



**UTILIZATION OF GARRETT SCORING METHODS FOR EVALUATING ONION
FARMERS' CHALLENGES CONCERNING POST-HARVEST LOSSES IN FUNTUA
LOCAL GOVERNMENT AREA OF KATSINA STATE**

Danmusa, A.H., Ahmad, N. and Muhammad, M. B.

Department of Agricultural Economics, Federal University Dutsin-ma,
P.M.B5001, Dutsin-ma, Katsina State, Nigeria.

Corresponding Author's Email: hamisua398@gmail.com,

GSM: +2348033708181, +2348098908181

ABSTRACT

The study examined the utilization of Garrett scoring methods for evaluating onion farmers challenges concerning post-harvest losses of onions in Funtua Local Government Area of Katsina State, Nigeria. Analysing the extent, causes, and economic ramifications of post-harvest losses in onion production was the goal of the study. A total of 123 onion farmers were selected for the study. Data were collected using questionnaire between March and May 2025 on their key restrictions connected with post-harvest losses on onion. Six rating scales were used in this study to evaluate farmers' preferences. Factors are arranged in descending order of mean Garrett scores to identify the most critical contributors to post-harvest losses. The first rank of the total estimated factors rank is shown by the highest percentage average score, while the last rank is indicated by the lowest percentage average score. The result revealed that poor storage facilities (77.0) is the most critical issue, indicating a need for low-cost ventilated storage units and training on onion curing techniques. The second was pest infestation (61.0) followed by transportation damage (57.0) while last according to the finding was Market price volatility with (23.0). The Garrett Ranking Technique provides a structured approach to prioritize post-harvest loss factors, helping policymakers and agricultural stakeholders allocate resources effectively. Applying this method in Nigeria can guide targeted interventions to enhance vegetable supply chains and reduce economic losses. The findings suggest that storage and pest management should be the primary focus for policymakers and agricultural extension services.

Keywords: Garrett- Scoring, Techniques, Onion, Losses

INTRODUCTION

Post-harvest losses" refers to quantifiable, qualitative, and quantitative losses in a particular product. Any of the several stages of the post-harvest system may see these losses. Cases of product deterioration must also be considered in this definition. However, it would be more correct to refer to it as a restriction in the usage of the product rather than actual losses. Perishable goods may actually no longer be fit for sale or human consumption if they are largely ruined, for instance, by improper storage conditions or temperature. Clearly, there have been value losses where it was meant for those purposes. From an economic perspective, the total of the product quality and quantity losses invariably translates into financial losses. Apart from direct financial losses, there are also losses brought on by inadequate post-harvest system management. They are demonstrated by the farmers' income and production not increasing (De Lucia 2018). A staple of the traditional daily diet, onions are consumed in a variety of ways by various people. It is one of Nigeria's top five vegetables and a significant spice (NIHORT, 2020). It is used almost every day in every home and can be eaten raw in salads, fried, boiled, or roasted. It can also be used to flavour soups, canned goods, and other savoury recipes (Hussaini *et.al.*, 2018). Onions have long been used as a medicinal herb to cure colds, measles, pneumonia, and catarrh. More recently, research has shown that onions can help prevent osteoporosis, or bone loss (Biochemist, 2020). Producing onions is a profitable business that uses a lot of labour, and the bulbs are traded in big quantities both domestically and internationally (Currah and Proctor, 2019). Onions are the second most important vegetable in Nigeria, but current production levels are insufficient to meet the demands of the country's swarming population. Although onion



consumption is widespread throughout the nation, its primary production area is in the northern part of the country, limited to Fadama areas, and grown primarily during the dry season under irrigation. As a result, limited changes in traditional production practices may still be falling behind the national demand (Denton and Ojeifo, 2019). In a similar vein, current production levels fall short of what other nations have achieved. For instance, Nigeria only has 15 t ha⁻¹, whereas India has 45 t ha⁻¹ (FAO, 2020).

Post-harvest losses in onions refer to the reduction in quantity and quality of onions from harvest until they reach the consumer. These losses occur due to various factors, including poor handling, storage conditions, diseases, and market inefficiencies. According to studies, post-harvest losses in onions can vary from 20% to 50%, depending on the region and handling practices (FAO, 2019; Opara, 2019). Post-harvest losses (PHL) in onions significantly impact Nigerian farmers' income and food security. The **Garrett Ranking Technique** is a statistical method used to prioritize factors based on their perceived importance by respondents. It converts ranks into scores, allowing for quantitative analysis of qualitative data. In the context of **post-harvest losses (PHL) on onion**, this technique can help identify and rank the most critical factors contributing to losses, such as poor storage, transportation issues, or lack of processing facilities.

