitter leaf (*Vernonia amygdalina*), and waterleaf (*Talinum triangulare*), PHLs can be economically catastrophic. The primary causes include mechanical injuries during harvesting, inadequate storage infrastructure, poorly organised transportation networks, and delayed market access (Companhia de Entrepostos e Armazéns Gerais de São Paulo [CEAGESP], 2002). These structural deficiencies expose smallholder farmers to distress selling at sub-optimal prices, compromise household welfare, and limit reinvestment in productive agricultural technologies, thereby perpetuating cycles of low productivity (Bold, Kaizzi, Svensson, & Yanagizawa-Drott, 2017).

Post-harvest decision-making refers to the cognitive and behavioural process through which farmers select a course of action from available alternatives following harvest (Umeh & Chukwu, 2014). These decisions which typically encompass immediate selling, cold-room storage, packaging for retail markets, and value addition through processing are conditioned by resource endowments, institutional access, risk preferences, and prevailing market conditions. Existing literature has examined post-harvest decision-making in rice systems in Tanzania (Ruhinduka, Alem, Eggert, & Lybbert, 2020), maize systems in Benin Republic (Kadjo, Ricker-Gilbert, Abdoulaye, Shively, & Baco, 2018), and tomato production in the FCT, Nigeria (Ikeh, 2021). However, comparable evidence for the leafy vegetable sub-sector in Nigeria is largely absent. Otitoju and Olawoye (2025) examined post-harvest loss reduction in cowpea production.

This study addresses that evidence gap by examining post-harvest handling decisions among smallholder leafy vegetable farmers in Kuje Area Council, FCT, Nigeria. Specifically, the study: (i) describes the socio-economic profiles of respondents; (ii) identifies the prevailing post-harvest decision patterns; (iii) analyses the determinants of those decisions; and (iv) identifies the limiting constraints affecting post-harvest decision-making in the study area. The findings are intended to inform present and future farmers, extension agents, agricultural finance policy, and targeted interventions designed to reduce post-harvest losses in Nigeria's vegetable sector.

**Methodology**

The study was conducted in Kuje Area Council, one of six area councils constituting the Federal Capital Territory (FCT), Abuja, Nigeria (Federal Capital Territory Administration [FCTA], 2016; National Population Commission [NPC], 2006). It covers an area of 1,644km² out of the 7,290km² of the total FCT land mass, with its land located between 8.8764° north and 7.2437° East. The area council lies within the Guinea Savannah agro-ecological zone (International Institute of Tropical Agriculture [IITA], 2009), and is predominantly rural in character. Smallholder vegetable production is a prominent agricultural activity along the river valleys and flood plains of the area council (NPC, 2006), making it an appropriate setting for this study.

Structured questionnaires were administered to the respondents during the 2021/2022 farming season which comprises of information such as socio-economic characteristics, post-harvest decision patterns, and perceived constraints to post-harvest management.

A multi-stage sampling technique was employed. In the first stage, Kuje Area Council was purposively selected due to large numbers of leafy vegetable farmers in the area. In the second stage, four wards namely (Kusaki, Kuje town, Yanga and Rubochi) were randomly chosen from the twelve administrative wards of Kuje Area Council. In the third stage, four communities were randomly selected per ward, to arrive at sixteen communities. In the final stage, nine leafy vegetable farmers were randomly selected per community from registers maintained by the Agricultural Development Project (ADP), producing a target sample of 144 farmers. Following data cleaning to remove incomplete and inconsistent questionnaires, a final analytical sample of 132 farmers were obtained, which represent a response and validity rate of 91.7%.

Data were analysed using descriptive statistics (frequencies, percentages, and means) and a multinomial logit (MNL) regression model. The MNL model is the appropriate econometric tool when the dependent variable comprises a nominal categorical outcome with three or more unordered alternatives (Greene, 2012). Previous studies among them are Otitoju, Ahmadu and Nwandu (2021), Enete, Otitoju, and Ihemezie (2015), Obeten, Ebukiba and Otitoju (2022), Otitoju (2013), used polychotomous models to examine influence of factors on dependent variables that is polychotomous in nature. Some studies have modelled decisions multivariate decisions using binary models by making one of the outcomes to be yes, and categorizing others as no. This usually obscures the relevance of the result especially in policy advice. Among these studies are Fidelis et al. (2024), Otitoju, Adamu and Onwuaroh (2021), Otitoju, Nwandu and Lawal (2020), Nwandu, Otitoju and Usman (2020) and Otitoju and Oni (2017). Otitoju and Ochimanana (2016), and Otitoju, Fidelis, and Abah (2022). But study used multinomial logit model.

