

Research Article

The Effect of Post-harvest Handling Practices of Indigenous Leafy Vegetable on Food and Nutrition Security Among Farmers in Isingiro Town Council, Isingiro District

Nsiimire Deziderius*, Rebecca Kalibwani, Atwongyeire Doreen

Agriculture, Agribusiness, Environment, Bishop Stuart University, Mbarara, Uganda

Abstract

This study assessed the effect of post-harvest handling practices of indigenous leafy vegetable on food and nutrition security among farmers in Isingiro Town Council, Isingiro district. The specific objective was to; identify the factors influencing the use of different post-harvest handling practices on indigenous leafy vegetables. The study adopted a cross-sectional survey design applying quantitative and qualitative approaches for data collection. Data was captured from a sample of 200 respondents using both questionnaire and interviews. Data was analyzed using SPSS version 16 to generate both descriptive and inferential statistics. The study revealed availability of technologies as one of the major factors influencing use of postharvest handling practices as supported by 91.8% and mean of 4.459. Furthermore, the garden tools available, level of knowledge and exposure to existing appropriate postharvest handling practices and experience in vegetable growing and handling also determined the use of postharvest handling practices. The study recommends that there should be provision of materials to farmers to use or hire at a relatively cheap cost, for instance polyethylene, tarpaulins, artificial driers using solar to help them come up with quality products for increased market competitiveness. There is also a need to explore community-based approaches and participatory decision-making processes among stakeholders.

Keywords

Post-harvest, Indigenous Leafy Vegetable, Food, Nutrition, Isingiro District

1. Introduction

According to the study of Maundi indigenous leafy vegetables (ILVs) are described as “edible plants that are biologically indigenous to an area, while introduced vegetables are those vegetables that have been introduced into a particular area and have not physiologically adjusted to the local conditions and subsequently require many agricultural inputs [13].

Globally, the number of food insecure persons have reduced from 870 million [8] to 842 million [9]. This is a good

indicator that some gains are being made towards eradication of extreme hunger and poverty. Micro-nutrient deficiencies, especially vitamin A and iron, are major impediments to social and economic development, and impair learning ability, growth, productivity and development [18]. The effect of post-harvest handling practices of indigenous leafy vegetables on food and nutrition security among farmers has gained increasing attention globally due to the vital role of these

*Corresponding author: nsiimiredeziderius@gmail.com (Nsiimire Deziderius)

Received: 14 April 2025; **Accepted:** 6 May 2025; **Published:** 12 June 2025



Copyright: © The Author(s), 2025. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

vegetables in addressing malnutrition and enhancing food security, particularly in developed countries [2]. For example In Canada, indigenous leafy vegetables play a significant role in Indigenous diets and cultural practices, particularly among First Nations, Métis, and Inuit communities. Traditional greens such as wild spinach (*Chenopodium* spp.) and wild leek (*Allium tricoccum*) are valued for their nutritional content and medicinal properties [2].

In Sub-Saharan Africa (SSA), per capita vegetable supply is only 43% of the required leading to widespread malnutrition [18]. According to the [18], consumption of fruits and vegetables in Sub-Saharan Africa (SSA) is less than the recommended 400g per capita daily. Subsequently, the region is prone to micronutrient deficiency diseases. [12] stated that the major causes of malnutrition in Sub Saharan Africa include rampant poverty, climate change, corruption, lack of knowledge/education and poor ways of distributing food. With such food and nutrition problems, the World Bank reported that dedication of more efforts in post-harvest technology is crucial in the attainment of food and nutrition security in Africa particularly Sub-Saharan Africa (SSA) [19].

In East Africa, the effect of post-harvest handling practices of indigenous leafy vegetables on food and nutrition security among farmers is vital due to the significant role these vegetables play in the region's diet and economy [15]. Indigenous leafy vegetables are rich sources of essential nutrients and contribute to dietary diversity, which is crucial for combating malnutrition and promoting food security [17]. For example, In Kenya, studies have shown that improper post-harvest handling of indigenous leafy vegetables like amaranth (terere), cowpea leaves (kunde), and spider plant (saget) results in significant losses due to wilting, decay, and spoilage [15].

