ANALYSING THE EFFECT OF POST HARVEST LOSSES ON PROFITABILITY OF CABBAGE TO TRADERS IN GULU CITY

BY

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A RESEARCH REPORT SUBMITTED TO THE COLLEGE OF AGRICULTURE AND ENVIRONMENTAL SCIENCES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF AGRIBUSINESS MANAGEMENT, MAKERERE UNIVERSITY

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DEDICATION

This research is dedicated to the resilient cabbage traders of Gulu City, whose hard work and determination in the face of challenges inspire continuous improvement in agricultural practices. Their commitment to their livelihoods serves as a testament to the importance of innovation and perseverance in the pursuit of economic sustainability. Additionally, I dedicate this work to my family and mentors, whose unwavering support and encouragement have guided me throughout my academic journey.

DECLARATION

I, OROMA PHIONAH hereby declare that the work presented in this desertion is my original work under the topic analyzing the effect of post-harvest losses on profitability of cabbage to traders in Gulu District and except where acknowledged, no part of it or its whole has been submitted to any other University / Institution for an award of degree or others.

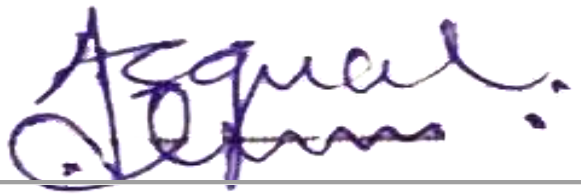
Signature:  ……..... Date: 24TH JANUARY, 2026

OROMA PHIONAH

APPROVAL

The research titled **"Analyzing the Effect of Post-Harvest Losses on Profitability of Cabbage Traders in Gulu City"** was reviewed and approved for submission. The undersigned acknowledges that the study has met the necessary requirements for academic rigor and ethical standards. The findings and recommendations contained within this research aim to contribute to the existing body of knowledge and provide actionable insights for improving the profitability and sustainability of cabbage traders in Gulu City.

Approval Signatures:



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I would like to express my sincere gratitude to all those who contributed to the successful completion of this research.

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ABSTRACT

The study investigates the profitability of cabbage traders in Gulu City, focusing specifically on the effects of post-harvest losses (PHL) on their financial outcomes. The primary objective is to analyze the profitability margins of traders while elucidating the socio-demographic characteristics, operational variables, and economic factors that significantly influence their profitability. Employing a robust linear regression model, the research identifies a noteworthy mean profitability margin of 90%, indicative of effective cost management and revenue generation strategies among traders.

However, the findings underscore critical challenges faced by these traders, particularly losses incurred during transportation and inadequacies in post-harvest management practices. These issues not only diminish potential profits but also impede the overall sustainability of trading operations. To address these challenges, the study proposes actionable recommendations, including the implementation of enhanced post-harvest management protocols, the adoption of efficient transportation methods, and the development of robust information channels to improve market intelligence. Furthermore, increasing access to financial resources is emphasized as a vital step for traders to invest in necessary infrastructure and operational improvements.

Through a comprehensive analysis, this research contributes to the understanding of the intricate dynamics affecting cabbage traders in Gulu City. The insights derived from the findings provide a foundational basis for future interventions aimed at bolstering the agricultural sector's resilience and growth, ultimately fostering economic stability within the community. By addressing the factors influencing post-harvest losses, this study aims to empower traders to optimize their operations, enhance their profitability, and contribute positively to the local economy.

CHAPTER ONE: INTRODUCTION TO THE STUDY

1.1 Background of the study.

Cabbage, a staple in Ugandan households, provides essential nutrients and is a significant crop for both consumption and trade. It plays a pivotal role in Uganda's agricultural economy, particularly in urban markets like Gulu City, where the vegetable forms an important link between rural farmers and urban consumers (Nsubuga et al., 2017). As a vibrant commercial hub in northern Uganda, Gulu facilitates the flow of agricultural goods, including cabbage, across regions, supporting livelihoods and ensuring food supply (Food and Agriculture Organization [FAO], 2020).

However, post-harvest losses (PHLs) pose a serious threat to this trade. PHLs, which refer to the degradation of produce during handling, transportation, and storage, lead to substantial quality and quantity losses, ultimately affecting profitability (Kitinoja et al., 2019). Traders in Gulu City face challenges such as physical damage to produce, spoilage, and pest infestations, all of which result in economic losses. Across Sub-Saharan Africa, post-harvest losses for vegetables can range between 20% and 50%, exacerbating the already precarious nature of small-scale trading (Akalanka et al., 2017; Wahome, 2015). Although specific studies on cabbage traders in Gulu are limited, anecdotal evidence suggests that these traders may be facing similar, if not higher, losses due to the region's underdeveloped transport and storage infrastructure.

The financial repercussions of PHLs are profound. Traders who lose a significant portion of their cabbage inventory experience reduced gross margins, which can destabilize their businesses and lead to market fluctuations (Gustavsson et al., 2011). For many, these losses are a matter of survival; they depend on daily sales to support their families, and any reduction in profitability can result in both economic strain and food insecurity for their communities.

Moreover, the environmental and societal implications of PHLs are significant. Every spoiled cabbage head represents wasted resources – from water and fertilizers to the labor invested in cultivation. Reducing these losses can not only boost profitability for traders but also contribute to more sustainable agricultural practices by minimizing waste (FAO, 2020). Addressing the causes

of PHLs, such as inadequate storage, poor transport conditions, and lack of market information, could unlock potential economic gains for traders and contribute to the region's food security.