Four post-harvest decision outcomes were modelled: (i) immediate selling after harvest; (ii) cold-room storage before selling; (iii) packaging before selling; and (iv) processing or value addition. Packaging before sale was designated as the reference category. Constraints to post-harvest decision-making were assessed using a four-point Likert scale (1 = Strongly Disagree; 2 = Disagree; 3 = Agree, and 4 = Strongly Agree). Constraints with a mean score ≥ 2.50 were classified as major constraints.
The MNL model is specified as:

$$Prob(Y_i = j \mid X_i) = exp(X_i\beta_j) / \Sigma_k exp(X_i\beta_k), \quad j = 1, 2, 3, 4 \qquad (1)$$

where $Y_i$ denotes the post-harvest decision of farmer $i$; $j$ represents each decision alternative; $X_i$ is a vector of explanatory variables for farmer $i$; and $\beta_j$ is the associated vector of coefficients. Statistical significance was evaluated using $z$-statistics at the 10%, 5%, and 1% significance levels.

The explanatory variables included in the model were: age of the farmers ($X_1$) measured in years, sex of the smallholder farmer ($X_2$) measured in dummy, 1 if male, 0 if female, educational attainment ($X_3$) measured in years of schooling, household size ($X_4$) measured in number of persons living under the same roof and eating from the same pot, personal income ($X_5$) measured in naira, cooperative membership ($X_6$) measured in dummy – 1 if yes, 0 if no, farming experience ($X_7$) measured in years, post-harvest training ($X_8$) measured in dummy – 1 if yes, 0 if no, farm size ($X_9$) measured in hectares, access to credit ($X_{10}$) measured in dummy – 1 if yes, 0 if no, and participation in publicly funded agricultural projects ($X_{11}$) measured in dummy – 1 if yes, 0 if no.

## Results and Discussion

### *Socio-Economic Characteristics of Respondents*

Table 1 presents the socio-economic profile of the sampled farmers. The mean age of 38.07 years indicates a predominantly active farming population, with 38.6% of respondents within the active age of 21–30 years. This reinforces the findings of Mohammed & Abdulquadri, (2012) that a relatively youthful farming workforce are more opened to novel technologies, market orientation, and willingness to adopt improved post-harvest practices. Meanwhile, about 55.3% of respondents were male. This shows that the mixed-gender character of vegetable production in the FCT. This is consistent with findings of Nnamani, Oselebe, & Okporie (2010). In addition, 45.5% of the farmers were single. Despite of the indication of likely few family labour benefits by the farmers, this implied minimal burden and responsibility which allows farmers to concentrate on their farming business.

Likewise, the mean formal education of 6.17 years indicates that the average respondent attained primary school completion. Nevertheless, 87.9% of respondents reported some level of formal schooling. This reinforces the findings of Dasgupta & Mandal, (1989) that educational attainment influences farmers' capacity to access, evaluate, and act on post-harvest management advisories, as well as to engage productively with market information systems. Also, the mean household size of 5.9 persons is consistent with rural Nigerian household structures reported by the National Bureau of Statistics (NBS, 2019), and implies both the availability of family labour for post-harvest operations and the existence of domestic consumption demand for produce. A high proportion of respondents (86.4%) held membership in cooperative societies, potentially important as channels for credit access and post-harvest technology diffusion. Meanwhile, mean farming experience of approximately 18 years indicates the accumulation of substantial indigenous knowledge, though only 29.5% had received formal training in post-harvest techniques though a critical knowledge gap with direct implications for the diversification of post-harvest strategies.

Also, on farm size, 60.6% of respondents operated farms ranging from 4.1 to 8.0 hectares, 38.6% cultivated between 1.0 and 4.0 hectares, and only 0.8% operated farms exceeding 8.0 hectares, confirming the smallholder character of vegetable production in the area; these partly explain the dominance of immediate selling as a post-harvest strategy in the area. This is consistent with the findings by Omotilewa *et al.,* (2021) on inverse farm size–productivity relationship among Nigerian smallholders. In the same vein, 76.5% of respondents reported having had contact with agricultural extension agents, while 23.5% had received no extension contact at all. However, the disconnect between extension contact (76.5%) and specific post-harvest training coverage (29.5%) confirms that extension programs in the study area are likely production oriented rather than post-harvest management. This corroborates the findings of Sosseh and Jallow (2022) in comparable horticultural farming systems.