Uganda also faces challenges related to post-harvest losses of indigenous leafy vegetables like nakati (African eggplant leaves) and dodo (*Amaranthus hybridus*). Studies have highlighted the importance of adopting improved handling techniques, including proper washing, cooling, and packaging, to minimize losses and preserve the nutritional quality of these vegetables [10]. Indigenous leafy vegetable are often cultivated in small patches in home gardens, fitting well in resource-poor farmers' agricultural systems as this has accelerated nutrition deficiency and food security. The perception of ILVs as low-status foods has hampered their utilization which can be addressed by awareness creation supported by well-coordinated scientific research and development [6].

2. Problem Statement

About 50% of vegetable loss in developing countries is because of poor infrastructure and excess supply of perishable produce that are realized when there is limited access to markets [7]. Further, Brown et al, revealed that few attempts and interventions have been put in place to tackle these problems of post-harvest losses through use of appropriate postharvest handling practices [7]. In Uganda, perishability

is a great challenge that hampers efficient utilization of Indigenous leafy Vegetables [1]. As a result, leafy vegetable surplus that is realized during the rainy seasons becomes scarce during the dry seasons as this is attributed to lack of knowledge and attitude towards use of post-harvest practices which may affect food and nutrition security among farming households. Consequently, in Isingiro town council, the indigenous leafy vegetables are not available throughout the year. During peak production of the vegetables, the farmers sell their produce at low prices as a result of low value added to it because of poor post-harvest handling technologies which would enhance nutrition deficiency and food insecurity [1]. A study by Abakutsa reported that ILVs are perishable and spoil easily within 24 hours when kept at room temperatures [1]. The same author reported species of indigenous leafy vegetables grown in Isingiro district and these include; amaranths, scarlet eggplant, African nightshade, African eggplant, spider plant, nakati and among others and sun drying, curing are most common postharvest practices to help them enhance shelf life of vegetables and promote food security.

There are significant gaps in research regarding effective post-harvest handling techniques for indigenous leafy vegetables (ILVs), which are crucial for reducing losses and enhancing food security. Specifically, what has not been adequately studied includes: *Evaluation of diverse post-harvest techniques*: Although some traditional methods like sun drying and curing are used, there is limited research on the effectiveness, scalability, and improvement of these techniques. Additionally, more advanced practices - such as controlled temperature storage, modified atmospheric packaging, and use of natural preservatives-are rarely explored or adapted to local conditions in Isingiro. This lack of investigation leaves farmers with limited options for minimizing spoilage.

Impact of post-harvest practices on nutrition and food security: While it is acknowledged that poor handling practices contribute to food insecurity, few studies have quantitatively examined how enhanced post-harvest techniques could improve nutrition outcomes in Isingiro. Understanding the direct impact of extended indigenous leafy vegetable availability on community health, particularly during dry seasons, remains a gap.

Farmer knowledge: The knowledge and attitudes of farmers in Isingiro toward post-harvest handling are under-documented. Research is lacking on the factors that influence farmers' adoption of improved post-harvest practices, including educational, economic, and cultural aspects that may affect their decision-making.

3. Research Objectives

The general objective of the study was to; assess the effect of post-harvest handling practices of indigenous leafy vegetables on food and nutritional security in Isingiro town council, Isingiro district. The specific objective was to; identify the factors influencing the use of different post-harvest handling

practices on indigenous leafy vegetables.

4. Significance of the Study

Understanding proper postharvest handling techniques would help vegetable farmers reduce losses and maintain the quality of their produce. This could directly impact their income and livelihoods by enabling them to fetch better prices for their vegetables in the market.

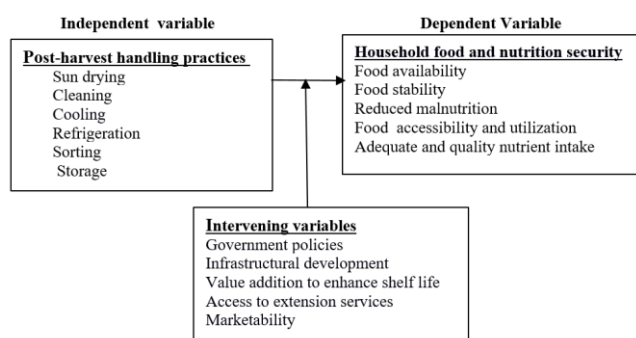
Indigenous leafy vegetables often carried cultural significance and were integral to local diets. By preserving the quality and nutritional value of these vegetables through effective postharvest handling practices, community members are likely to ensure a consistent supply of nutritious food. This would contribute to improved health outcomes and overall well-being within the community, particularly in areas where access to diverse and nutritious food options were limited.

