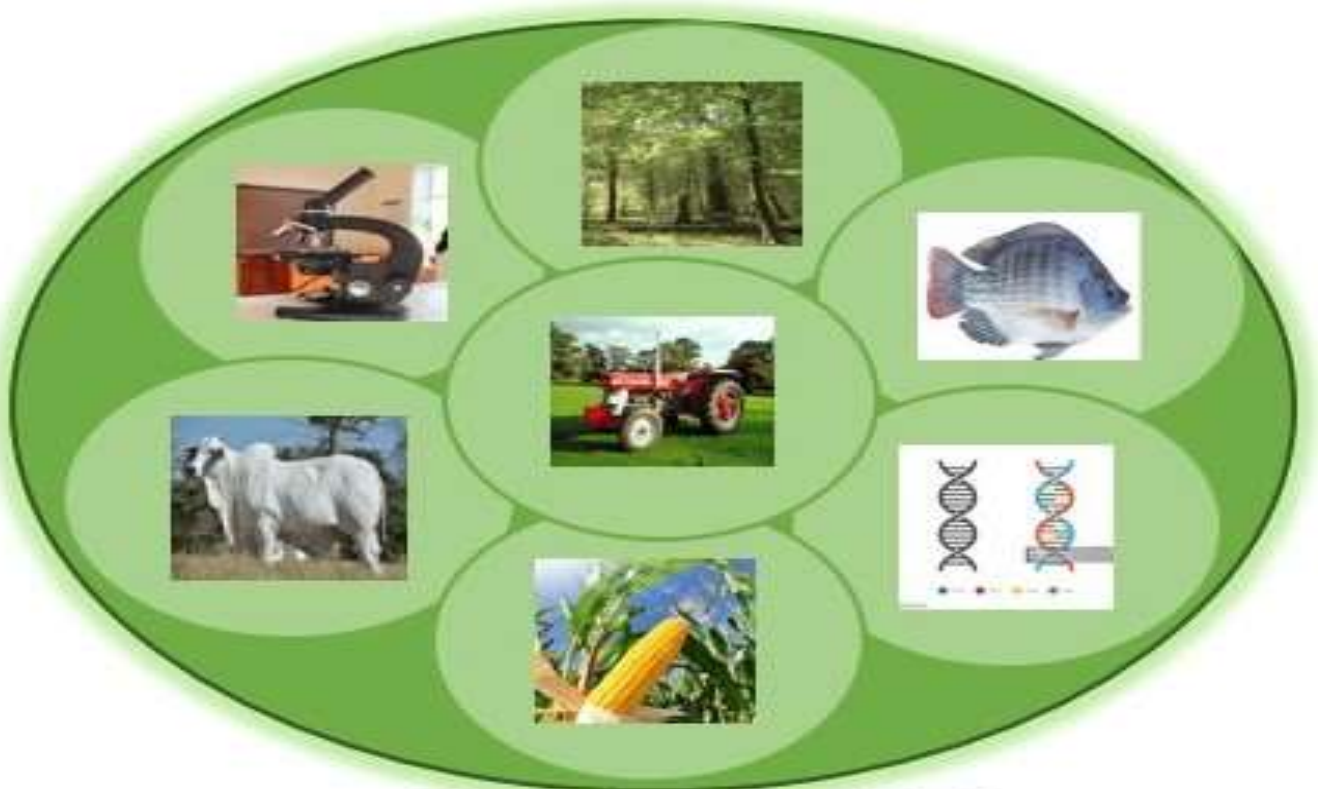




**(KEJAANS)**

# KEBBI JOURNAL OF AGRICULTURE AND NATURAL SCIENCES

January, 2025 Vol. 1, issue 1



**KEJAANS**

**CONTACT:**

The Editor,  
Kebbi Journal of Agriculture and Natural Sciences,  
Faculty of Agriculture,  
Kebbi State University of Science and Technology Aliero,  
PMB 1144, Birnin kebbi, Nigeria.  
Email: [kejaanseditor@ksusta.edu.ng](mailto:kejaanseditor@ksusta.edu.ng), [kejaans.foa@gmail.com](mailto:kejaans.foa@gmail.com).  
Phone: +234 8039370546

**ISSN: 1595-5776**



KEBBI JOURNAL OF AGRICULTURE AND NATURAL SCIENCES  
(KEJAANS)

JANUARY, 2025: Volume 1, Issue 1

OFFICIAL JOURNAL OF THE  
FACULTY OF AGRICULTURE  
KEBBI STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY, ALIERO

**Editors**

**I.S. Jega  
M.I. Ribah  
I. Sani  
M. Atiku  
M.N. Kwaifa**

KEJAANS

ISSN: 1595-5776

(c) 2025



### **About the Journal**

This official scientific publication of the Faculty of Agriculture, Abdullahi Fodiyo University of Science and Technology Aliero, is a non-profit, open access, double-blind peer-reviewed Journal publishing four issues (January, April, July and October) per annum. The Journal is a platform open to collaborations with researchers, authors, institutions, research agencies and private companies related to Agriculture. The Mission of the Journal is to disseminate scientific knowledge through the publication of original research articles, research notes, book reviews, letters to the editor and reviews of Literature, representing a contribution to scientific and technological knowledge in respective areas covered by the Journal. The Kebbi Journal of Agriculture and Natural Sciences seeks to validate and disseminate new knowledge, making it public in order to strengthen the human capacity, constitute a link in the scientific community to the society and encouraging the expansion of University and academic researches.

### **Scope of Kebbi Journal of Agriculture and Natural Sciences (KEJAANS)**

The Kebbi Journal of Agriculture and Natural Sciences has the sole aim of providing an intellectual platform and ideas for scholars, by promoting interdisciplinary studies related to agriculture and natural science through publishing the latest scientific research findings that are of direct policy implications and beneficial to the research community. Consequently, the journal covers all aspects of Crop Science, Animal Science, Agricultural Economics, Agricultural Extension and Rural Development, Food Science, Fisheries and Aquaculture, Biotechnology, Soil Science and Agricultural Engineering, Forestry and Environment, Wildlife, Agricultural Education, Agro-allied Industries as well as all Natural Science researches related to Agriculture.