Interventions aimed at reducing post-harvest losses could significantly improve profitability. Technological solutions, such as mobile cold storage units and real-time market information systems, could help mitigate losses by preserving the quality of the produce during transportation and storage (Kitinoja et al., 2019). Furthermore, improved handling practices, better storage infrastructure, and training for traders and farmers are critical to addressing this issue.

Research in this area should focus on identifying the points in the supply chain where the highest losses occur and proposing targeted interventions. Collaboration between government bodies, non-governmental organizations, and the private sector is essential for implementing effective solutions that benefit all stakeholders (Gustavsson et al., 2011).

In conclusion, post-harvest losses in Gulu City's cabbage trade affect not only the financial stability of traders but also the sustainability of the entire agricultural sector. This study aims to investigate the extent of post-harvest losses and their impact on the profitability of cabbage traders in Gulu City, with the goal of developing evidence-based strategies to mitigate these losses and improve the livelihoods of those involved in the trade.

1.2 PROBLEM STATEMENT

The cabbage trade in Gulu City, a critical source of income for traders and a key provider of nutrients for many households, faces the pervasive issue of post-harvest losses (PHLs), which encompass physical damage, spoilage, and pest infestations. These losses significantly reduce both the quantity and quality of cabbage available for sale, directly impacting traders' gross margins and contributing to food insecurity by limiting consumer access to this essential commodity (Gustavsson et al., 2011). Although PHLs in sub-Saharan Africa are estimated to range between 20% and 50% (Akalanka et al., 2017), localized data specific to Gulu City's cabbage trade is largely absent, creating a significant gap in understanding the full economic impact of these losses. Without empirical data, it is challenging to apply statistical models to quantify the relationship between PHLs and traders' profitability. This study aims to address this gap by systematically

assessing the extent of PHLs in Gulu City's cabbage trade, using regression analysis and other quantitative methods to evaluate the direct impact of these losses on traders' profit margins. Furthermore, the research will identify the statistically significant factors contributing to PHLs—such as transportation methods, storage conditions, and handling practices—and provide data-driven insights for targeted interventions. Ultimately, the findings will offer crucial information for policymakers and stakeholders to develop strategies to reduce PHLs, improve profitability, enhance food security, and promote sustainable agricultural practices in the region.

1.3 Main Objective

- To analyze the profitability of cabbage traders in Gulu City as impacted by post-harvest losses (PHL).

Specific Objectives

1. To describe the socio-demographic characteristic of cabbage traders in Gulu city
2. To Identify key factors contributing to post-harvest losses of cabbage in Gulu City
3.

1.4 RESEARCH QUESTIONS

1. How do post-harvest losses affect the profitability of cabbage traders in Gulu City?
2. What are the socio-demographic characteristics of cabbage traders in Gulu City?

1.5 JUSTIFICATION

Post-harvest losses (PHLs) pose a significant yet often overlooked threat to the cabbage trade in Gulu City, undermining the quality, marketability, and profitability of this essential commodity. These losses, which included spoilage, damage during transportation, and infestations, erode traders' earnings, impacting their livelihoods and contributing to food insecurity. Despite widespread recognition of these issues, the extent and economic impact of PHLs in Gulu City's cabbage trade remain largely unquantified, creating a critical gap in the knowledge needed to develop effective interventions. This research is essential in addressing this gap by providing a data-driven analysis of PHLs and their effects on profitability, ultimately offering insights into solutions that can reduce losses and improve livelihoods. Beyond economic outcomes, the study aims to contribute to broader objectives of enhancing food security and promoting sustainable agricultural practices. By uncovering the root causes and proposing targeted interventions, the

research will pave the way for a more resilient cabbage trade that benefits farmers, traders, and consumers, while supporting sustainable development in Gulu City.

1.6 Scope of the Study

Geographical Scope

The research study focused specifically on Gulu City and its immediate surrounding areas within the Northern Region of Uganda. The defined geographical scope allows for a focused and in-depth analysis of the factors contributing to post-harvest losses (PHLs) and their impact on cabbage traders within this specific context.

Contextual scope

The research was situated within a rich contextual framework encompassing economic, social, environmental, and political factors that shape the challenges and opportunities related to post-harvest losses (PHLs) and their impact on cabbage trader profitability in Gulu City, Uganda

The contextual framework underscores the complexity of the PHL challenge and the need for multi-pronged solutions that address not only technical aspects but also the broader social, economic, and environmental factors at play. By considering these interrelated aspects, the research can contribute to a more comprehensive understanding of the PHL problem in Gulu City and pave the way for effective and sustainable interventions that benefit both cabbage traders and the wider community.

Time Scope

The study focused on the present and recent past, with data and analysis taking place in 2024. By focusing on a one-year timeframe while acknowledging the importance of broader context and potential future research, this study aims to provide a reliable and relevant analysis of PHLs and their impact on cabbage traders in Gulu City, informing targeted solutions for improved profitability and sustainability within the cabbage value chain.

Limitations of the study.

The study on post-harvest losses (PHLs) and their impact on the profitability of cabbage traders in Gulu City may face several limitations. One significant challenge was data availability; obtaining

accurate and comprehensive information on PHLs and profitability could be hindered by a lack of existing records or reluctance from traders to share financial details. Additionally, the sample size may be limited, affecting the generalizability of the findings, as a non-representative sample may not reflect the broader population of cabbage traders. Self-reporting bias is another concern, as traders may underestimate losses or overstate profits, leading to inaccuracies in the data. External factors, such as seasonal variations, market fluctuations, and changing consumer preferences, can complicate the analysis by impacting profitability and the extent of PHLs. Moreover, the study's focus on cabbage traders in Gulu City may limit the applicability of the findings to other agricultural sectors or regions with different trading dynamics. Time constraints may restrict the depth of research, potentially overlooking nuanced factors contributing to PHLs and profitability. Variability in the availability and use of modern storage and transportation technologies among traders may also influence the extent of PHLs, complicating the assessment of effective interventions. Finally, changes in environmental conditions, such as weather patterns or pest outbreaks, may affect study outcomes, making it difficult to isolate the impact of PHLs on profitability. Acknowledging these limitations is crucial for providing context to the study's findings and conclusions.