Policy makers/government: Insights from studies on post-harvest handling practices are hoped to inform the development of policies and interventions aimed at promoting food security and sustainable agriculture. Policy makers may use this information to design training programs, provide resources, and implement regulations that support small-scale farmers in adopting improved postharvest techniques.

Research on postharvest handling practices of indigenous leafy vegetables is hoped to provide a foundation for further investigation and innovation in the field of agriculture and food science. Future researchers may build upon existing knowledge to explore new methods for extending shelf life, reducing postharvest losses, and enhancing the nutritional quality of indigenous vegetables.

The study results are finally hoped to contribute to the researcher's academic progress towards earning a Master of Agriculture and Rural Innovations degree of Bishop Stuart University.

5. Conceptual Framework



Source: Self-generated, 2023

Figure 1. Conceptual framework depicting relationship between study variables.

The framework demonstrates a set of relationships among background variables, independent variables and dependent variables. In this context, independent variables influence dependent variable, when intervening variables are held constant.

6. Materials and Methods

The study was conducted in Isingiro town council, Isingiro district. Isingiro District is bordered by Kiruhura District to the north, Rakai District to the east, the Tanzania to the south, Ntungamo District to the west, and Mbarara District to the northwest. The town of Isingiro is approximately 35 kilometres (22 mi), by road, southeast of the city of Mbarara, the main metropolitan area in the Ankole sub-region. The coordinates of the district are 00 50S, 30 50E. Agriculture is the mainstay of the district economy of Isingiro District. Isingiro Town Council is located in Isingiro District, Uganda. Its coordinates are approximately 0.7572° S latitude and 30.4942° E longitude. The town council is subdivided into several wards which include Kamuri Ward, Mabona Ward, Rwekubo Ward and Kaharo Ward. The vegetation type in Isingiro Town Council and its surrounding areas likely includes a mix of savannah grasslands, scattered trees, and patches of shrub land, typical of the Ugandan landscape. As for the type of soils, Isingiro District is known for various soil types, including fertile clay soils, loamy soils, and sandy soils.

The study used cross-sectional data to explore correlations between postharvest handling practices and food security indicators. By analyzing the relationship between variables such as storage conditions, transportation methods, market access, and food availability, identified factors that contributed to food security outcomes.

The target population of 550 for this study was vegetable farmers, agricultural extension agents, community stakeholders from the selected parishes in Isingiro town council, Isingiro district.

The study was conducted on representative sample of 231 respondents. An optimum sample is one which fulfills the requirements of efficiency, representativeness, reliability and flexibility [11]. [3] emphasize that a researcher must determine the sample size that provided sufficient data to answer the research problem. Using a sample was important to reduce costs, time and has a high degree of accuracy. The sample size was determined using Solvins 1965 formula;

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

$$= 550 / 1 + 550 (0.05)^2$$

N = estimated population of vegetable farmers (650)

e = standard error = 5% (0.05)

n is required sample size, N is population size, (e)² is marginal error

n = 231 respondents

Simple random sampling was used to select vegetable

farmers in the selected parishes in the town council and every farmer had equal chances of being selected.

Purposive sampling was employed to select, community stakeholders and agricultural extension agents who were believed to be providing technical support because these people were expected to have high level of expertise on the phenomenon under investigation.

The questionnaire was chosen to collect quantitative data because it was an efficient data collection mechanism especially when the researcher knew what was required and how to measure the variables of interest. It also allowed the researcher to collect a lot of information over a short period of time at a low cost and free from bias. The researcher used interview guide which was unstructured in nature, containing open ended questions, covering the thematic areas of the study. The data collection tool also had some probes to enable generation of detailed or in-depth information.

Quantitative data was analyzed using Statistical Package for the Social Scientists version 16.0. Data analysis also took the form of descriptive statistics such as frequencies, percentages. Qualitative data was analyzed in verbatim form/responses given by key informants based on study themes.