KEJAANS

## INSTRUCTIONS FOR AUTHORS

### Submission of Manuscript

Submission of manuscript to JAANS shall be on an online platform. Papers could also be submitted as e-mail attachment to the Editor-in-Chief using the [kejaanseditor@ksusta.edu.ng](mailto:kejaanseditor@ksusta.edu.ng) or [kejaans.foa@gmail.com](mailto:kejaans.foa@gmail.com). The paper should be submitted as a single file in Microsoft Word Format (no other formats will be accepted) and the file shall not be more than 5 Megabytes so that it can be e-mailed to reviewers. The first author, month and year of submission shall be the file name (e.g Ibrahim *et al.* Aug 2010 doc). Once the Editorial Board receives the submission, acknowledgement shall be sent to the corresponding author. If acknowledgement of submission is not received within a week, the author shall remind the Editor-in-Chief through the official email.

### Preparation of Manuscript

**General presentation:** The manuscript should be presented clearly and concisely in English Language. Manuscripts must be prepared (preferably with MS word package) using 12-point New Times Roman (TNR) font, double line-spaced on A4 size paper (210 — 297mm) with at least 3cm margins on all sides. All typing should be justified. Pages including figures and Tables, should be numbered consecutively in the bottom middle with the title page as page 1. Manuscript should contain the following sections (except for review and commentary articles): **Title page; Abstract; Introduction; Materials and Methods; Results, Discussion (Results and Discussion could be combined); Conclusion and References.**

#### Title page

The first page of the manuscript should contain the title of the article, which should be concise and explicit, typed with upper-case, bold, 14 font size, TNR and not more than 21 words. The surname and forenames (in full) of authors, affiliation of each author should be provided. Phone number and email address of the corresponding author (identified by an asterisk) should be provided. Superscripts should be used to relate authors to their affiliations.

#### Abstract

The next page should contain abstract in English. Abstract should not be more than 250 words and should provide sufficient information to give the reader a full understanding of the content of the article. Paragraphs, footnotes, references and undefined abbreviations should be avoided.

#### Keywords

Up to five keywords in normal fonts, separated by semi-column, should be provided to assist the reader and facilitate information retrieval.

#### Body of Text

The title of the article should be typed in upper-case letters and bold. All other headings should be typed in upper-case letters and bolded while sub-headings should be in lower-case and bolded. The main headings should not be indented. The SI unit system must be used. Standard abbreviations may be used without definition, and specialized abbreviations should be used only after they are defined when they first appear. Use capital 'T' for Table and 'F' for figure. Mathematical formulae should be carefully typed with symbols, correct alignment and must be adequately spaced. Statistical evaluation of results should be described briefly and if necessary, supported by references.

#### Introduction

A concise introduction of the background to the subject is required and should include a brief statement of the problem, significance and purpose of the research and relationship to earlier works with well acknowledged references.

## Materials and Methods

This section must be presented with adequate clarity and provide sufficient details to permit the repetition of the experimental work. The techniques and the methodologies adopted should be supported with standard references. Subheadings under this section should be in lower case except the first letter.

## Results and Discussion

Results should be presented concisely. Only in exceptional cases will it be permissible to present the same set of results in both Table and figure. In discussion, point out the significance of the results and place the results in the context of other work and theoretical background. Results and Discussion part could be written separately if author so wish.

## References

Only published articles (Journals and Proceedings) or Books may be cited. In addition, articles with evidence of Journal acceptance are considered as "in press" and are also citable. The reference list should be arranged alphabetically. Authors should be referred to in text by name and year (Harvard system). Examples:

### For Journals, list as:

Jega, I.S. and Kwaifa, M.N. (2017). Statistics of Cassava Yield Trials with the Additive Main Effects and Multiplicative Interaction (AMMI) model. *African Journal of Root and Tuber Crops*, 3 (1), 46-50.

Within the text, references should be given as: Meaza *et al.* (2007), or similar results have been obtained (Meaza *et al.*, 2007).

### For proceedings, list as:

Aina, O.O., Dixon, A.G.O. and Akinrinde, E.A. (2021). Influence of shoot and root characteristics of cassava genotypes on yields in Nigeria. *African Crop Science Conference Proceedings*, Vol. 5. pp. 1119-1125.

### For Books, list as:

DeVries, J. and Toenniessen, G. (2001). *Securing the Han/est Biotechnology, Breeding and Seed Systems for African Crops*. The Cromwell Press, Trowbridge, Wiltshire, UK. 208pp.

For electronic resource materials (online publications) list as:

Zachary, G.P. *Africa plays the rice card*. Foreign Policy. May/June 2008 (web-exclusive story). [http://WWW.foreignpolicy.com/stogg/cms.php?story\\_id=4306](http://WWW.foreignpolicy.com/stogg/cms.php?story_id=4306). Accessed 26 August 2008.

## Tables and Figures

Tables and Figures should be labelled serially using Arabic numerals (e.g Table 1, Table 2, etc; Figure 1, Figure 2, etc.)

## Abbreviations

Avoid the use of abbreviations at the beginning of the title, heading or sentence. The following abbreviations with numerals can be used without spelling out at first use. H, min, s, yr, mo, mm, kg, g, DNA, RNA, cpDNA, dNTP.

## Numbers

Avoid the use of figures /numbers at the beginning of a sentence. Write out one through nine unless a measurement, a designator, or a range (e.g five seeds, 8cm, 3yr, 5-11 flowers)

## Ethical matters

The author using experimental animals must seek permission and include a statement that the investigation was approved by the Ethics Clearance Committee of the researchers' institution.

### **Copyright**

Submission of a copyright to **KEJAANS** implies that the study presented has not been published before or under consideration for publication elsewhere. Once an article has been accepted for publication, author concedes the copyright to **KEJAANS**. However, authors are responsible for the content that appeared in their manuscripts.

### **Plagiarism Check on Submitted Papers**

Since academic Journals must strictly audit the quality of the papers, prevent plagiarism, fraud and other phenomena, ensure that the papers are scientific, original and standardized; cultivate the author's research integrity and consciousness in the process, create a healthy and fair academic environment. It is advisable that each author first conduct a plagiarism check on their paper before submission. Every submitted paper undergoes a plagiarism check by the editors. The editors of **KEJAANS** shall liaise with the Academic Librarians of the organization/institution to do this. Any paper that is more than 20% (or less as determined by the editors) in its plagiarism check shall be sent back to the author for reworking and resubmission.