***Post-harvest Decision Patterns among Respondents***

Figure 1 shows that 52.3% of farmers adopted immediate selling after harvest. This high prevalence reflects the biological nature and perishability of leafy vegetables and the near-absence of affordable storage infrastructure at the community level. Meanwhile, 22.7% of the farmers adopted cold-room storage before selling, 16.7% of them adopted packaging before selling and 8.3% of them adopted value addition or processing (such as drying and preservation). These results reveal that value-chain upgrading activities remain alien to majority of the smallholder leafy vegetable farmers in the study area. The larger percentage of immediate or distress selling observed in this study is consistent with the findings of Masarirambi, Mavuso, Songwe, Nkambule, and Mhazo, (2010) on supply chains of vegetable small holder vegetable farming in sub-Saharan Africa. Furthermore, the low adoption of value addition further corroborates the findings of Ikeh (2021), who reported similar constraints among FCT tomato farmers.

***Determinants of Farmers Post-harvest Decisions***

Table 2 presents the parameter estimates of the MNL model (n = 132; Wald $\chi^2$ (33) = 71.67; Prob > $\chi^2$ = 0.0002; Pseudo $R^2$ = 0.1349). The model shows an adequate overall fit, and the significant chi-square statistic confirms the joint explanatory power of the variables used in this study. Age shows a significant negative effect on immediate selling ($\beta = -0.036$) and on value addition ($\beta = -0.111$), indicating that younger farmers were significantly more likely to opt for both immediate selling and value addition relative to the reference category. This implies that younger farmers in the FCT are more responsive to market price signals and more willing to invest in value-chain upgrading activities. This is consistent with the findings of (Ruhinduka *et al.,* 2020) that risk and time preferences significantly shape post-harvest storage and processing decisions among smallholder farmers, particularly young farmers. The marginal effect finding indicated that the sex of the farmer was significant at ($p<0.10$). According to the results, the sex of the farmer significantly reduced the likelihood of cold room storage relative to packaging. This implies that male-headed households are less inclined toward cold storage, potentially reflecting differential access to or awareness of cold chain infrastructure between male and female farmers. This is consistent with the findings of (Mohammed & Abdulquadri, 2012) on gender-differentiated resource access, particularly to women who are faced with constrained access to capital and thereby systematically limited from participating in storage-based post-harvest strategies. Also, Household size had a significant negative effect on immediate selling ($\beta = -0.115$). This indicates that farmers from larger households are more likely to package their food rather than sell it immediately after harvest, potentially due to their ability to utilize family labor for packaging tasks, rendering this choice comparatively more appealing. This possible outcome is consistent with the findings of Kadjo *et al.* (2018), wherein larger households provide greater family labour for storage, sorting, and processing operations, thereby enabling more deliberate and value-adding post-harvest strategies. Personal income significantly increased the probability of cold room storage ($\beta = 3.58\times10^{-7}$) and processing by adding value ($\beta = 5.98\times10^{-7}$), relative to packaging. This indicates that farmers with higher income are more likely to invest in cold-chain logistics and processing equipment and thereby access higher-value post-harvest strategies that require huge capital. This in line with the findings of Kadjo *et al.* (2018), who established that liquidity constraints substantially restrict optimal post-harvest decision-making among smallholder farmers in West Africa.

Meanwhile, training in post-harvest techniques significantly increased the likelihood of selling immediately ($\beta = 1.350$) and cold room storage ($\beta = 2.288$), relative to packaging. The significant effect of cold-room storage shows that trained farmers could better appreciate the price premium and shelf-life benefits achievable through refrigerated storage; thus, these results underscore the critical role of technology adoption by the farmers, shifting their mindset from passive, immediate/distress-selling behaviour to more