7. Study Results

The key demographic characteristics captured for the study included; gender, age, education level, marital status, farming

experience. These features were found to be of great help in terms of clearly depicting the diverse background of the farmers in the study area as show below;

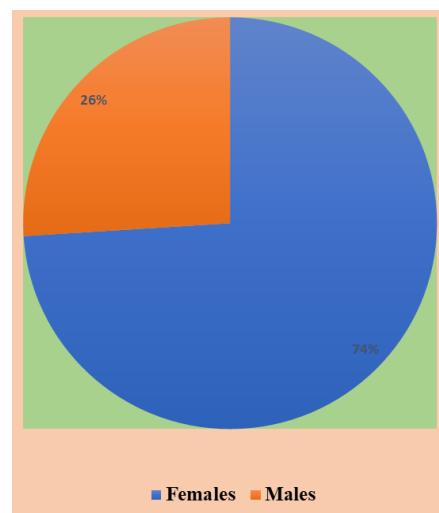


Figure 2. Sex of respondents.

As shown in Figure 2 above, majority 74% were females and 26% were males. The dominance of females in the study meant that activities done during vegetable post-harvest handling are not hectic enough and could easily be done by women.

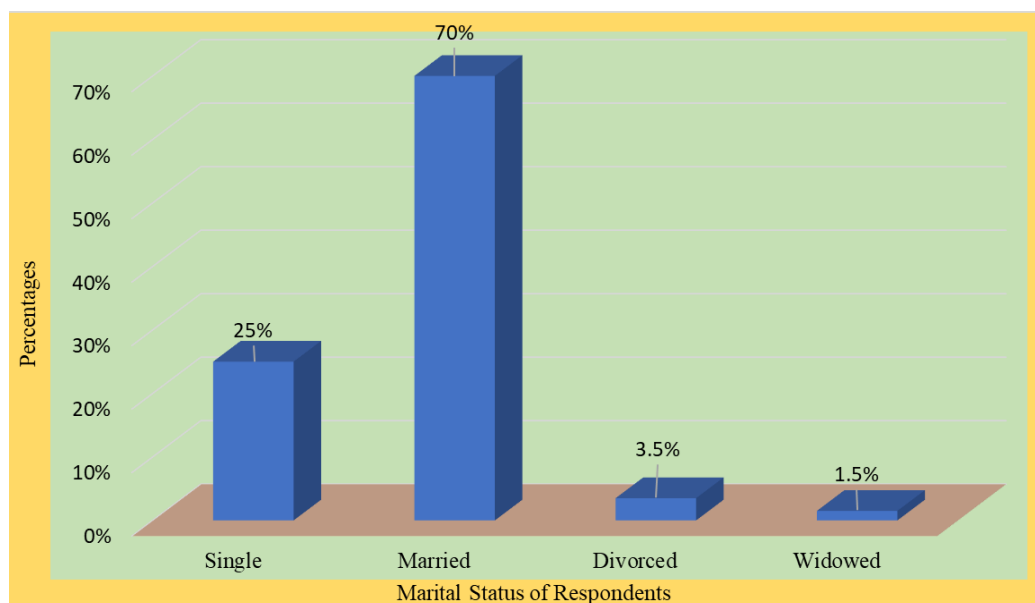


Figure 3. Marital status.

According to the findings in Figure 3 above, it was revealed that 70% of respondents were married, 25% were single, 3.5% had divorced and 1.5% were widowed. The dominance of married couples implied that post-harvest practices of indigenous leafy vegetables was meant to improve on their food security to help them fund their children school fees as well as improving food security to avoid starvation during food insecurity situations.

Table 1. Descriptive Statistics.

Classification	N	Minimum	Maximum	Mean	Std. Deviation
Age in years	200	18	70	36.96	14.036
Years spent in school	200	0	18	10.68	4.430
Experience in postharvest handling of vegetables	200	1	18	7.71	3.138

As shown in Table 1 above, mean age distribution of the respondents was 36 years with a minimum of 18 and a maximum 70. In terms of age distribution, respondents had a minimum age of 18, average age of 36 and maximum age of 70. Minimum number of years spent in school was zero for

those who never went to school/those with no formal education, maximum years spent in school were 18 and average years were 10. Minimum years of experience was 1, maximum were 18 years and average were 7 years.