Study Variables.

Dependent Variable:

- **Profitability (Profit Margin)**: The profitability of cabbage traders, expressed as the profit margin obtained from the sale of cabbages.

Independent Variables:

Demographic Variables:

- **Age of Trader**: The age of the trader.
- **Marital Status**: The marital status of the trader.
- **Level of Education**: The educational attainment of the trader.
- **Years in Business**: The length of time the trader has been involved in the cabbage trade.

Operational Variables:

- **Average Angles**: Refers to the average angles at which cabbages are stored or displayed.
- **Source of Cabbage**: The origin of the cabbages sold by the trader.

Economic Variables:

- **Loss at Transport**: The amount of loss incurred during the transportation of cabbages.
- **Access to Credit**: The trader's ability to access credit.

Informational Variables:

- **Channel of Information**: The sources of information available to the trader regarding market trends and best practices.

1.7 CONCEPTUAL FRAMEWORK

1. Introduction

The conceptual framework serves as a blueprint for understanding the dynamics between post-harvest losses and the profitability of cabbage traders in Gulu City. It elucidates how various independent variables—demographic, operational, economic, and informational—interact to influence the dependent variable: profitability measured as profit margin.

2. Dependent Variable

Profitability (Profit Margin)

This variable represents the net profit that cabbage traders derive from their sales after accounting for all costs. It is a critical measure of the economic viability of the cabbage trade and serves as the primary outcome variable in this study.

3. Independent Variables

The independent variables are categorized into four distinct groups, each contributing uniquely to the profitability of cabbage traders:

A. Demographic Variables

- **Age of Trader:** The age of the trader can significantly impact their experience, decision-making, and overall business management. Older traders may have more experience but could be less adaptable to new practices.
- **Marital Status:** This can influence financial stability and risk-taking behavior. Traders with families may prioritize stability over riskier investments.
- **Level of Education:** Higher educational attainment often correlates with better business practices, understanding of market trends, and effective management strategies.
- **Years in Business:** Experience gained over the years can enhance traders' ability to navigate market challenges, impacting profitability.

B. Operational Variables

- **Average Angles:** Refers to the angles at which cabbages are stored or displayed. Optimal storage conditions can reduce spoilage and enhance product appeal, directly affecting sales and profit margins.
- **Source of Cabbage:** The origin of the cabbages can impact quality and freshness. Cabbages sourced from reliable suppliers may have lower post-harvest losses, leading to higher profitability.

C. Economic Variables

- **Loss at Transport:** This variable quantifies the losses incurred during transportation. High transportation losses reduce the amount of product available for sale, thereby decreasing profitability.
- **Access to Credit:** The ability to access credit can enable traders to invest in better storage facilities, transportation, and marketing strategies, positively influencing profitability.

D. Informational Variables

- **Channel of Information:** Access to reliable information sources regarding market trends, best practices, and pricing can enhance traders' decision-making capabilities. Well-informed traders are better positioned to maximize profitability.

4. Relationships Between Variables

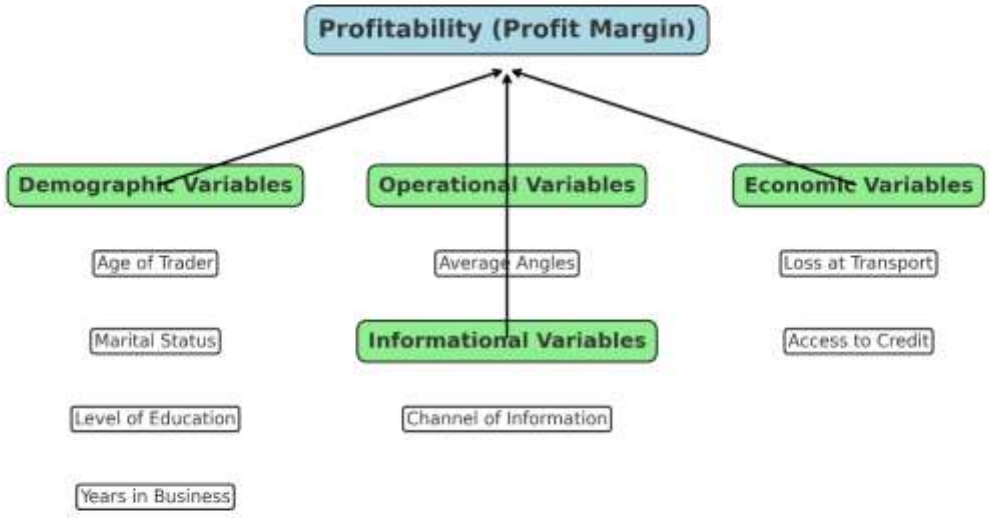
The conceptual framework illustrates that the independent variables interact with one another and collectively influence the dependent variable—profitability.

1. **Demographic Variables → Profitability:** These factors may shape traders' capabilities and strategies, affecting their profitability.
2. **Operational Variables → Profitability:** Efficient operational practices can mitigate post-harvest losses, leading to improved profitability.
3. **Economic Variables → Profitability:** Direct costs associated with losses during transport and access to financing influence overall profit margins.
4. **Informational Variables → Profitability:** The quality and timeliness of information available to traders impact their strategic choices, thus affecting profitability.