deliberate and economically rational post-harvest strategies. Also, training equips farmers with the technical knowledge and confidence to utilize preservation infrastructure rather than settling for packaging as a default post-harvest strategy. This corroborates the findings of Bold *et al.,* (2017) on the importance of technology adoption in improving agricultural productivity and marketing outcomes in sub-Saharan Africa. Access to credit significantly reduced the probability of selling immediately ($\beta = -0.210$) and value addition ($\beta = -1.464$), in relation to packaging. The negative effect on immediate selling is in line with *a priori* expectation that farmers with access to credit are less compelled to sell off or liquidate their produce immediately to meet cash needs, thereby mitigating distress selling, while the negative effect on value addition though counterintuitive, this may likely show the inadequacy of available credit products for post-harvest processing investments, whereby disbursed credit is absorbed by production costs or other household expenditures leaving insufficient capital for processing activities, or the additional financial burden of debt servicing that constrains discretionary investment in value addition. Also, rather than being counterintuitive, this finding indicates that farmers with credit access are significantly more likely to choose packaging over immediate selling or processing. Nevertheless, participation in publicly funded agricultural development projects was positively and significantly increased the probability of value addition ($\beta = 1.592$). Farmers who participate in such projects are about 6.6 percentage points more likely to process their produce than to package it, reflecting the role of project-embedded support such as access to processing infrastructure, structured market linkages, and technical knowledge for value-chain upgrading, it concurrently enhances the feasibility of value addition as a post-harvest decision strategy.

***Constraints to Farmers' Post-harvest Decision-Making***

Table 3 shows all the eleven constraints had mean scores exceeding the 2.50 threshold, this could indicate that post-harvest loss control in Kuje Area Council is simultaneously impeded by capital, infrastructure, institutional, and behavioural barriers. Amongst the listed constraints, farmer risk aversion has the highest (mean = 3.18) and ranked as the most binding constraint affecting post-harvest decisions. The majority of respondents perceived the risk of losses from storage and processing as outweighing the potential price premiums achievable through deferred selling. This behavioural constraint is consistent with the findings of (Ruhinduka *et al.,* 2020) that reducing the exposure of stored produce to spoilage through improved storage technologies and insurance products could meaningfully shift post-harvest strategy choices. Similarly, lack of access to supporting facilities, as well as cooperative extension and adult education programs (mean = 3.06), was ranked second, and thus indicates the weak institutional infrastructure for post-harvest technology diffusion in the study area. Likewise, the absence of a coherent policy framework for mobilising scientific and human resources for crop preservation was ranked third (mean = 3.04), followed closely by the lack of adequate storage facilities (mean = 3.02). The arrays and convergence of these institutional and physical infrastructure deficits further infer the inadequate attention and systemic neglect of the post-harvest dimension of agricultural policy in Nigeria.

## Conclusion and Recommendations

This study examined post-harvest handling decisions among smallholder leafy vegetable farmers in Kuje Area Council, FCT, Nigeria, and established that immediate selling after harvest driven primarily by the extreme perishability of leafy vegetables and the near-total absence of affordable community-level storage infrastructure was the most common post-harvest strategy. Age, household size, personal income, training in post-harvest techniques, credit access, and participation in publicly funded agricultural projects were all the key determinants of post-harvest decision choice of the farmers in the study area. Also, the study shows that farmers are challenged by capital, physical infrastructure, institutional, and behavioural barriers. Based on these findings, public and private sector investment in affordable community-level cold-chain and packaging infrastructure is urgently needed to expand the practical post-harvest options available to smallholder farmers; governments and development partners should scale up post-harvest technology training through agricultural extension services, with deliberate targeting of young farmers and women, given the consistently strong and significant positive effect of training documented across decision categories.

## References

Blanchard, C. (2013). Post-harvesting decision tool. *Journal of Economics, 43*, 12–13.

Bold, T., Kaizzi, K. C., Svensson, J., & Yanagizawa-Drott, D. (2017). Lemon technologies and adoption: Measurement, theory and evidence from agricultural markets in Uganda. *Quarterly Journal of Economics, 132*(3), 1055–1100. https://doi.org/10.1093/qje/qjx009

Companhia de Entrepostos e Armazéns Gerais de São Paulo [CEAGESP]. (2002). *Post-harvest losses: Causes and prevention*. CEAGESP.

Dasgupta, S., & Mandal, S. (1989). Economic losses in post-harvest operations: A review. *Indian Journal of Agricultural Economics, 44*(2), 58–66.

Delucia, E., & Assemato, E. (1994). *Post-harvest losses of food crops* (FAO Agricultural Services Bulletin No. 108). FAO.

Enete, A. A., Otitoju, M. A. & Ihemezie, E. J. (2015). The choice of climate change adaptation strategies among food crop farmers in Southwest Nigeria, *Nigerian Journal of Agricultural Economics,* 5(1): 72-80. DOI: https://10.22004/ag.econ.267812

Federal Capital Territory Administration [FCTA]. (2016). *FCT Area Councils Profile*. FCTA.