Table 2. Factors influencing the use of post-harvest handling practices on indigenous leafy vegetables.

Statements	SA	A	NS	D	SD	Mean	Std. D
The confidence and faith in indigenous postharvest practices is one of the factors that influence use of PHH practices	119 (64.3)	21 (11.4)	15 (8.1)	3 (1.6)	27 (14.6)	4.092	1.451
The use of postharvest handling practices is also influenced by available technologies	127 (68.6)	43 (23.2)	0	3 (1.6)	12 (6.5)	4.459	1.063
The garden tools available also tend to determine the use of post harvest handling practices	137 (74.1)	17 (9.2)	9 (4.9)	0	22 (11.9)	4.33	1.325
The level of knowledge and exposure to existing appropriate PHH practices also influences use of these practices	129 (69.7)	29 (15.7)	3 (1.6)	0	24 (13)	4.292	1.344
To some extent, the gender roles have been a factor influencing use of post harvest handling practices	129 (69.7)	14 (7.6)	8 (4.3)	3 (1.6)	31 (16.8)	4.117	1.520
Availability of capital also influences the post harvest handling practice a farmer chooses to use	59 (31.9)	52 (28.1)	59 (31.9)	0	15 (8.1)	3.757	1.147
Availability and condition of Infrastructural facilities such as coldrooms, good roads, electricity also affect use of PHH practices	110 (69.5)	27 (14.6)	16 (8.6)	6 (3.2)	26 (14.1)	4.022	1.444
Experience in vegetable growing and handling will also determine the use of PHH practices	134 (72.4)	13 (7)	15 (8.1)	0	23 (12.4)	4.270	1.364
Access to alternative markets further determines whether and when the farmer should use PHH practices	114 (61.6)	19 (10.3)	11 (5.9)	8 (4.3)	33 (17.8)	3.935	1.569
One's level of education is a determinant of use of post harvest handling practices	12 (6.5)	5 (2.7)	15 (8.1)	64 (34.6)	89 (48.1)	1.848	1.113

KEY: SA=Strongly agree, A= Agree, NS=Not Sure, D=Disagree, SD=Strongly Disagree.

Respondents were asked whether the confidence and faith in indigenous postharvest practices is one of the factors that influence use of PHH practices. In response, 75.7% were in agreement, 8.1% were not sure while 15.2% disagreed with the statement. There was a mean of 4.092 which indicated

high agreement although a standard deviation of 1.45 indicated divergence of views. The findings indicated that to most farmers, the confidence and faith in indigenous postharvest practices is one of the factors that influence use of PHH practices in Isingiro Town Council.

Respondents also reacted to the statement that the use of postharvest handling practices is also influenced by available technologies whereby 91.8% agreed while 8.1% were in disagreement. There was a mean of 4.46 indicated agreement with the statement while 1.06 indicated divergence of views. The findings indicated that to a large extent, the use of post-harvest handling practices is also influenced by available technologies.

The statement that the garden tools available also tend to determine the use of post harvest handling practices was reacted to differently where 83.3% agreed, 4.9% were not sure while 11.9% disagreed with the statement. There was a mean response of 4.33 which showed agreement and standard deviation of 1.32 which indicated divergence of views. This indicated that to a large extent, the garden tools available also tend to determine the use of post harvest handling practices.

Respondents were asked whether the level of knowledge and exposure to existing appropriate post-harvest handling practices also influences use of these practices and in response, 85.4% agreed with the statement, 1.6% were not sure while 13% disagreed. The mean of 4.29 was obtained which indicated agreement as standard deviation of 1.34 indicated divergence of views. The findings indicated that to a large extent, the level of knowledge and exposure to existing appropriate post harvest handling practices also influences use of these practices.

There was another statement that to some extent, the gender roles have been a factor influencing use of post harvest handling practices. In response, 77.3% agreed with the statement, 4.3% were not sure while 18.4% disagreed with the statement. The mean response of 4.12 indicated agreement as standard deviation of 1.52 indicated divergence of views. The findings indicated that to most farmers, the gender roles have been a factor influencing use of post harvest handling practices.