In Nigeria, post-harvest losses (PHL) in vegetables pose a serious problem since they drastically lower food supply, farmer income, and nutritional security. Because of their high moisture content, vegetables are extremely perishable and can spoil if not handled properly. The Food and Agriculture Organization (FAO, 2019) estimates that due to inadequate processing, storage, and transportation, Nigeria loses between 30% and 50% of its vegetables after harvest. In developing nations like Nigeria and India, losses are especially high because of poor handling practices and insufficient storage facilities (Opara, 2019).

Post-harvest losses are also a result of a lack of expertise and access to contemporary preservation methods, including freezing, canning, and drying. According to a study by Okoruwa and Ogundele (2019), just 15% of Nigerian vegetable growers process their produce in any way, which results in significant waste, particularly during the busiest harvest seasons. Vegetables are subjected to heat, dust, and physical harm when they are transported in open vehicles and on poorly maintained roads. Many vegetables are crushed and bruised during transportation because they are not properly packaged. According to a report by the Nigerian Institute of Transport Technology (NITT, 2021), a lack of refrigerated vehicles and bad road conditions cause 35% of vegetable losses during shipment. Post-harvest losses are largely caused by improper harvesting techniques. Numerous Nigerian farmers employ rudimentary equipment and unskilled labor, which causes mechanical damage such as cuts, bruising, and punctures that hasten deterioration. According to a study by Oke et al. (2020), 25% of tomato losses in Nigeria happen during harvest because the crop is physically damaged by improper handling and container use. Vegetables deteriorate quickly in the absence of adequate storage infrastructure, such as cold storage and controlled environment systems. The majority of smallholder farmers use conventional storage techniques, which are ineffective against mold, pests, and temperature changes. According to Afolayan and Afolayan (2018), approximately 40% of green vegetables in Nigeria deteriorate within a few days of harvest due to the absence of refrigeration and insufficient ventilation in storage facilities.

Globally, between 20% and 40% of onions are thought to be lost after harvest, which has a significant effect on the economy, food security, and environment. Nigeria's inadequate infrastructure for handling, storing, and shipping onions makes losses particularly severe there. In addition to impacting farmers' revenue, these losses reduce the quantity of onions available for consumption, which exacerbates food insecurity. The causes of post-harvest losses in onion production are multifaceted. These losses are mostly caused by high perishability, inadequate storage facilities, careless handling techniques, restricted market access, and pest and disease infestations. Furthermore, the scarcity of research focused specifically on post-harvest losses of onions in Funtua highlights the necessity for a complete investigation.

The study's conclusions will have a big impact on stakeholders, policymakers, and farming communities, making it an important and timely study.



Onion production has been hampered mostly by inadequate soil fertility, which leads to low yields and makes it difficult for farmers to store the extremely perishable crop for extended periods of time (Denton and Ojiefu, 2019). One of the main obstacles to Nigeria's goal of having a year-round supply of onions is post-harvest losses.

Amans *et al.* (2016) found that storing onion bulbs for two to three months could result in losses of up to 60%. However, according to Kale (2020), cultural traditions have been shown to extend the shelf life of onions. In contrast, Henriksen (2018) found no impact of nitrogen spraying on the storage quality of onions in the temperate zone. However, in Egypt, El-tabbakh *et al.* (2019) found that applying N improved the storage quality (Kudi, 2020). Post-harvest issues were another important source of concern; 36% of respondents complained of inadequate marketing, and 64% of respondents complained of inadequate storage facilities. (Nisar, *et al.* 2020).

METHODOLOGY

Description of the Study Area

Funtua is a local government area in Katsina State, Nigeria, with its headquarters located in the town of Funtua on the A126 highway. Founded following local government reforms in 1976, Funtua LGA is the headquarters of the Katsina South senatorial district, which consists of eleven municipalities. With a land area of approximately 552.323 km² and a population of 169 829 as of the 2006 national census (Federal Republic of Nigeria, 2012), the majority of the state's industries, including Funtua Textile Limited and Jargaba Agric Processing Company, can be found there. Due to its location in latitude and longitude 11°32'N, 7°19'E, Funtua enjoys favourable weather conditions. Funtua experiences 53.52 wet days (14.66% of the time) and 50.56 millimetres (1.99 inches) of precipitation on average each year. The average temperature and humidity in the city are 32°C and 44%, respectively.