### **Blind Peer-review of Submitted Papers**

Submitted papers that passed a plagiarism check by **KEJAANS** shall be sent to at least two reviewers that are expert in the field, after every piece of information that can reveal the identity or the affiliation of authors has been concealed for fair, blind peer review. The reviewers shall give a comprehensive report of their review. The editors shall design a Form to be completed by the reviewers after the review. The reports and completed forms shall guide the editors in their further decisions on the reviewed article. The reviewers shall recommend the paper for publication or otherwise.

### **Publication of Papers**

This shall be done after the acceptance of articles for publication in line with the next publication time of the Journal. Prior to publication, a galley proof copy shall be sent to the corresponding author who shall immediately effect correction (if any), and return to the editors. The number of articles to be published in a given issue of the Journal shall be at least 15. It is not compulsory for **KEJAANS** to produce an issue of the Journal if there are no accepted articles ready for publication at a given time of publication.



## ANALYSIS OF POSTHARVEST LOSSES IN ONION (*Allium cepa* L.) AMONG VALUE CHAIN ACTORS IN KEBBI STATE, NIGERIA

\*<sup>1</sup>Magaji, Umar, <sup>1</sup>Maikasuwa Abubakar Mohammed, <sup>1</sup>Kaka Yahaya, <sup>2</sup>Muhammd Adamu,  
<sup>1</sup>Adamu Abdussalam Jega

<sup>1</sup>Department of Agricultural Economics and Extension, Kebbi State University of Science and  
Technology, Aliero.

<sup>2</sup>Department of Crop Science, Kebbi State University of Science and Technology, Aliero.

Corresponding author: [umarmagaji122@gmail.com](mailto:umarmagaji122@gmail.com) (08062410164)

### ABSTRACT

*Onion (*Allium cepa* L.) is a major vegetable crops cultivated in northern Nigeria, inherently liable for deterioration in quantity and quality, particularly in tropical conditions. Much resource is spent in its production with little attention paid to its postharvest losses that may results in not meeting the supply needs of the population. This study aimed at analyzing the extent of postharvest losses along the onion value chain in Kebbi State, Nigeria. Multistage and simple random sampling procedures were used to select 366 respondents from the study area based on sampling frame to generate primary data using questionnaires and focal group discussion from ten local government areas and two notable onion markets in Kebbi State. The data collected were analyzed using Minitab 16 statistical package. Extent of postharvest losses shows that retailers (2.35kg) and producers (1.4kg) recorded highest and lowest losses per 120kg bag of onion respectively from aggregate of 8.12kg/bag. The result of multiple linear regressions on factors affecting onion producers' postharvest losses have negative coefficients for age, education-level, household-size etc meaning, increase in the variables reduce postharvest losses. Wholesalers' coefficients for household-size and business-experience were negative implying reduction in losses with increase in the variables. Exporters' coefficients for age, business-experience and market distance have negative coefficients signifying decrease in postharvest losses if variables increase. Findings show that postharvest losses are prevalence to onion marketers and socioeconomic characteristics of the onion actors influence a reduction in postharvest losses. Therefore, intervention for capacity building on the needs for efficient postharvest handling technologies by all the onion stakeholders is fundamental.*

*Keywords: Onion actors, onion producers, onion marketers, postharvest losses, value chain*

### Introduction

Feeding the world estimated population of 9.1 billion people by 2050 require a corresponding increase in food production by 70% and food production in the developing countries would need to be double (FAO, 2009;

Relief Web, 2009). However, in Nigeria, a wide range of food products are being cultivated and mostly lost at various operations leading to wastage in human effort, farm resources, investments and livelihood of persons involved in the production and



marketing processes (Olayemi, *et al.*, 2012; Adeniyi and Ayandiji, 2014). The large losses on food crops from farm to plate are attributed to poor handling, distribution, storage and consumption behavior (Manalili *et al.*, 2014) where colossal resources that could have been deployed on more productive activities go into waste.

Postharvest losses have been identified as one of the principal determinant and main causes of food shortage problem in Nigeria (Ashinya *et al.*, 2021). According to Centre for the Promotion of Imports from Developing Countries { (CBI), 2021 } food loss in Tomato, Onion and Chilli, in Nigeria was about 32 million tonnes due to postharvest losses per year with about 50 % losses in onion. According to Peoplesgazette (2021) and WorldStage (2022) Nigeria produces over 1.4 million metric tons of onions, however, between 40% and 60% (i.e. about 622, 084 metric tons) go to postharvest losses mainly at transit and storage levels. Major causes of postharvest losses in onion are; pest and diseases, physical bulb damage at harvest, haulage, transportation and at marketing transactions (Bello and Yakubu, 2023) leading to a substantial loss in the profit and livelihood of the onion producers and marketers. Onions became unsuitable for human consumption with possible health hazards (carcinogenic mycotoxins) due to postharvest diseases in addition to its lost in quality (nutrient composition, taste, smell etc) and quantity (Sule, 2019; Sharma, 2023). Reducing postharvest losses may be more sustainable than increasing production to meet up for the losses (Sule, 2019) which could improve quantity, quality, food safety, and high profits to producers, marketers and processors. Minimizing onion losses can help and improve the income and wellbeing of onion growers and marketers (Bello and akubu, 2023).

. Onion crop is the most widely used flavouring vegetable of major commercial value

worldwide (Ocholi *et al.*, 2021) but goes bad speedily if not properly preserved. Onion is cultivated in about 170 countries with China, India and USA leading the global production by 20,507,759tons, 13,372,100tons and 3,320,870ton respectively (FAO, 2021) and in Africa, Nigeria is ranked second (1,346,218tons) behind Egypt (2,208,080tons) trailed by Morocco (1,001,300tons), Algeria (821,072tons) and South Africa (518,284ton). In Nigeria, onion is one of the most important commercial vegetables produced, which is mostly grown in northern part of the country due to its favourable climatic condition. Some of the largest onion producing States in the northern Nigeria include but not limited to Kebbi, Sokoto, Kano, Jigawa, Kaduna, Katsina etc and with precipitated onion traders (Maharazu, 2023). Onion moves from the producers to marketers such as middlemen, wholesalers, retailers, exporters as biggest onion actors in the region.