Respondents were further asked whether availability of capital also influences the post harvest handling practice a farmer chooses to use and in response, 60% agreed with the statement, 31.9% were not sure while 8.1% disagreed with the statement. The mean of 3.76 indicated agreement while standard deviation of 1.15 indicated slight divergence of views. This indicated that to a large extent, availability of capital also influences the post harvest handling practice a farmer chooses to use.

Another statement was that availability and condition of infrastructural facilities such as cold rooms, good roads, electricity also affect use of PHH practices. The responses were that 84.1% of the respondents agreed with the statement, 8.6% were not sure while 17.3% disagreed with the statement. The mean of 4.02 was obtained which indicated agreement as standard deviation of 1.44 indicated divergence or disagreement. The findings indicated that to most farmers, availability and condition of Infrastructural facilities such as cold rooms, good roads, electricity also affect use of PHH practices.

Furthermore, respondents reacted to the statement that Experience in vegetable growing and handling will also de-

termine the use of PHH practices whereby 79.4% agreed, 8.1% were not sure while 12.4% disagreed with the statement. There was a mean response of 4.27 which indicated agreement while a standard deviation of 1.36 indicated disagreement. The findings pointed to the fact that in most cases, experience in vegetable growing and handling would also determine the use of PHH practices.

The statement that access to alternative markets further determines whether and when the farmer should use PHH practices was differently perceived whereby 71.9% of the respondents agreed, 5.9% were not sure while 22.1% disagreed with the statement. The mean response of 3.93 indicated agreement while standard deviation of 1.57 indicated divergence of views. This indicated that access to alternative markets further determines whether and when the farmer should use PHH practices.

The other statement was that one's level of education is a determinant of use of post harvest handling practices whereby 9.2% agreed, 8.1% were not sure while 82.7% disagreed with the statement. There was a mean of 1.85 which indicated disagreement and standard deviation of 1.11 which indicated divergence/disagreement. The findings showed that to a large extent, One's level of education was not a determinant of use of post harvest handling practices. This implied that use of post harvest handling practice was practiced by both the educated and less/uneducated farmers.

Key informants interviews were also conducted regarding the factors influencing use of postharvest handling practices in Isingiro town council. They went ahead to mention some of the challenges or factors that influence use of post-harvest handling practices of indigenous leafy vegetables as follows;

Available technologies was one of the factors influencing use of postharvest handling practices among vegetable farmers. In relation to this, one of the key informants had this to say; *"Usually some farmers engage in post harvest handling practices being partly motivated by available technologies such as refrigerators, deep freezers, cold rooms. Once these technologies are available and cheaper to access, then farmers will embrace postharvest handling practices such as freezing to extend shelf life and tap into desired market"*

Other factors were mentioned by key informants as perceived benefits from postharvest handling practices, availability of market for the fresh vegetables, enabling infrastructure and knowledge levels. On the issue of perceived benefits, one of the key informants revealed thus; *"Sometimes vegetable farmers undertake post harvest handling practices because of the anticipated benefits in terms of income and food security. Once a farmer anticipates to get good incomes from embracing postharvest handling practices as a form of value addition, then he or she will always embrace some form of postharvest handling practices and when there are no perceived benefits, a farmer will not bother to use these practices"*.

Another key informant on the issue of knowledge levels commented thus; *"More often use of postharvest handling*

practices has been partly influenced by one's level of knowledge about these various postharvest handling practices. Those who have indigenous knowledge or have acquired modern knowledge from different sources, they most likely embraced these PHH practices compared to those who have less or no knowledge on the postharvest handling practices".

8. Discussion of Results

The study results revealed that availability of technologies was among the major factors influencing use of postharvest handling practices as supported by 91.8% and mean of 4.459. the findings revealed that availability of affordable technologies encouraged more and more farmers to embrace postharvest handling practices for their vegetable farming venture. This implied that the fact that majority did not afford postharvest technologies such as cold rooms, were forced to settle for indigenous and cheaper postharvest handling practices. This finding is in agreement with Arah et al., who established that selection of suitable method for harvesting of the produce is necessary otherwise bruises or injuries during harvesting [4]. Many later manifest as black or brown patches on vegetables or fruits making them unattractive. Injuries may become an entry point for microorganisms, causing rotting [4].