5. Post-Harvest Losses as a Mediating Factor

Post-harvest losses serve as a critical mediating variable that can directly influence profitability. By impacting the quantity and quality of cabbages that reach the market, these losses can significantly alter profit margins. Effective management of post-harvest practices can help mitigate these losses, ultimately enhancing the profitability of cabbage traders.

Conceptual Framework for Analyzing Post-Harvest Losses and Profitability



CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Post-harvest losses (PHL) are a big problem in farming areas. They affect both how much food is available and how well the economy works. Cabbage, which is a type of vegetable, is especially at risk of PHL because it can spoil quickly after being harvested. This review looks at what studies have found about how post-harvest losses affect the money cabbage sellers make in Gulu City, Uganda.

Cabbage is a common vegetable, and many people rely on it for food and income. But when cabbage goes bad before it's sold, farmers and sellers lose money. This review will explore how big this problem is in Gulu City and what can be done about it to help cabbage sellers make more money.

2.2 Magnitude of Post-Harvest Losses in the Vegetable Supply Chain

Post-harvest losses happen when vegetables spoil after they are harvested. This is a big problem worldwide. The Food and Agriculture Organization (FAO) says that as much as 40% of vegetables are lost each year because of how they are handled, stored, and transported (FAO, 2019). In Uganda, researchers like Biruma et al. (2018) and Nakyanzi et al. (2020) have also shown that post-harvest losses are a major issue for vegetables, including cabbage.

Imagine a farmer who grows lots of cabbage but loses almost half of it because it spoils before reaching the market. That's a lot of wasted food and money. This happens because the vegetables are not handled, stored, or transported properly. Sometimes they are left out in the sun too long, or they get squashed during transportation. All these things contribute to post-harvest losses.

2.3 Factors Contributing to Post-Harvest Losses in Cabbage

Post-harvest losses in cabbage happen for various reasons, and understanding these factors is important to find ways to reduce them.

Improper handling techniques are one major cause. When cabbage is harvested, it needs to be handled carefully to avoid bruising or damage. However, sometimes farmers and traders may not know the best way to handle cabbage, leading to unnecessary spoilage (FAO, 2019).

Another factor is inadequate storage facilities. Cabbage needs to be stored in a cool, dry place to stay fresh. But if farmers or traders don't have access to proper storage facilities like cold rooms or ventilated crates, the cabbage can spoil quickly (FAO, 2019).

Transportation challenges also contribute to post-harvest losses. Cabbage is often transported over long distances to reach markets. If the transportation methods are not efficient or if the vehicles used don't have proper cooling systems, the cabbage can wilt or rot before it reaches its destination (FAO, 2019).

Additionally, lack of access to market information is a problem. Farmers and traders need to know where and when to sell their cabbage to get the best prices. But if they don't have access to market information, they may end up selling their cabbage at the wrong time or in the wrong place, leading to financial losses (FAO, 2019).

Furthermore, pests and diseases can cause additional losses during storage. Even if cabbage is harvested and handled properly, it can still be damaged by pests like insects or diseases like mold if it's not stored correctly (Biruma et al., 2018).

To summarize, factors contributing to post-harvest losses in cabbage include improper handling techniques, inadequate storage facilities, transportation challenges, lack of access to market information, and pests and diseases during storage.

2.4 Impact of Post-Harvest Losses on Profitability

Post-harvest losses have a big impact on how much money cabbage traders can make. When cabbage goes bad after it's harvested, traders lose out on both the quantity and quality of cabbage they can sell. This means they can't sell as much cabbage, and what they do sell might not be as good, so they can't get as much money for it (Nakyanzi et al., 2020).

Imagine a trader who buys a lot of cabbage but loses a big chunk of it because it spoils before it's sold. That's a lot of potential money down the drain. Not only do traders lose out on sales, but they also have to deal with the extra costs of getting rid of the spoiled cabbage. This includes things like transportation costs to take the waste away and disposal fees at landfills or composting sites. All these extra costs eat into the trader's profits, making it harder for them to make money (FAO, 2019).

In simpler terms, when cabbage goes bad, traders can't sell as much, and what they do sell isn't worth as much. Plus, they have to spend more money getting rid of the spoiled cabbage, which cuts into their profits even more.

2.5 Strategies to reduce post-harvest losses and enhance profitability in the cabbage value chain:

1. **Improved Storage Facilities**:
    - Cold rooms: Utilizing cold rooms for cabbage storage helps maintain optimal temperature and humidity levels, extending the shelf life of the produce. This prevents wilting, decay, and loss of nutritional value (Biruma et al., 2018).
    - Ventilated crates: Ventilated crates facilitate proper air circulation around the cabbage, reducing the risk of moisture buildup and mold formation, which are common causes of post-harvest losses (Nakyanzi et al., 2020).
2. **Training on Proper Handling and Storage Techniques**:
    - Farmers and other stakeholders in the cabbage value chain benefit from training programs that educate them on best practices for harvesting, handling, and storing cabbage. Techniques such as proper handling to minimize bruising, sorting to remove damaged or diseased cabbage, and using appropriate packaging materials contribute to reducing losses (Biruma et al., 2018).
3. **Enhancing Transportation Infrastructure**:
    - Improving transportation infrastructure, including roads and refrigerated vehicles, is crucial for reducing transit times and maintaining cabbage quality during transportation. Efficient transportation minimizes physical damage and temperature fluctuations, which can lead to spoilage (Nakyanzi et al., 2020).
4. **Strengthening Market Linkages through Information and Communication Technologies (ICTs)**:
    - ICTs play a vital role in strengthening market linkages by providing timely information on market demand, prices, and logistics. Platforms such as mobile apps, online marketplaces, and SMS-based services enable farmers to make

informed decisions regarding when and where to sell their cabbage, reducing the likelihood of surplus or undersupply (Biruma et al., 2018).