Fidelis, E. S., Otitoju, M. A., Idisi, P. O., Anazo, U. E., & Achemu, D. O. (2024). The determinants of recall event timing of contaminated frozen poultry products in retail outlets in North-Central Nigeria. *Turkish Journal of Agriculture – Food Science and Technology*, 12 (s2), 2222 – 2233. DOI: https://doi.org/10.24925/turjaf.v12is2.2222-2233.6867

Food and Agriculture Organization [FAO]. (2008). *Post-harvest losses of vegetable crops in Africa*. FAO.

Goktolga, Z. G., Bal, S. G., & Kaya, S. (2006). Factors affecting consumer behaviour in organic food. *Journal of Central European Agriculture, 7*(1), 105–112.

Greene, W. H. (2012). *Econometric analysis* (7th ed.). Pearson Education.

Ikeh, D. O. (2021). *Factors influencing tomato farmers' post-harvest decisions in Gwagwalada Area Council, Federal Capital Territory, Nigeria* [Unpublished B. Agriculture project]. Department of Agricultural Extension and Rural Sociology, University of Abuja.

International Institute of Tropical Agriculture [IITA]. (2009). *Agro-ecological zones of Nigeria*. IITA.

Kader, A. A., & Rolle, R. S. (2004). *The role of post-harvest management in assuring the quality and safety of horticultural produce* (FAO Agricultural Services Bulletin No. 152). FAO.

Kadjo, D., Ricker-Gilbert, J., Abdoulaye, T., Shively, G., & Baco, M. N. (2018). Storage losses, liquidity constraints, and maize storage decisions in Benin. *Agricultural Economics, 49*(4), 435–454. https://doi.org/10.1111/agec.12427

Lovett, F. C. (2006). Rational choice theory and explanation. *Cambridge Handbook of Social Sciences, 12*(4), 211–225.

Masarirambi, M. T., Mavuso, V., Songwe, V. D., Nkambule, P., & Mhazo, N. (2010). Indigenous post-harvest handling and storage of traditional vegetables in Swaziland: A review. *African Journal of Agricultural Research, 5*(24), 3333–3341.

Mohammed, B. T., & Abdulquadri, A. F. (2012). Comparative analysis of gender involvement in agricultural production in Nigeria. *Journal of Development and Agricultural Economics, 4*(8), 240–244.

National Bureau of Statistics [NBS]. (2019). *Nigeria living standards survey: Main report*. National Bureau of Statistics.

National Population Commission [NPC]. (2006). *Population and housing census of the Federal Republic of Nigeria: Priority tables (Vol. I)*. NPC.

Nnamani, C. V., Oselebe, H. O., & Okporie, E. O. (2010). Aspects of ethnobotany of traditional leafy vegetables utilised as human food in rural tropical communities. *Annual Research International, 7*(1), 1110–1111.

Nwandu, P. I.; Otitoju, M. A. & Usman, H. T. (2020). Determinants of access to improved seeds among maize farmers in Kagarko Local Government Area of Kaduna State, Nigeria, *International Journal of Agriculture and Development Studies (IJAD), 5(2), 21-28*

Obeten, W. O., Ebukiba, E. S., & Otitoju, M. A. (2022). Factors influencing pest management decisions among maize farming households, *Review of Agricultural and Applied Economics,* 25 (1) 3-1. Advance online publication doi: https://10.15414/raae.2022.25.01.3-12

Okello, J. J., Gitonga, Z., Mutune, J., Rao, E. J. O., Mukhopadhyay, S., & Cole, D. C. (2012). Determinants of the use of certified maize seed in Kenya: Evidence from farm household survey data. *Journal of Development and Agricultural Economics, 4*(11), 313–323.

Omotilewa, O. J., Jayne, T. S., Muyanga, M., Aromolaran, A. B., Liverpool-Tasie, L. S. O., & Awokuse, T. (2021). A revisit of farm size and productivity: Empirical evidence from a wide range of farm sizes in Nigeria. *World Development, 146*, 105592. https://doi.org/10.1016/j.worlddev.2021.105592.