Furthermore, the garden tools available also tended to determine the use of post harvest handling practices as was supported by 83.3% and a mean of 4.33. it was revealed that availability of supportive tools such as cleaners, containers, transport equipment was among the major factors influencing use of postharvest handling practices. This implied that their availability motivated farmers to use the post harvest handling practices while their absence and unaffordability hindered majority from embracing postharvest handling practices.

The level of knowledge and exposure to existing appropriate PHH practices also influences use of these practices as was supported by 85.4% and a mean of 4.292. it was established knowledge and exposure was key in determining the ability to use and the rate of use of postharvest handling practices among leafy vegetable farmers. The findings are in agreement with [16] who reported that education of the farmer has been assumed to have a positive influence on farmers' decision to use postharvest practices. Education level of a farmer increases his ability to obtain; process and use information relevant to new post-harvest handling practices.

Further findings established that experience in vegetable growing and handling will also determine the use of PHH practices and was supported by 79.4% and mean of 4.270. It was learnt that experience in vegetable growing had enlightened farmers on the importance of embracing postharvest handling practices as one of the key factors in determining the quality and quantity of vegetable produce and hence accrued incomes. Hence they were in position to use some postharvest handling practices they thought were appropriate compared to those who had had no experience in vegetable growing.

The confidence and faith in indigenous postharvest prac-

tices was one of the factors that influence use of PHH practices. It was established from 75.7% with a mean of 4.092 that once farmers believe in what they are doing and anticipate to get positive results, they will always embrace postharvest handling practices. This implied that those who were confident in using postharvest handling practices were willing to risk and embrace these practices compared to those that were doubting their relevance. The study findings are related to [5] in Ghana who revealed that certain cultural practices, such as the preference for sun-drying leafy vegetables, hindered the adoption of more efficient postharvest handling methods like refrigeration or cold storage. In contrast, research by Nsabi-mana et al., in Rwanda highlighted the importance of traditional knowledge in preserving indigenous leafy vegetables, showing that integrating traditional preservation techniques with modern postharvest practices could enhance adoption rates [14].

Availability and condition of infrastructural facilities such as coldrooms, good roads, electricity also affect use of PHH practices. It was established that these infrastructural facilities were very important and greatly determined the nature and rate of use of postharvest handling practices in Isingiro town council. The findings established that most of these facilities were either unreliable, unavailable or in poor state, all of which served to discourage use of postharvest handling practices by vegetable farmers. This finding is consistent with [2] who in her study revealed that facilities like power, water, roads enhances sustainable production and when agricultural infrastructure (mechanization) are either inadequate or non-existent in several production areas, it makes the processor provide some of these by himself thereby increasing the cost of production and reducing competitiveness to take it to scale for widespread manufacturers.

9. Conclusion

The factors influencing the use of postharvest handling practices on indigenous leafy vegetables in Isingiro town council, Isingiro district have comprised of availability of postharvest technologies, availability of garden tools, the level of knowledge and exposure to existing appropriate PHH practices and experience in vegetable growing and handling. It should be noted that most of these factors have been favourable to vegetable growers with exception of availability of postharvest technologies and infrastructural facilities. These have been inaccessible and expensive to afford yet would add value to vegetable growing as business.

10. Study Recommendations

Efforts should be made towards increasing awareness of the importance of post-harvest handling technologies so that post-harvest losses on leafy vegetables are reduced to improve vegetable availability all the time.

There is a need to explore community-based approaches, participatory decision-making processes, and empowerment strategies that enhance resilience and promote food security at the local level in the process of growing green leafy vegetables.

Farmers should form strong cooperatives that can easily access agricultural financing and be able to hire the modern post-harvest handling equipment at a low cost. These cooperatives will go a long way in facilitating their members to engage in modern postharvest handling practices to reduce postharvest losses while increasing incomes in the long run.

There is need for crop diversification among vegetable farmers such that income diversification will be achieved as well as sustained household food security.

The government represented by Isingiro town council should step up efforts to invest in rural infrastructure that ranges from feeder roads to rural electrification, water facilities, with the aim of providing an enabling environment to green leafy vegetable farmers to embrace postharvest handling practices.