These interventions are supported by research findings. For instance, Biruma et al. (2018) emphasize the effectiveness of improved storage facilities and training programs in reducing post-harvest losses and enhancing profitability in the cabbage value chain. Similarly, Nakyanzi et al. (2020) highlight the importance of transportation infrastructure and ICTs in improving market access and reducing losses.

Conclusively, Post-Harvest Losses pose a significant challenge to the profitability of cabbage traders in Gulu City, Uganda. Addressing these losses requires a multi-faceted approach involving interventions at various stages of the value chain. By implementing strategies to reduce post-harvest losses, traders can enhance profitability, improve food security, and contribute to the overall economic development of the region.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction:

The methodology section outlines the research design and techniques employed to analyze the profitability of cabbage traders in Gulu City and the impact of post-harvest losses (PHL) on their financial performance. Understanding the dynamics of post-harvest management is crucial in agricultural markets, as inefficiencies can significantly reduce the profitability of traders and adversely affect the overall economy. The study adopts a mixed-methods approach, integrating quantitative analysis with qualitative insights to provide a comprehensive understanding of the factors influencing profitability in cabbage trading. This approach allows for the exploration of socio-demographic characteristics, operational challenges, and economic variables that contribute to post-harvest losses. The methodology is designed to address the main objective of this research while fulfilling specific objectives that delve deeper into the traders' profiles and the operational landscape of cabbage trading in Gulu City. Through rigorous data collection and analysis techniques, this study aims to provide actionable insights that can inform strategies for improving post-harvest practices and enhancing the profitability of cabbage traders in the region.

3.2 Area of the Study

Gulu City is situated in the Northern Uganda region, approximately 300 kilometres from Kampala, the capital city of Uganda. Located in the Acholi sub-region, Gulu City is a significant urban centre in the country, boasting a population of over 100,000 people. The city is strategically located at the intersection of the Gulu-Kampala and Gulu-Masindi highways, making it a hub for trade and commerce in the region.

Gulu City is known for its rich agricultural heritage, with a significant portion of the local economy dependent on farming. The city is particularly renowned for its production of cabbage, which is a staple crop in many Ugandan households. The city's fertile soil and favourable climate make it an ideal location for agricultural production, with many farmers cultivating crops such as maize, beans, and cassava. The city's agricultural sector is also supported by several markets and trading centres, which provide a platform for farmers to sell their produce to local consumers and traders.

The Gulu City area is also characterized by a diverse range of cultural and socio-economic characteristics. The city is home to several ethnic groups, including the Acholi, Langi, and Banyalla communities. The city's residents have a mix of traditional and modern livelihoods, with

many engaging in informal activities such as artisanal crafts, small-scale trading, and subsistence farming. The city's educational institutions, including Gulu University and several secondary schools, also attract students from across the region.

Overall, Gulu City presents a unique context for studying agricultural development, rural livelihoods, and urban-rural linkages in Uganda. The city's agricultural production, cultural diversity, and socio-economic complexity make it an important case study for understanding the challenges and opportunities facing rural development in Uganda.

3.3 Research Design

The study employed a descriptive-explanatory research design, which combines both descriptive and explanatory research methods. The descriptive research method was used to describe the characteristics of cabbage traders in Gulu City, while the regression model was used to analyse the factors affecting post-harvest losses on the profitability of cabbage traders. Gross margin (profit) obtained by calculating revenue-cost of sales.

Where,

Cost of sale-purchase cost, rent, market due, communication, packaging cost, transport

Revenue-sales of the product

Study Population

The target population includes all active cabbage traders within Gulu City. Based on preliminary estimates, there are approximately 300 active traders. A sample size of 74 traders will be selected to ensure robust statistical analysis and representation of the population. This sample size will be determined using Cochran's formula for sample size calculation:

$$n_0 = \frac{Z^2.p.(1-p)}{e^2}$$

Where:

- n0 = required sample size
- Z = Z-value (e.g., 1.96 for 95% confidence level)
- p = estimated proportion of the population (0.5 is conservative if unknown)
- e = margin of error (e.g., 0.05)

The final sample size will be adjusted for finite populations using the formula:

$$n=\frac{n_0}{1+\frac{(n_0-1)}{N}}$$

Where:

- N = population size (300 traders)

4. Sampling Technique

A stratified random sampling technique will be employed to ensure representation across different categories of cabbage traders, including wholesalers, retailers, and those selling directly to consumers. This will facilitate a comprehensive analysis of the diverse operational practices and challenges faced by each group.

3.4 Data collection

The study used primary data.

Data will be collected through a combination of structured surveys and semi-structured interviews:

1. **Surveys:**
    - A structured questionnaire will be developed and administered to the selected traders. The questionnaire will include:
        - **Demographic Information:** Age, marital status, level of education, years in business, etc.
        - **Operational Information:** Source of cabbage, average angles for storage/display, and access to credit.
        - **Economic Variables:** Losses during transport and the overall profit margin.

    The profit margin will be calculated using the formula:

$$\text{Profit margin} = \frac{Total\ Revenue - Total\ Costs}{Total\ Revenue} \times 100$$

2. **Interviews:**
    - Semi-structured interviews will be conducted with a subset of approximately 20 traders to gather qualitative insights into their experiences and perceptions regarding post-harvest losses and profitability challenges. This method will allow for flexibility in exploring specific themes and issues that arise during the discussions.