Notwithstanding of the above potentialities, onion production and marketing is no doubt faced with postharvest losses leading to a gloomy trading activities due to its fast perishable nature for lack of adequate scientific storage and packaging facilities, improper handling of the crop by onion actors, poor transportation network, hence for considerable onion postharvest losses. Therefore, this study focused on assessing the extent of postharvest losses and identifies the factors responsible for such losses in the study area. Without an estimated and reliable record on onion postharvest losses in the state, it is difficult to proffer proper policies to reduce such losses. Research works on onion postharvest losses in the study area is still scanty as most of the researches focused on onion production and marketing without attention to evaluate its postharvest losses. Few of such research works include; Dauda *et al.* (2016); Illo *et al.* (2016); Magaji *et al.* (2021); Kaka and Gindi (2021). The information on the extent of onion

postharvest losses and factors promoting such losses at various actors' level would be a vital guide to onion actors in reducing onion postharvest losses which can help to increase its availability without necessarily increasing the production size. It can help policy makers in formulating the desired policies that can help in reducing onion postharvest losses in the State. The research can also be useful for researchers who intent to carry out studies on onion postharvest losses in the future.

## Materials and Methods

### The study area

The study was conducted in Kebbi State located at the extreme North-Western corner of Nigeria on latitudes  $10^{\circ} 8'$  and  $13^{\circ} 15'$  North and longitudes  $3^{\circ} 30' E$  and  $6^{\circ} 2' E$ . In the North and West, it shares borders with Niger and Benin Republics respectively, Niger State to the South and Sokoto and Zamfara States to the east and south-east (Kebbi State Government, 2013). Kebbi State occupies an area of about 37,698,685 square kilometers (3.7 million hectares) out of which 36.46% is made up of farmland (Kebbi State Government, 2018). The State has a projected population of about 5,563,000 million (NPC, 2022). Kebbi State has tropical weather conditions with three seasons: rainy, dry and hot. The annual rainfall is variable between the range of 600 mm and 850 mm with an average of 650 mm. The monthly temperature in the region ranges from  $25^{\circ} C$  to  $45^{\circ} C$  (Usman *et al.*, 2016). The State possesses two important agricultural lands namely: dryland (arid-prolonged dryness) and fadama (floodplains-significant alluvial clay particles). These two lands remained the key source of income to millions of people in the state (Usman *et al.*, 2016). Agriculture is the most important economic activity, with riverine floodplains producing crops like groundnuts, cotton, rice, millet, sorghum and vegetables such as tomato, pepper, onions etc. Majority of the farmers in Aliero, Maiyama,

Jega and Birnin Kebbi Local Government Areas in Kebbi State cultivate onion as dry season crop, while Yauri and Shanga Local Government Areas cultivate in both seasons (Dauda *et al.*, 2016). Most of the land in the State is used for grazing livestock (Kebbi State Government, 2013). The major ethnic groups in the State are the Fulani, Hausa, Dakarkari, Kambarawa, Zabarmawa, and Dandawa.

### Sampling procedure and sample size

The population for this research work comprised of sole onion actors (producers and marketers) in Kebbi State. In consideration of the onion producers' ecological characteristics, level of cultural practices or technology and size of production of onion attributed to the 13 local government areas that are into onion production in the study area viz; Aliero, Jega, Maiyama, Birnin Kebbi, Yauri, Gwandu, Shanga, Ngaski, Augie, Argungu, Bagudo, Koko/Besse and Dandi Local Government Areas (Kebbi State Government, undated). Based on high concentration of onion marketers at very important onion marketing centers well known in attracting buyers and sellers from regional and international places that are available throughout the year with common networking marketing activities and practices around the study area and fused into one body addressed Kebbi State Onion Producers and Marketers Cooperative Association characterized the beneath unit procedure.

The procedure recommended by Adam (2020) was adopted to arrive at 366 sample size for the study out of the sample frame of 6,321 (i.e. onion farmer-4828, middlemen-176, wholesalers-423, retailers-752 and exporters-142) in respect of registered members of Kebbi State Onion Producers and Marketers Cooperative Association as obtained.

The number of respondents drawn from each level of participating actor was determined by using sample size formula as in equation (1) as

adopted from (Shaikh *et al.*, 2016) shown in Table 1.

$$NI = \frac{n}{N} \times Ni \quad (1)$$

Where

NI= sample size in each actor level  
 n=total number of actors' sample sizes  
 N=total number of actors in the target population (i.e. sample frame)  
 Ni=total number of actors at each level

Table: 1. Distribution of Actors' Sample Size at different levels in the Study Area

Actor	Sample frame (Ni)	NI = $\frac{n}{N} \times Ni$	Sample size (NI)
Onion farmers	4828	(366/6321) X 4828	280
Retailers	752	(366/6321) X 752	44
Wholesalers	423	(366/6321) X 423	24
Exporters	142	(366/6321) X 142	08
Middlemen	176	(366/6321) X 176	10
<b>Total</b>	<b>6, 321</b>		<b>366</b>

**Source:** Kebbi State Onion Producers and Marketers Cooperative Association

Multistage and simple random sampling procedures were used to select respondents from the study area based on sampling frame as follows.

At stage I, ten local government areas were purposively selected based on their intensity in sole onion production and two notable onion markets based on the concentration and availability of onion marketers throughout the year. At stage II, two dominant villages in sole onion production were purposively selected from each of the ten local government areas selected giving a total of 20 villages. In stage III, in each of the 20 villages, 14 producers were selected using simple random sampling procedure to obtain a sample size of 280 onion producers used in the study. At stage IV, Simple random sampling techniques was adopted to select 12 wholesalers, 22 retailers, 5 middlemen and 4 exporters from each of the onion central markets at Aliero and Yauri where sole onion marketers precipitated and operate both in off and on onion seasons making a total of 86 onion marketers considered for the study. Substantially, a total

of 366 respondents formed the study sample size.