Sampling Procedure and Sample Size

For the investigation, a multi-stage sampling technique was used. The study's targeted demographic was the Funtua Local Government Area (L.G.A.) onion farmers. In the first stage, Funtua L.G.A. from Katsina South Senatorial Zone was purposefully chosen based on the area's intensity of onion production. Four (4) communities that are known to be heavily active in onion production in Funtua L.G.A. were purposefully chosen for the second stage. These villages are Gwaigwaye, Yartafki, Maska, and Makwalla. In the last phase, using Yamane, T. (1967) formula and proportionate sampling, one hundred & twenty three (123) onion producers were selected for the study.

The following expression was used to determine the sample size as:

$$n = \frac{n}{1 + (N)e^2}$$

Where:

n = Sample size determination

N = Total number of Marketers

e² = Confidence level (0.05)²

1 = Constant

Table 1: Sample Size of the Onion farmers

S/NO	VILLAGES	SAMPLING FRAME	SAMPLE SIZE
1	Waigwaye	68	47
2	Yartafki	50	35
3	Maska	32	22
4	Makwalla	28	19
	TOTAL	178	123

Field survey, 2025



Method of Data Collection

Information on post-harvest losses of onions in Funtua Local Government Area were gathered for this study using primary data. A systematic questionnaire intended to gather information on the challenges farmers encounter in producing onions was used to gather the data. Respondents were asked to rate the importance of certain issues. Through in-person interviews and observations, the questionnaire was given to onion producers in the Funtua Local Government Area. To guarantee accuracy and completeness, the researcher oversaw the data collection procedure. The Garrett ranking algorithm was used to analyse the gathered data.

Analytical Tools

Onion marketing restrictions were identified using the Garrett ranking technique. To examine preference and the conversion of constraint and advantage orders into numerical scores, Garrett's Ranking Technique was used. This technique's main advantage over a simple frequency distribution is that, from the respondents' perspective, the limitations are organised according to their severity. When respondents' preferences for a certain problem diverge, Garrett's scoring technique—which converts ranks into scores—was used to examine the issues that respondents encountered in onion marketing. The following is the conversion method:

The following algorithm will be used to determine each rank's percentage position as a first step:

$$\text{Percent position} = \frac{100(R_{ij} - 0.5)}{N}$$

Where,

R_{ij} is the rank given to i th item by the j th individual

N is the number of item ranked by the j th individual.

The table provided by Garrett will then be used to translate the % position into scores. Following this process, scores will be generated based on the order of merit provided by each respondent regarding the onion marketing issues. The scores of each respondent will then be totalled and divided by the total number of respondents for each reason. Ranks will be assigned after these mean scores for all causes are sorted in descending order. This approach will yield an accurate preference determination.

RESULT AND DISCUSSION

The results of the study on the factors affecting post-harvest losses of onions in Katsina State's Funtua Local Government Area are shown in this section. To determine the most important limitations and gauge farmers' preferences, the Garrett ranking technique was employed. Three tables are used to display the results: The number of rankings provided by sample respondents is shown in Table 2 percent the position and Garrett value are displayed in Table 3, the estimated average score of all respondents is shown in Table 4.

Number of Ranks Given by Sample Respondents

A survey was conducted among 123 onion farmers in Funtua L.G.A. of Katsina State, Nigeria, who ranked these factors from **1 (most severe) to 6 (least severe)**. The respondents' rankings of the six discovered criteria are shown in table 2. Rankings from 1st to 6th were assigned to each factor, and the frequency of each rank was noted. These ranks were transformed into scores using the Garrett Ranking Technique, which made it possible to determine the average and total scores for every element. This approach made it possible to compare things clearly and helped determine which criteria were most important to the respondents .

Table 2: Number of Ranks given by sample respondents

Factors	Rank Given by the Respondents					
	1 st	2 nd	3 rd	4 th	5 th	6 th
Poor storage facilities	70	5	30	15	0	3
Pest infestation	11	55	38	7	12	0
Transportation damage	32	20	48	0	5	8
Lack of proper drying	30	10	15	43	20	5
Inadequate packaging	13	20	15	20	40	15
Market price volatility	21	12	15	0	5	70

Source: Field survey, 2025

Percentage Position and Garret Value

Using the conversion table created by Garrett and Woodworth (1969), the Garrett ranking technique served as the basis for the scoring process. Six rating scales were used in this study to evaluate farmers' preferences.