Otitoju, M. A., Fidelis, E. S., & Abah, E. O. (2022). Factors influencing farmers' willingness-to-pay for biofortified maize in the Federal Capital Territory, Nigeria. *Review of Agricultural and Applied Economics,* 25(2), 33-42. DOI: http://10.15414/raae.2022.25.02.33-42

Otitoju, M.A. & Ochimana, D. D. (2016). Determinants of farmers' access to fertilizer under fertilizer task force distribution system in Kogi State, Nigeria, *Cogent Economics & Finance*, 4:1, 1225347, DOI: 10.1080/23322039.2016.1225347

Otitoju, M. A. & Oni, F. O. (2017). Factors influencing farmers' willingness to plant agroforestry trees in Ekiti State, Nigeria. *Nigerian Journal of Agricultural and Development Economics, 7 (1), 249-258.*

Otitoju, M. A. (2013). The Effects of Climate Change Adaptation Strategies on Food Crop Production Efficiency in Southwestern Nigeria, PhD Thesis, Department of Agricultural Economics, University of Nigeria, Nsukka. DOI: https://doi.org/10.22004/ag.econ.187217

Otitoju, M. A., & Olawoye, T. (2025). Effect of post-harvest loss reduction practices on households' welfare among cowpea farmers in Niger and Nasarawa states, Nigeria. *Turkish Journal of Agriculture - Food Science and Technology,* 13(8), 2137-2144, DOI: https://doi.org/10.24925/turjaf.v13i8.2137-2144.7733

Otitoju, M. A., Ahmadu, D., & Nwandu, P. I. *(2021).* Determinants of yam agribusiness participation decisions among rural households. *Review of Agricultural and Applied Economics, 24(2), 3-11.* Advance online publication. doi: https://10.15414/raae.2021.24.02.03-11

Otitoju, M. A., Nwandu, P. I., & Lawal, J. B. (2020). Analysis of the Factors influencing Willingness-to-Support Local Economic Development in Bwari Area Council of Federal Capital Territory, Nigeria. *International Journal of Agriculture and Development Studies (IJAD), 5(2), 52-59.*

Otitoju, M.A., Adamu, M. S., & Onwuaroh, A. S. (2021). Consumers' Intention to Buy Branded Fresh Leafy Vegetables among Rural and Urban Households. *Review of Agricultural and Applied Economics,* 24(2), 28-36. Advance online publication, doi: https://10.15414/raae.2021.24.02.28-36

Ruhinduka, R. D., Alem, Y., Eggert, H., & Lybbert, T. (2020). Smallholder rice farmer post-harvest decisions: Preferences and structural factors. *European Review of Agricultural Economics, 47*(4), 1587–1620. https://doi.org/10.1093/erae/jbz052

Sosseh, L., & Jallow, A. (2022). Horticultural farmers' access to agricultural extension information on post-harvest technology in Kombo Central and North, West Coast Region, The Gambia. *Academia*. https://www.academia.edu/69602448

Umeh, G. N., & Chukwu, U. A. (2014). *Role of women in farm and family decision-making processes in Enugu State, Nigeria* [Unpublished research project]. Department of Agricultural Economics, Management and Extension, Ebonyi State University.

## Appendix

**Table 1: Socio-Economic Characteristics of Smallholder Leafy Vegetable Farmers**

| Variable | Frequency | Percentage (%) |
|---|---|---|
| **Age (years)** | | |
| ≤ 20 | 2 | 1.5 |
| 21–30 | 51 | 38.6 |
| 31–40 | 25 | 18.9 |
| 41–50 | 32 | 24.2 |
| 51–60 | 13 | 9.8 |
| 61–70 | 8 | 6.1 |
| 71–80 | 1 | 0.8 |
| Mean = 38.07 years | | |
| **Sex** | | |
| Male | 73 | 55.3 |
| Female | 59 | 44.7 |
| **Marital Status** | | |
| Single | 60 | 45.5 |
| Married | 48 | 36.4 |
| Divorced | 12 | 9.1 |
| Widowed | 12 | 9.1 |
| **Educational Attainment** | | |
| No formal education | 16 | 12.1 |
| Primary school | 46 | 34.8 |
| Secondary school | 49 | 37.1 |
| Tertiary education | 21 | 15.9 |
| Mean = 6.17 years | | |
| **Household Size (persons)** | | |
| 1–5 | 83 | 62.9 |
| 6–10 | 48 | 36.4 |
| 16–20 | 1 | 0.8 |
| Mean = 5.9 persons | | |
| **Farming Experience (years)** | | |
| 1–10 | 43 | 32.6 |
| 11–20 | 65 | 49.2 |
| 21–30 | 24 | 18.2 |
| Mean = 18 years | | |

| Variable | Frequency | Percentage (%) |
|---|---|---|
| **Cooperative Society Membership** | | |
| No | 18 | 13.6 |
| Yes | 114 | 86.4 |
| **Training in Post-harvest Techniques** | | |
| No | 93 | 70.5 |
| Yes | 39 | 29.5 |
| **Farm Size (hectares)** | | |
| 1.0–4.0 | 51 | 38.6 |
| 4.1–8.0 | 80 | 60.6 |
| 8.1–12.0 | 1 | 0.8 |
| **Extension Contact** | | |
| No extension contacts | 31 | 23.5 |
| Had extension contact | 101 | 76.5 |

Source: Computed from field data, 2021.