#### Data collection

The study used both primary and secondary sources of data. The primary data were collected through the use of structured questionnaire in conjunction with oral interview and focal group discussion with some of the major onion stakeholders. Two sets of questionnaire were used in consonance with Maharazu, (2023); one set was for the sole onion producers and other was for the onion marketers. Each constituent of the questionnaire had section/sub-sections that allowed the researcher to collect the information required from the targeted respondents. The questionnaires were administered by the researcher to the respondents with the help of ten hired ad-hoc enumerators from Local Government Department of Agriculture and primary school teachers proximate to the selected study location. The enumerators were properly trained (round table) by the researcher on the purpose of data collection, the skills in

administering the questionnaires including ethical considerations acknowledged by Frankline (2023) to serve as the go-between the researcher and the respondents to ensure high percentage return. In view of the low level of read and write in English language amongst the respondents, the enumerators translated/asked the questions in Hausa language and recorded the responses of the interviewees accordingly. Data collected from the onion producers include but not limited to socioeconomic characteristics (i.e. age, educational level, household size, farming experience etc.), quantities and costs of inputs used (i.e. seeds, agrochemicals, manure, labour, fuel/oil, machines etc.), output information on quantity of onion produced, marketed and postharvest losses incurred, marketing cost, output selling price. Similarly, data solicited from the onion marketers include; marketer's age, gender, level of education, selling experience trader type, volume purchased, , market of purchase, actor purchased from, selling destination, actor sold to, use of agents, storage activities, marketing cost/charges among other things. All the information was collected from field survey between the months of August and October, 2023 for 2022/2023 cropping season. The secondary information used was sourced from relevant literatures namely; books, journals, conference papers, thesis etc.

### Methods of data analysis

The collected data were analyzed using the following tools of analysis; descriptive statistics. Multiple regression analysis (OLS) was used to estimate factors affecting postharvest. The following multiple linear regression function was applied to each actor level which is specified as below (adopted from Kumar *et al.*, 2006; Gathambiri, 2021).

### Regression model for determinants of onion producers' postharvest losses

$$Y_{phlp} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + e \quad (2)$$

Where:

$Y_{phlp}$  = Postharvest loss of onion producers (kg)

$\beta_0$  = Constant term

$\beta_1$ - $\beta_7$  = Regression coefficients estimated

$X_1$  = age of the respondents (years)

$X_2$  = Education level (years)

$X_3$  = Household size (No. of persons)

$X_4$  = Business experience (years)

$X_5$  = Distance to market place (km)

$X_6$  = Quantity produced (kg)

$X_7$  = Cost of storage (₦)

$e$  = Random error

### Regression model for determinants of onion wholesalers' postharvest losses

$$Y_{phlw} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e \quad (3)$$

Where:

$Y_{phlw}$  = Postharvest loss at wholesalers' level in kg

$\beta_0$  = Constant term

$\beta_1$ - $\beta_6$  = Regression coefficients estimated

$X_1$  = age of the respondents (years)

$X_2$  = Education level (years)

$X_3$  = Household size (No. of persons)

$X_4$  = Business experience (years)

$X_5$  = Distance to market place (km)

$X_6$  = Quantity purchased/year (kg)

$X_7$  = Cost of storage (₦)

$e$  = Random error

### Regression model for determinants of onion exporters' postharvest losses

$$Y_{phlex} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e \quad (4)$$

Where:

$Y_{phlex}$  = Postharvest loss at exporters' level in kg

$\beta_0$  = Constant term

$\beta_1$ - $\beta_5$  = Regression coefficients estimated

$X_1$  = age of the respondents (years)

$X_2$  = Education level (years)

$X_3$  = Household size (No. of persons)

$X_4$ = Business experience (years)  
 $X_5$ = Distance to market place (km)  
 $e$ = Random error

### Regression model for determinants of onion retailers' postharvest losses

$$Y_{phlr} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e \quad (5)$$

Where:

$Y_{phlr}$ = Postharvest loss at retailers' level in kg  
 $\beta_0$ = Constant term  
 $\beta_1$ - $\beta_6$ = Regression coefficients estimated  
 $X_1$ = age of the respondents (years)  
 $X_2$ = Education level (years)  
 $X_3$ = Household size (No. of persons)  
 $X_4$ = Business experience (years)  
 $X_5$ = Distance to market place (km)  
 $X_6$ = Quantity purchased/year (kg)  
 $e$ = Random error

The sign of the variables in the regression model is very important in explaining the observed level of influence of postharvest losses of the onion producers and marketers in the study area. A negative coefficient implies that the variable has the effect of reducing postharvest losses, while a positive coefficient indicates that the variable has the effect of increasing onion actors' postharvest losses.

## Results and Discussions

### Analysis of onion postharvest losses in Kebbi State

Onion postharvest losses have been assessed from the level of producer to retailer except for the middlemen who principally perform mediation activities for the other actors, hence relatively conceived no onion losses along the value chain in the study area. From Table 2 it was found that 3948240kg of onion was produced by all the 280 onion producers from 280.85ha of land out of which 45800kg was recorded as postharvest losses incurred at field, transportation and marketing stages. On the

average an onion producer can cultivate 1.01ha, produced 14100kg and can loss 1.4kg/120kg bag of onion, impliedly 164kg $ha^{-1}$  (1.20%). This shows that postharvest loss is not a serious challenge to onion farmers, may be due to instant disposal of the commodity just after harvest by majority of the onion farmers in the study area. The result contravenes the findings reported by Kok *et al.* (2021) and Falola *et al.* (2023) who worked on onion postharvest losses in Bangladesh and Kaduna, Nigeria and reported that about 2.4% and 23.9% onion postharvest losses were incurred by onion producers respectively. Postharvest losses at wholesaler marketing level indicate that, of the total onion traded 2568000kg about 46560kg (1.82%) resulted in a loss which is 2.18kg/200kg of onion bag for ever wholesaler. However, Kok *et al.* (2021) reported postharvest losses at wholesales' level (3.8kg/q). The loss which is above that of the producers may be attributed to the fact that onion crop at wholesale level has to be packed/unpacked, loaded/unloaded to meet to other actors and the final consumers, thus risk to more losses.