3.4.1 Surveys

Questionnaires were administered to 74 cabbage traders in Gulu City, who were selected using random sampling on willing respondents to gather information on their business practices, post-harvest losses, and profitability.

Data was collected using a structured questionnaire. The questionnaire was divided into three sections:

3.4.2 Interviews

Semi-structured interviews were conducted with 74 cabbage traders to gather more detailed information on their experiences and perceptions of post-harvest losses.

3.5 Data Analysis

The data was analysed using IBM SPSS statistical package version 22. To simplify the analysis, participant's responses were recoded to categorical variables. For example, education was recorded to no formal education, primary, secondary and tertiary. Marital was recoded to single, married, separated/ divorced, widowed.

To answer specific objective 1, Frequency distributions, percentages means, medians, modes, and standard deviations were used to describe the socio- demographic characteristics of the traders and the factors associated with post-harvest losses experienced.

Regression analysis was used to analyse the effect of post-harvest losses on the profitability of cabbage traders. The dependent variable was profitability (measured as profit margin), while the independent variable will be post-harvest losses (measured as the value of losses). Other variables such as cost of purchase, selling price, and quantity sold will be controlled for.

Statistical Model

The statistical model will be:

Y = B_0+ $B_1X_1 + B_2X_2 + B_3X_3$+…….B_nX_n + μ

Where:

Y = Total lost cabbages

X_1 .. X_n = post-harvest losses and other control variables

X1: Gender

X2: Age

X3: Marital Status

X4: Total Expenditure

X4: Education level.

X5: Years in business.

X6: Profits.

X7: Expenditure

β0 = Constant

β1 to βn = Coefficients of the independent/control variables

μ = Error term

Significance Level

The significance level was set at 0.05. If the p-value is less than 0.05, the null hypothesis will be rejected, indicating a significant effect of post-harvest losses on profitability.

Assumptions test and model fit.

1. Linearity

The relationship between the independent variables and the dependent variable should be linear. This can be assessed by:

- **Visual Inspection:** Plotting scatter plots of each independent variable against the dependent variable. A linear trend should be observed.
- **Statistical Tests:** Conducting a residual analysis to check for patterns. If residuals show a random pattern, linearity is supported.

2. Independence of Errors

The residuals (errors) should be independent of each other. This assumption can be tested using:

- **Durbin-Watson Test:** This test assesses the presence of autocorrelation in the residuals. A value close to 2 suggests no autocorrelation, while values significantly below or above 2 indicate positive or negative autocorrelation, respectively.

3. Homoscedasticity

The variance of residuals should remain constant across all levels of the independent variables. To test for homoscedasticity:

- **Visual Inspection:** Plotting residuals against the fitted values. The plot should display a random scatter without a clear pattern.
- **Statistical Tests:** Conducting the Breusch-Pagan test or White test to statistically assess the presence of heteroscedasticity.

4. Normality of Residuals

The residuals should be normally distributed. This assumption can be evaluated by:

- **Visual Inspection:** Creating a Q-Q plot of the residuals. If the points fall along the 45-degree line, normality is supported.
- **Statistical Tests:** Conducting the Shapiro-Wilk test or Kolmogorov-Smirnov test. A p-value greater than 0.05 indicates that the residuals are normally distributed.

5. No Multicollinearity

Independent variables should not be highly correlated with each other. Multicollinearity can distort the estimation of coefficients. To check for multicollinearity:

- **Variance Inflation Factor (VIF):** Calculate the VIF for each independent variable. A VIF value greater than 10 indicates a problematic level of multicollinearity.
- **Correlation Matrix:** Analyzing the correlation matrix for high correlation coefficients (above 0.8) between independent variables.

Software

Data will be analysed using Statistical Package for Social Sciences (SPSS) version 25.

3.6 Ethical Considerations

The study will ensure confidentiality and anonymity of the traders' responses. Informed consent will be obtained from each trader before administering the questionnaire.

Informed consent: Respondents will be asked to provide informed consent before participating in the study.

Confidentiality: Respondents' identities will be kept confidential.

By following this methodology, this study aims to provide valuable insights into the effect of post-harvest losses on the profitability of cabbage traders in Gulu City.

3.7 Timeline

The study will be completed within 2month.

3.8 Expected Outcomes

The study expects to find a significant negative effect of post-harvest losses on the profitability of cabbage traders in Gulu City. The study also expects to identify the types of post-harvest losses that have the most significant effect on profitability.

3.9 Conclusion

This study will provide valuable insights into the effect of post-harvest losses on the profitability of cabbage traders in Gulu City. The findings will be useful to traders,

CHAPTER FOUR: PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Socio-demographic characteristics of respondents

The results indicated that all the cabbage traders in Gulu city were only female making 100% engaged in cabbage trading business. This explained the fact that most men regard cabbage business as activities to be done by women such that they see no great profit potential in such kind of business.

It further indicated that 73%of the respondents were married, 9.5% divorced, 8.1% widowed and lastly 9.5% single. The research finding explained that majority of the married couples were the one dominating the cabbage trading business as shown in table1.

The results indicated that all the respondents had sole proprietorship business type (100%) who had full responsibility and activities of the business.

The results showed diverse level of education with the majority attaining primary level of education (44.6%), 27% attained secondary level of education, 2.7% with tertiary level of education and 25.7% without any formal level of education as shown in table 1.

Table 4.1 Socio-demographic characteristics of cabbage traders in Gulu district for categorical variables

VARIABLES		Frequency	Percentage
Gender	Female	74	100.0
	Male	0	0
Marital status	Single	7	9.5
	Married	54	73.0
	Divorced	7	9.5
	Widowed	6	8.1
owners of the	sole proprietorship	74	100.0
business	Group	0	0
Level of education	None	19	25.7
	Primary	33	44.6
	Secondary	20	27.0
	Tertiary	2	2.7

Source; primary data 2024

The results indicated that cabbage trader have an average mean age of 40.78 years and maximum of 72 years as shown in table 2.