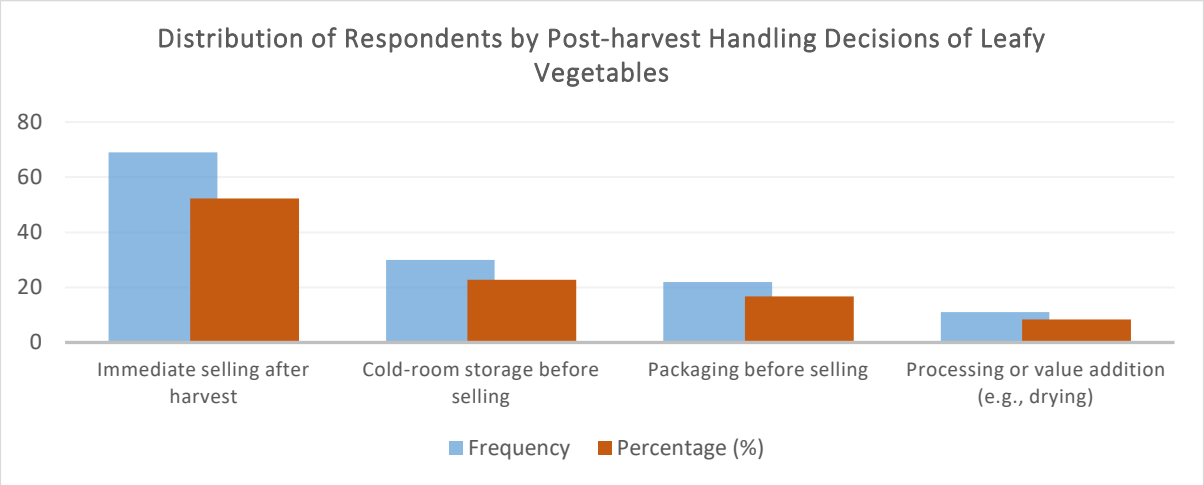



**Figure 1: Distribution of Respondents by Post-harvest Handling Decisions of Leafy Vegetables**
Source: Computed from field data, 2021.

**Table 3: Constraints to Post-harvest Decision-Making among Leafy Vegetable Farmers**

| S/N | Constraint | SD (%) | D (%) | A (%) | SA (%) | Mean Score |
|---|---|---|---|---|---|---|
| 1 | Unwillingness to accept post-harvest risks in leafy vegetables | 11 (8.3) | 23 (17.4) | 29 (22.0) | 69 (52.3) | 3.18** |
| 2 | Lack of access to supporting facilities (cooperatives, adult education) | 10 (7.6) | 40 (30.3) | 14 (10.6) | 68 (51.5) | 3.06** |
| 3 | Absence of coherent policies on scientific and human resources for crop preservation | 13 (9.8) | 29 (22.0) | 30 (22.7) | 60 (45.5) | 3.04** |
| 4 | Lack of proper storage facilities | 14 (10.6) | 38 (28.8) | 11 (8.3) | 69 (52.3) | 3.02** |
| 5 | Lack of access to loans | 21 (15.9) | 44 (33.3) | 4 (3.0) | 63 (47.7) | 2.83** |
| 6 | Poor market structure | 28 (21.2) | 29 (22.0) | 18 (13.6) | 57 (43.2) | 2.79** |
| 7 | Inadequate access to processing machinery | 28 (21.2) | 26 (19.7) | 30 (22.7) | 60 (45.5) | 2.82** |
| 8 | Insufficient knowledge of credit sources for vegetable agribusiness | 27 (20.5) | 35 (26.5) | 14 (10.6) | 56 (42.4) | 2.75** |
| 9 | Inadequate modern post-harvest handling techniques | 34 (25.8) | 26 (19.7) | 16 (12.1) | 56 (42.4) | 2.72** |
| 10 | Inadequate government policies for agribusiness empowerment | 33 (25.0) | 30 (22.7) | 22 (16.7) | 47 (35.6) | 2.63** |
| 11 | Absence of extension programmes for post-harvest loss control in vegetables | 34 (25.8) | 26 (19.7) | 31 (23.5) | 41 (31.1) | 2.60** |

Source: Computed from field data, 2021. SD = Strongly Disagree; D = Disagree; A = Agree; SA = Strongly Agree. ** Mean score ≥ 2.50 indicates major constraint.