Postharvest losses incurred at onion exporter level almost share the same features with those of wholesalers in terms of large quantities handled, transportation distances among others. The postharvest losses at this level were estimated at 120480kg (1.82%) losses out of total handled (6605760kg) per year by various exporters trading at this level. It was also estimated that in every 120kg bag of onion each exporter losses 2.19kg of onion. In the case of onion retailers, about 594840kg of onion was traded but 11640kg (1.95%) has been loss may be due to poor storage facilities, transit, bad weather etc usually in handling for unsold onion. This may aid spoilage at their hands. Retailers' postharvest loss per 120kg bag of onion was 2.35kg which is the highest among the actors. This finding affirms the results reported by Sahu *et al.* (2021) who reported

that retailers recorded 1.73kg/q postharvest losses in their study area. Generally, percentage share of onion losses per 120kg of onion bag was higher at the retailer level (29%) followed

by Exporters (26.99%), Wholesalers (26.85%), while onion producers (17.25) had the least recorded onion postharvest losses in the study area.

Table 2: Postharvest losses in onion at different actor level in the study area

Variable	Actor Level				Total
	Producers n=280	Wholesalers n=24	Exporters n=8	Retailers n=44	
Total onion cultivated area (ha) by selected onion farmers per production cycle.	280.85 (1.01)	-	-	-	-
Total onion produced/purchased (kg) by selected actor per year	3948240 (14100)	2568000 (107000)	6605760 (825720)	594840 (13519)	13716840
Losses in total onion produced/handled (kg) by selected actor per year.	45800 (164)	46560 (1940)	120480 (15060)	11640 (265)	224480
Total percentage losses in onion by each actor	1.20	1.82	1.82	1.95	
Average losses in total onion produced/purchased by actor per 120kg bag	1.4	2.18	2.19	2.35	8.12
Share of percentage losses per 120kg bag of onion per actor	17.25	26.85	26.97	29.00	100.00

Source: Field survey data, 2023

Note: figures placed in parenthesis are average values.

### Regression estimates of factors affecting postharvest losses among onion producers

From Table 3, the coefficient of determination ( $R^2$ )=24.03% of the onion producers explains that about 24% variation in the total onion postharvest losses (dependent variable) is accounted by the independent variables in the regression model. The F-ratio (1.70015) was significant, thereby indicating the good fit of the regression model. The table further showed that coefficient of age (-38.65) of the onion producer is negatively significant (in

agreement with the *a priori* expectation) related to postharvest losses in onion production. This suggests that the higher the age, the lower the postharvest losses in onion by 38.65kg which conforms to *a priori expectation*. This could be, the older a farmer is, the more experience he/she becomes in postharvest handling thus, help reduce postharvest losses. This finding fails to align with report of Falola, *et al.* (2023) who obtained a positive value. Level of education (-74.64) of the onion producer was significant ( $p < 0.10$ ) and negatively related to postharvest

losses in onion and in agreement with the *a priori* expectation. This implies well educated onion producers have lower postharvest losses in onion compared with the less education. This result consolidates the findings of (Gathambiri, 2021; Falola *et al.*, 2023) who reported similar outcome. The coefficient of household size (39.64) was significant ( $p < 0.05$ ) positively signed not in consonance with *a priori* expectation. However, it may be implied that family members of the onion producers were not mobilized to engage in the management of postharvest losses in onion, thereby, making it more likely difficult for the few participating actors' family to optimally handle the bulk of onion produced. Distance to market (-31.95) was significant ( $p < 0.05$ ) negatively signed in tandem with *a priori* expectation. This result implied that the shorter the distance covered from the onion farm to the market spot, the lesser the postharvest loss in onion production and reverse is true. The result compares favourably with Falola *et al.* (2023) who reported similar outcome in Kaduna, Nigeria.

#### **Regression estimates of factors affecting postharvest losses among onion exporters**

The result of the multiple regression analysis (OLS) estimates of factors affecting postharvest losses at onion wholesales level is also presented in Table 3. From the table, the estimate gave the best fit with coefficient of determination ( $R^2$ ) = 78.07% and a significant F-ratio of 3.5594 indicating the good fit of the predicted regression model. Table 3 depicts that the coefficient of the household size (-3535.0) of onion wholesaler was significant

( $p < 0.10$ ) negatively signed in tandem with *a priori* expectation which reduces postharvest losses in onion wholesalers. This suggests that wholesalers with large households tend to incur less postharvest loss as a result of timely and available labour to such marketer. The coefficients for years of experience (3363.9) was significant ( $p < 0.01$ ) positively signed at variance with *a priori* expectation. This implies that as the years of experience of wholesaler increases, postharvest losses in onion increases. This can be attributed to either lost in concentration of the onion wholesalers or to have focused on their long known ways of traditional transactions transmitted from one generation to other with little or no prowess learnt in onion postharvest control as may be acquired from the limited business trainings services.

#### **Regression estimates of factors affecting postharvest losses among onion exporters**

The expected variables and the related statistical test results obtained from multiple regression analysis (OLS) for the onion exporters in respect of onion postharvest losses in the study area is presented in Table 3. The coefficient of determination ( $R^2$ ) = 98.45%, signifies that the variability in the postharvest losses (dependent variable) is explained by the independent variables, while the remaining (1.55%) unexplained variations may be as a result of error and/or due to non-inclusion of other relatively important variables in the regression model. The F-ratio value = 25.3400 also indicating a goodness of fit for the regression model.