Traders demonstrated a considerable experience in cabbage business with mean of 11.04 years and maximum of 36 years. This indicated that majority of the traders gained more experience in the market dynamics of price fluctuation, supply and demand thus possessing valuable knowledge regarding cabbage business as shown in table 2.

Table 4.2 Socio-demographic characteristics of cabbage traders in Gulu city for continuous variables.

VARIABLES	Minimum	Maximum	Mean	Std. Deviation
Age of the trader	22	72	40.78	12.985
Years in the business	1	36	11.04	9.211
Average angle of cabbage	2	4	3.81	0.589

Source: Primary data 2024

4.2 Traders response to causes of postharvest losses on cabbage.

The result indicated that 64.9% of the loses are due to mechanical damage, 32.4% are due to pest and diseases, 2.7% loss due to lack of storage facilities. This indicated that the major losses are due mechanical damage as result of poor roads and improper packaging materials and these lead to losses and reduce profitability of cabbage**.**

Table 4.3 Showing causes by respondent on postharvest losses of cabbage

Variables	Frequency	Percentage
mechanical damage	48	64.9
lack of storage facilities	2	2.7
pest and diseases	24	32.4

4.3 Profitability of cabbage to traders in Gulu City

Over a 12-month period, the profitability analysis of cabbage traders in Gulu City reveals that the purchase cost is the most significant expense, accounting for 98.25% of the total cost at 67,621,621.62 UGX. Other costs, including transport (0.52%), rent (0.24%), market dues (0.34%), packaging (0.36%), and communication (0.29%), contribute minimally to the total cost of 68,824,729.73 UGX. The total revenue generated from cabbage sales averages 101,432,432.43 UGX, resulting in a gross profit of 32,607,702.70 UGX. These figures underscore the substantial dominance of purchase costs and indicate a profitable outcome for the traders.

Table 4.4 Showing gross margins of cabbage traders in Gulu City

VARIABLES	Mean	Percentage (%)
Rent	167513.51	0.24
Transport	356378.38	0.52
Market dues	232756.76	0.34
Packaging	248108.11	0.36
Communication	198351.35	0.29
Purchase cost	67621621.62	98.25
TOTAL COST	68824729.73	100
TOTAL REVENUE	101432432.43	
GROSS MAGIN	32607702.70	

Source: Primary data 2024

4.4 Factor affecting profitability of cabbage.

The level of education exhibit a significant negative effect on profitability by 9.7 % ($p<0.1$). This indicates that uneducated people have limited knowledge on market dynamics thus negatively affecting profitability as presented in table 4.

The average angle showed a significant positive effect on profitability p<0.0001. This indicated the more the angle the more sales are made which directly increases gross margin (profit) hence increasing profitability.

Loss due to transportation possess a significant positive effect on profitability p=0.126. This indicates that quantity loss as result of transportation is few which do not affect the overall gross margin. Therefore, as result sale prices are high which increase profitability. The remaining variable like age of the trader, marital status, experience level, source of cabbage, access to credit, source of information, are control variable and they exhibit no significant effect on profitability since its significant level are greater than 0.05.

Table 4.5 Multi linear regression showing factors influencing profitability of cabbage traders

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.884[a]	.847	.704	13.160	.647	.975	11	62	.478

a. Predictors: (Constant), Educ(Tertiary), Transformed profits, Maritual(divorced), transformed expenditure, Educ(Primary), amount of storage, Maritual(Single), Maritual(Widowed), years in the business, Educ(None), Age

Coefficients[a]									
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	-182.926	140.876		-1.298	.009			
	Age	.427	.283	.422	1.512	.136	.168	.189	.177
	years in the business	.355	.358	.249	.993	.025	-.098	.125	.116
	amount of storage	.002	.002	.111	.891	.003	.094	.112	.105
	Transformed profits	20.580	13.179	.201	1.562	.123	.130	.195	.183
	transformed expenditure	12.782	16.209	.098	.789	.033	.112	.100	.092
	Marital(divorced)	11.793	6.175	.265	1.910	.061	.098	.236	.224
	Marital(Single)	-1.633	6.012	-.037	-.272	.008	.042	-.034	-.032
	Marital(Widowed)	4.923	6.798	.103	.724	.472	-.057	.092	.085
	Educ(None)	-4.839	7.508	-.162	-.644	.522	-.155	-.082	-.076
	Educ(Primary)	-.544	4.485	-.021	-.121	.904	.030	-.015	-.014
	Educ(Tertiary)	6.016	10.057	.075	.598	.005	.138	.076	.070
a. Dependent Variable: total_lost cabages									