Table 3 describes the percent position value of the total sample respondents; for each percent position value, the Garrett value will be estimated by considering the Garrett Ranking Conversion Table. These figures offered a consistent framework for assessing the variables influencing post-harvest losses among the study area's onion growers.

In this case, the 8 percent position value will be the nearest integer of the Garrett Ranking Conversion Table, i.e., 77 and so on. This is because the Garrett value is crucial for calculating the total score of the respondents by ranking on various factors of the phenomenon. The Garrett value was calculated using the formula, which is $100(R_{ij}-0.5)/N_j$. Table 3 displays a summary of these rankings' outcomes.

Table 3: Percent Position and Garret Value

S/N	Percent Position $100(R_{ij}-0.5)/N_j$	Percent Position Value	Garrett Score
	$100(1-0.5)/6$	8.3	77
	$100(2-0.5)/6$	25	63
	$100(3-0.5)/6$	41.7	54
	$100(4-0.5)/6$	58.33	46
	$100(5-0.5)/6$	73	38
	$100(6-0.5)/6$	91.6	23

Source: Field survey, 2025

Estimation of Average Score of the Total Respondents

After converting all farmer rankings, the average Garrett score for each factor is computed. Based on respondents' ranks, the table 4 shows the average and total Garrett scores for the six important factors. The total score is determined by multiplying the Garrett value by the rank that the respondents provided for each factor in the sample. The average score using Garrett value ranking approaches is determined by dividing the total score by the total number of respondents in the chosen sample. The first rank of the total estimated factors rank is shown by the highest percentage average score, while the last rank is indicated by the lowest percentage average score.

The table shows poor storage facilities (77.0) – The most critical issue, indicating a need for low-cost ventilated storage units and training on onion curing techniques. This is in line with the Afolayan and Afolayan (2018), who reported over 40% of leafy vegetables in Nigeria spoil within a few days of harvest due to the absence of refrigeration and poor ventilation in storage facilities. Pest infestation (63.0) – Requires improved pest control measures, such as neem-based treatments and proper fumigation. Transportation damage account for (54.0) this corroborated a report by the Nigerian Institute of Transport Technology (NITT, 2021) which indicated that 35% of



vegetable losses occur during transportation due to poor road conditions and lack of refrigerated trucks. Suggests better packaging (e.g., crates instead of sacks) and road infrastructure improvements.

Table 4: Results of Garrett Ranking Analysis

Factor	Total Score (Sum)	Mean Score	Final Rank
Poor storage facilities	9,471	77.0	1
Pest infestation	7,749	63.0	2
Transportation damage	6,642	54.0	3
Lack of proper drying	5,658	46.0	4
Inadequate packaging	4,674	38.0	5
Market price volatility	2,829	23.0	6

Source: Field survey, 2025

CONCLUSION AND RECOMMENDATION

The efficiency and profitability of onion production are hampered by factors like inadequate storage facilities, bad infrastructure, and restricted finance availability. The Garrett Ranking Technique provides a structured approach to prioritize post-harvest loss factors, helping policymakers and agricultural stakeholders allocate resources effectively. Applying this method in Nigeria can guide targeted interventions to enhance vegetable supply chains and reduce economic losses. The findings suggest that storage and pest management should be the primary focus for policymakers and agricultural extension services. It is crucial to address these limitations and encourage best methods in harvesting, storing, and marketing in order to lessen these difficulties. Onion farmers can enhance their general well-being, boost productivity, and lower post-harvest losses by doing this.

The study's conclusions lead to the following suggestions:

1. To lower post-harvest losses and enhance onion quality, government and private sector stakeholders should invest in silos and other contemporary storage facilities.
2. To enable effective marketing and distribution of onions and lower transportation expenses and losses, the government should improve roads, transportation networks, and communication systems.
3. To help production and marketing efforts, financial institutions and microfinance banks can offer farmers accessible credit options, such as low-interest loans with adjustable repayment terms.
4. To improve farmers' skills and knowledge, agricultural extension agents and other stakeholders should regularly provide training programs on post-harvest handling, marketing, and contemporary farming practices.

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