Table 3: Regression Estimates of Determinants of Postharvest Losses at different Actor Levels

Actor Level	Producers	Wholesalers	Exporters	Retailers
Variable	$\beta$ (t-value)	$\beta$ (t-value)	$\beta$ (t-value)	$\beta$ (t-value)
Constant	1947.37** (2.42849)	-1993.5 (0.43127)	-65229.0** (-2.27784)	860.535 (0.59371)
Age	-38.65* (-1.79512)	-750 (-1.05769)	-1317.6*** (-3.33310)	-20.853 (0.73028)
Education level	-74.64* (-1.58846)	564.3 (0.24150)	6181.9*** (3.68002)	-19.379 (-0.22131)
Family size	39.64* (2.07239)	-3535.0* (-1.91956)	9013.8*** (4.81311)	9.605 (0.29572)
Years of experience	29.53 (1.25786)	3363.9*** (3.22853)	-756.8* (-1.65086)	14.049 (0.47541)
Distance to market place	-31.95** (-2.46032)	6.5 (0.80005)	26.3*** (3.24362)	-6.210 (-0.26475)
Quantity produced/purchased	0.02 (0.97479)	0.0 (0.16372)	-	0.017** (2.08782)
Cost of storage	0.02* (1.68513)	0.1 (0.74604)	-	-
R <sup>2</sup>	24.03%	78.07%	98.45%	28.34%
R <sup>2</sup> (adjusted)	19.90%	56.13%	94.56%	4.74%
F-ratio	1.70015*	3.5594***	25.3400***	0.85666

**Source:** Minitab 16 statistical package from field survey data, 2023

Note: \*\*\*, \*\*, \* signify statistically significant at 1%, 5% and 10% level of probability and figures placed in parenthesis are t-value.

The table further showed that coefficients of age (-3117.6) negatively signed and statistically significant ( $p < 0.01$ ) and tally with *a priori* expectation. This findings infers that increase in exporters' age, reduces onion postharvest loss incurred may be for a gain in experience and skill. The coefficient of level of education (6181.9) was highly significant ( $p < 0.01$ ) positively signed and contrary to *a priori* expectation. It implies that increase in the exporters' level of education, exerts more postharvest loss may be due to uncontrolled volumes of onion transacted at all point in time and long distances covered. Coefficient of household size (9013.8) was highly significant ( $p < 0.01$ ) positively signed and contrary to *a priori* expectation. This suggest that, the more

the family size, the more the postharvest loss probably for not participating in onion exportation activities, thus exert more pressure on the household head, hence for more postharvest losses. Coefficient for years of experience (-756.8) was significant ( $p < 0.10$ ) and tallies with *a priori* expectation. This infers that the more experience gained by the exporter, the lesser the postharvest losses in onion recorded. This is in affirmative with the reported of Yebirzaf and Esubalew (2021) who asserted that marketing experience has a significant influence on postharvest loss. The coefficient for distance to market place (26.3) was significant ( $p < 0.01$ ) positively signed and in line with *a priori* expectation which assumes

that the longer the distance covered to access market place, the higher the level of postharvest losses in onion and the reverse is true. This could be attributed to the poor condition of the road networks and the transporting condition of the vehicle in covering such distances in export. This report also supports that of Falola *et al.* (2023) who reported similar outcome.

### **Regression estimates of factors affecting postharvest losses among onion retailers**

The results of the multiple regression analysis of the relationship between the onion retailers' socioeconomic characteristics as indices affecting their postharvest losses in onion marketing in the study area are presented in Table 3. The results proved that, F-ratio was not significant and the coefficient of determination ( $R^2$ ) =28.34% was also low in the regression model. The explanatory variables included in the analysis were all not significant except volume of onions purchased (0.017), positively signed and statistically significant ( $p < 0.05$ ) alpha level of statistical probability. This finding fits in with the findings of other previous research works who have generally obtained a low  $R^2$  (Abdulkadir, 2015) who further advanced that other researchers obtained a limited ( $R^2$  value of less than 0.5) in their study reports Xu and Jeffrey (1997) obtained an  $R^2$  value of 0.21, 0.31 and 0.19, respectively.

### **Conclusion**

The study concludes that there is an incidence of more postharvest losses among onion marketers than the producers which may be attributed to longer period of handling of the commodity, inadequate scientific storage structures with frequent loading and offloading. This can inevitably affects the profit and wellbeing level of the onion marketers in the study area. Determinants of

postharvest losses among the value chain actors facilitate reduction in postharvest losses thus, could influence income generation and better actors' wellbeing if sustained and promoted to boost their capability. Therefore, concerted efforts are needed to minimize the postharvest losses by onion cooperative, governments' agricultural agencies, private organizations and NGOs to spur by way policy technological measures in curbing postharvest losses, stabilize prices and bridge up seasonal supply gaps.

### **References**

- Abdulkadir, K. O. (2015). An Evaluation of the Efficiency of Onion Producing Farmers in Irrigated Agriculture: Empirical Evidence from Kobo District, Amhara Region, Ethiopia. *International Scholars Journal of Agricultural Extension and Rural Development*, 2(5), 116-121.
- Adam, A. M. (2020). Sample Size Determination in Survey Research. *Journal of Scientific Research and Reports*, 26(5), 90–97.
- Adeniyi, O. R. and Ayandiji, A. (2014). Economic Analsis of Post Harvest Losses in Plantain (and Banana): A case stud of south western Nigeria> *British Journal of Applied Science and Technology*, 4(31), P 4456-4467.
- Ashinya, G. T., Frank, O. N. and Moore, N. C. (2021). Women Farmers and Postharvest Losses: A Study of Technical and Environmental Factors in Tarka Local Government Area of Benue State, Nigeria, *International Journal of Economics and Business Management*, 3(1),16-35.
- Bello, M. and Yakubu, A.U. (2023). Examining the Economic consequences of Post-Harvest Losses in Smallholder Onion Farmers in Kano State, Nigeria.