Abbreviations

A	Agree
D	Disagree
FAO	Food Agriculture Organisation
NS	Not Sure
PHH	PostHarvest Handling
SA	Strongly Agree
SD	Strongly Degree
SSA	Sub-Saharan Africa
WHO	World Health Organisation

Acknowledgments

The successful completion of this research work owes much from several individuals who contributed much in one way or another. My earnest gratitude goes to Isingiro district authorities for allowing the researcher to carry out study in their area. Earnest gratitude goes to my research supervisors; Assoc. Prof. Rebecca Kalibwani and Ms. Atwongyeire Doreen for having spared their enough time for me right away from the seminal phase of this research to the end, your work will always never be under-estimated.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Abakutsa, M. O. (2019). Iron and protein content of priority indigenous leafy vegetables in the Lake Victoria Basin. *Journal of Agricultural Science and Technology* 4(4): 67-69.
- [2] Alenazi, H (2019). Analysis of food security among farming households in Borno State, Nigeria. *Journal of Agricultural Economics Environmental & Social Sciences*, 1(1), 130-141.
- [3] Amin A, (2005). *Statistical methods for the social sciences*. San Francisco, California: Dellen Publishing Company.
- [4] Arah, I. K, (2015). "An overview of post-harvest challenges facing tomato production in Africa," *Diversity and Development, 37th AFSAAP Conference Proceedings, AFSAAP*, pp. 1-21, The African Studies Association of Australasia and the Pacific.
- [5] Ayazika, M. N., & Osei-Bonsu, P. (2017). Traditional post-harvest handling practices of leafy vegetables in northern Ghana. *Journal of Agricultural Extension and Rural Development*, 9(6), 123-130.
- [6] Besigwa, D, (2014). Copper and Ascorbic Acid Content of Cooked African Indigenous.
- [7] Brown, S., Lumpkin, V., Barber, S., Hardie, E., Kraft, K. H., and Luedeling, E., (2015). Global horticulture assessment. *Scripta Hort* 3: 1-134.
- [8] FAO, (2012). *Basic Harvest and Post-Harvest Handling Considerations for Fresh Fruits and Vegetable handling and Preservation*, FAO, Rome, Italy.
- [9] FAO. (2017). *Teaching good eating habits to reduce malnutrition and diet-related diseases*. Rome, Italy.
- [10] Kizito, E. B., Kinyua, R., & Ewell, P. T. (2018). Post-harvest handling practices and challenges of leafy vegetables among smallholder farmers in Uganda. *African Journal of Agricultural Research*, 13(14), 671-68.
- [11] Kothari, C. R. (2004). *Research methodology: methods and techniques*, (2nd ed.). New Delhi. New Age International (P) Limited. Kuhnlein & Turner, 2019.
- [12] Luchuo E. T Mutege, E., Mucheru-Muna, M., & Mwai, G. (2020). Assessment of the agronomic, culinary and nutritional characteristics of a collection of traditional African nightshade (*Solanum* spp.) from eastern Africa. *African Journal of Agricultural Research*, 10(16), 1873-1885.
- [13] Maundi, E, (2019). Postharvest handling practices and associated problems in producing and marketing tomatoes in Mbeya Region, Tanzania. *Journal of Experimental Agriculture International*, 26(2), 1-14.
- [14] Nsabimana, J., Mugisha, J., Baributsa, D., & Rurinda, J. (2020). Adoption and perceived impacts of improved post-harvest handling practices on African leafy vegetables in Rwanda. *Food Security*, 12(1), 115-132.
- [15] Ombuki, C., Ochieng, J., & Mbogoh, S. (2020). Post-harvest handling practices and losses of selected indigenous leafy vegetables among smallholder farmers in Kisii County, Kenya. *Journal of Postharvest Technology*, 8(2), 19-29.
- [16] Senkondo, T. E, (2011). Postharvest handling practices of indigenous leafy vegetables in Uganda. *African Journal of Food, Agriculture, Nutrition and Development*, 16(2), 10877-10892.

- [17] World Health Organization (WHO). (2015). World Hunger and Poverty Facts and statistics. World Hunger Education service.
- [18] World Health Organization. (2019). Nutrition program (Bruno beBenoist, inesEgli), Micronutrient Deficiency information system, Iron Deficiency Anemia. World Health Organization. Geneva.
- [19] World Bank (2011). Stemming post-harvest waste crucial to African Food security.