**Table 2: Parameter Estimates of the MNL for Determinants of Post-harvest Handling Decisions of Leafy Vegetables**

| Explanatory Variables | Parameters | Selling immediately after harvesting | | | Storage in a cold room before selling | | | Processing by adding value | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Coefficient | z-value | dy/dx | Coefficient | z-value | dy/dx | Coefficient | z-value | dy/dx |
| Age ($X_1$) | $\beta_1$ | -0.0361 (0.0207) | -1.74* | -0.0003 | -0.0371 (0.0269) | -1.38 | -0.0003 | -0.1109 (0.0450) | -2.46** | -0.0040 |
| Sex ($X_2$) | $\beta_2$ | -0.5503 (0.5394) | -1.02 | 0.0302 | -1.1559 (0.6264) | -1.85* | -0.1237 | -0.3318 (0.8034) | -0.41 | 0.0144 |
| Education Level ($X_3$) | $\beta_3$ | 0.1429 (0.1210) | -1.18 | -0.0108 | -0.1984 (0.1435) | -1.38 | -0.0165 | -0.0790 (0.1860) | 0.43 | 0.0109 |
| Household Size ($X_4$) | $\beta_4$ | -0.1146 (0.1644) | -1.70* | -0.0343 | 0.0637 (0.1699) | 0.37 | 0.0268 | -0.5694 (0.2485) | 0.23 | -0.0000 |
| Personal Income ($X_5$) | $\beta_5$ | 2.63e-07 (1.97e-07) | 1.33 | -2.78e-09 | 3.58e-07 (2.01e-07) | 1.78* | 2.02e-08 | 5.98e-07 (2.56e-07) | 2.33** | 1.77e-08 |
| Cooperative Societies (Number of Coop Societies the farmer belongs) ($X_6$) | $\beta_6$ | 0.0337 (0.1779) | -0.19 | 0.0048 | -0.0672 (0.2012) | -0.33 | -0.0057 | -01288 (0.2933) | -0.44 | -0.0047 |
| Faming Experience (in years) ($X_7$) | $\beta_7$ | 0.0196 (0.0470) | 0.42 | -0.0010 | 0.0404 (0.0536) | 0.75 | 0.0042 | 0.0139 (0.0638) | 0.22 | -0.0004 |
| Training in Post-harvest techniques (Dummy, 1 if yes, 0 otherwise) ($X_8$) | $\beta_8$ | 1.3499 (0.8002) | 1.69* | -0.0167 | 2.2880 (0.8408) | 2.72*** | 0.2029 | 1.2834 (1.0455) | 1.23 | -0.0051 |
| Farm Size (Hectares) ($X_9$) | $\beta_9$ | 0.0278 (0.1717) | 0.16 | 0.0114 | -0.0037 (0.2037) | -0.02 | -0.0027 | -0.1333 (0.2461) | -0.54 | -0.0076 |
| Access to credit (Dummy, 1 if yes, 0 otherwise) ($X_{10}$) | $\beta_{10}$ | -0.2099 (0.5261) | -2.30** | -0.1764 | 0.5259 (0.6469) | -0.81 | 0.0861 | -1.4643 (0.8745) | -1.67* | -0.0296 |
| Participation in agricultural funded project (Dummy, 1 if yes, 0 otherwise) ($X_{10}$) | $\beta_{11}$ | 0.3312 (0.5390) | 0.61 | -0.0205 | 0.3793 (0.6536) | 0.58 | 0.0030 | 1.5915 (0.7887) | 2.02** | 0.0656 |
| Constant | $\beta_0$ | 4.0962 (1.9464) | 2.10 | | 2.2777 (2.1071) | 1.08 | | 2.5583 (2.5038) | 1.02 | |

Number of observations = 132, Wald Chi-square (33) = 71.67, Prob. > Chi-square = 0.0002, Pseudo R-square = 0.1349.

**, **, ***, 10%, 5%, 1% levels of significance. Packaging before selling is the base outcome (comparison category). Standard errors in parenthesis*

Source: Computed from field data, 2021.