- Journal of Agriculture and Environment, 19(1), 53-72
- Centre for the Promotion of Imports from Developing Countries (CBI). (2021). Food Loss in Nigeria Value Chain Analysis (VCA) of Tomato, Onion, Chilli Value Chains. CBI Ministry of Foreign Affairs: 1-82
- Dauda, W. P., Alao S. E. I., Zarafi, A. B. and Alabi, O. (2016). Farmers Perceptions of “Danzazzalau”: Disease Affecting Onions. Tanzania Journal of Agricultural Sciences, 15(2), 93–100.
- Falola, A., Mukaila R., Uddin, R.O., Ajewole, C.O. and Gbadebo, W. (2022). Postharvest Losses in Onion: Causes and Determinants. KSÜ J. Agri Nat, 26(2), 346-354.
- FAO. (2009). How to feed the World in 2050, FAO, Rome, Italy, pdf.
- FAO. Food and Agriculture Organization of the United Nations, Rome, Italy. 2021. <http://www.fao.org/faostat/en/#home>. Accessed 20th November, 2024.
- Frankline, K. Ethical Considerations in Data Collection for Survey Research . Sept. 2023. <https://www.geopoll.com/blog/ethics-data-collection/>. Accessed 15th June, 2023.
- Gathambiri, C. (2021). Post-Harvest Losses of Bulb Onion (*Allium Cepa* L.) in Selected Sub Counties of Kenya. African Journal of Food, Agriculture, Nutrition and Development., 21(2):17529–17544.
- Kaka, Y. and Gindi, A. A. (2021). Economic Efficiency of Onion Production and Price Trend in Kebbi State, Nigeria : A Stochastic Frontier Cost Function Approach. Direct Research Journal of Agriculture and Food Science, 9: 325–333.
- Kaka, Y., Gindi, A. A. and Magaji, U. (2021). Evaluation of Onion Value Chain Actors in Kebbi State, Nigeria: A Case Study of Producers and Retailers. Asian Journal of Agricultural Extension, Economics and Sociology, 39(2): 12–22.
- Kebbi State Government. (Undated). Agriculture in Kebi, 1-33pp
- Kebbi State Government. (2013). Growing Agriculture in Kebbi State. A Paper Presented at the 19th National Economic Summit Group (NESG), Abuja, 4th September, 2013, 1-24
- Kebbi State Government. About Kebbi. Dec., 2018. [www.kebbistate.org.ng](http://www.kebbistate.org.ng). Accessed 24<sup>th</sup> November, 2019.
- Kok, M. G., Soethoudt, J. M. and Vernooij, D. M. (2021). Analysis of the Onion Value Chain in Bangladesh Towards a strategic Action Agenda for the Dhaka City Corporations. Wageningen Food & Biobased Research: 1-45.
- Magaji, U., Kaka, Y., and Gindi, A. A. (2021). Profitability and Constraints to Onion (*Allium cepa* L.) Production in Kebbi State, Nigeria. International Journal of Agriculture, Environment and Bioresearch, 6(2): 1–10.
- Maharazu, I. (2023). Analysis of Marketing Performance of Onion (*Allium Cepa*) among Participants in Kaduna and Katsina States, Nigeria, Science World Journal, 18(4): 641-652.
- Manalili, N. M., Dorado, M. A., Otterdijk, R. (2014). Appropriate Food Packaging solutions for Developing Countries, Rome, Italy., P.30, retrieved from <http://www.fao.org/3/a-i3684e.pdf>.
- National Population Commission. Population Statistics, Charts, Maps (2022) Projection Figures. 2022. Federal Republic of Nigeria, Abuja. [https://www.citypopulation.de/en/nigeria/admin/NGA022\\_kebbi/](https://www.citypopulation.de/en/nigeria/admin/NGA022_kebbi/). Accessed 20<sup>th</sup> August, 2023.
- Ocholi, A., Nguwasen, A. V. and Udeh, M. (2021). Effect of Marketing Intermediaries on Pricing of Onions in



- Benue State, Nigeria, *Journal of Agribusiness and Rural Development* (60):133–141.
- Olayemi, F. F., Adegbola, J. A., Bamishaiye, E. I. and Awagu, E. F. (2012). Assessment of Post Harvest Losses of some selected Crops in Eight Local Government Areas of Rivers State, Nigeria. *Asian Journal of Rural Development*, 2(1), P.13-23.
- Peoples gazette (2021). Farmers Lunch New Onions Bags to Reduce Postharvest Losses. <https://gazettngr.com/farmers-lunch-new-onions-bags-to-reduce-post-harves..>
- ReliefWeb. (2009). "How to Feed the World-2050: High-Level Expert Forum, Rome 12-13 October, 2009-Investment-World/Reliefweb". <https://reliefweb.int/report/world/how-feed-world-2050-high-level-expert-forum-rome-12-13-oct-2009-investment>. Accessed 21st November, 2024.
- Sahu, S., Sharma, J.P., Burman, R.R., Reshma, G., Sinha, S.K., and Pramod, K. (2021). Estimation of Post-harvest Losses of Onion in Maharashtra and Potato in Uttar Pradesh, Indian. *Journal of Community Mobilization and Sustainable Development*, 16(3),1011-1016.
- Shaikh, S. A, Hongbing, O, Khan, K., Ahmed, M. (2016). Determinants of Rice Productivity: An Analysis of Jaffarabad District-Balochistan, Pakistan. *European Scientific Journal*, 2(12), 41-50.
- Sharma, D. K. (2023). Strategy for Onion Post-Harvest Diseases management. *Asian Journal of Research in Botany*, 6(2), 279-300
- Sule, B. (2019). Feed the Future Innovation Lab for Food Security Policy, Nigeria Agricultural Policy Project, May 2019. Reduction of Post-Harvest Losses in Onion Production: 1-6.
- Tesfaye, Z., and Negese, N. (2021). Analysis of Onion Market Value Chain among Smallholder Farmers in Rural Ethiopia: A Case Study of South Bench Woreda in ench Maji. *Journal of Smart Economic Growth*, 6(1), 49–74.
- Usman, S., Noma, S, S. andKudirir, A. M. (2016). Dynamic Surface Soil Components of Land and Vegetation Types in Kebbi State Nigeria. *Eurasian Journal of Soil Science*, 5(2), 113–12
- WorldStage (2022). Nigeria yet to meet National Demand of 2.44m Metric Tonnes Onion-PS. Retrieved from <https://www.worldstagenews.com/2022/11/25/nigeria-yet-to-meet-national-demand-of-2.44m-metric-tonnes-onion-sp/>
- Xu, X. and Jeffrey, S. R. (1998). Efficiency and Technical Progress in Modern Agriculture: Evidence from Rice Production in China, *J. Agric. Econ.* 18,157-165
- Yebirzaf, Y. and Esubalew, T. (2021). An Investigation into Major Causes for Postharvest Losses of Horticultural Crops and their Handling Practices in Debre Markos, North-western Ethiopia. *Hindawi Advance in Agriculture*, 2021, article ID 1985303,1-10.