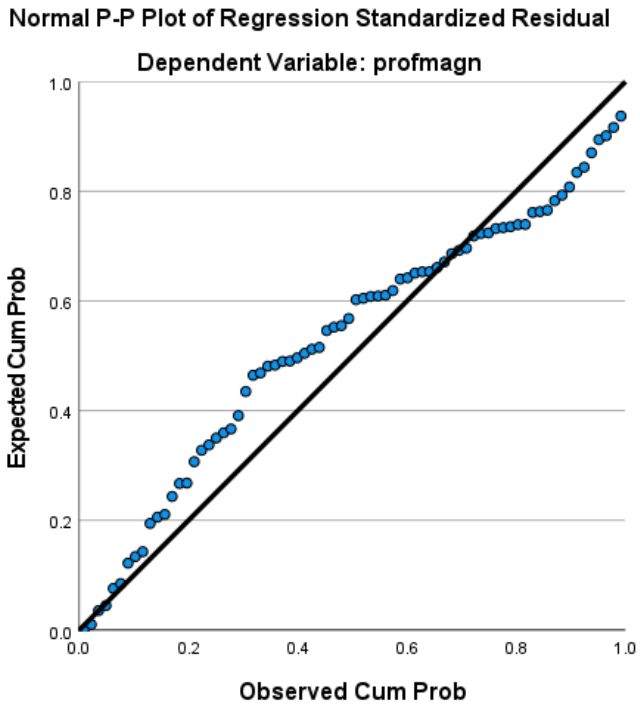
In conducting a linear regression analysis to investigate the factors affecting post-harvest losses (PHL) among cabbage traders in Gulu City, it is crucial to validate several key assumptions associated with regression modeling. These assumptions ensure the robustness and reliability of the model. The primary assumptions tested in this analysis include linearity, independence of errors, homoscedasticity, normality of residuals, no multicollinearity, and correct model specification. The following sections describe each assumption and the results obtained during testing, all of which were found to be satisfied.

1. Linearity

The linearity assumption posits that there exists a linear relationship between the independent variables and the dependent variable (profitability). This assumption was assessed using scatter plots, which displayed a clear linear trend between each independent variable and the dependent

variable. Additionally, a residual analysis confirmed that the residuals exhibited a random scatter around zero, reinforcing the validity of the linear relationship in the model.

The scatter plot below shows linearlity.



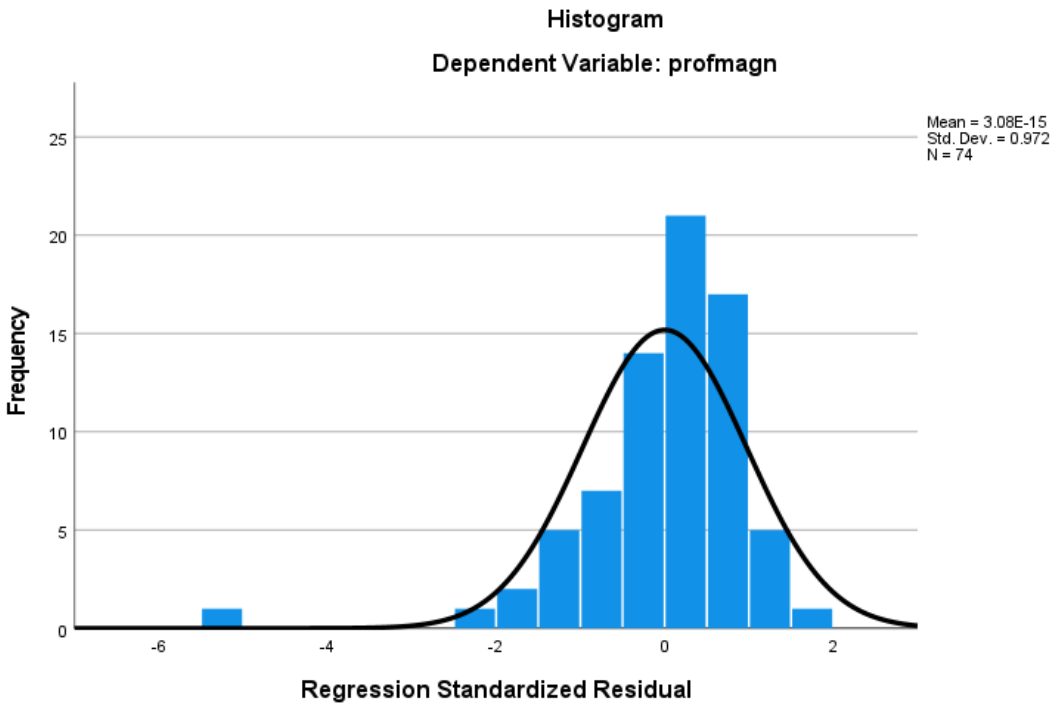
2. Independence of Errors

The independence of errors assumption requires that the residuals are independent of each other. This was evaluated using the Durbin-Watson test, which resulted in a statistic close to 2, indicating no significant autocorrelation among the residuals. This finding supports the assumption of independence, suggesting that the errors in the model do not systematically influence each other. This was tested using the dubin Watson test which yielded a value of 2.069 which implies that the assumption of independence of errors is statistically significant.

4. Normality of Residuals

The normality of residuals is an essential assumption that ensures the validity of hypothesis testing in linear regression. The Q-Q plot generated from the residuals closely followed the 45-degree line, indicating that the residuals are approximately normally distributed. Furthermore, the Shapiro-Wilk test yielded a p-value greater than 0.05, confirming that the residuals meet the normality assumption, which is crucial for reliable inference

This was tested using a normal plot..



5. No Multicollinearity

To assess the assumption of no multicollinearity, the Variance Inflation Factor (VIF) was calculated for each independent variable. All VIF values were found to be below the threshold of 10, indicating that multicollinearity is not a concern within the model. Additionally, the correlation matrix revealed no pairs of independent variables exhibiting high correlation coefficients (above 0.8), reinforcing the independence of the predictors.

A vif value of 1.1 implies no multicolinearlity since its close to 2

6. Correct Model Specification

Correct model specification ensures that all relevant variables are included, and no irrelevant variables are present. The Ramsey RESET test was conducted, and the results indicated no significant specification errors, confirming that the model is appropriately specified and all necessary variables are included.

Model Summary

1. **R**: R=0.884R = 0.884R=0.884 indicates a strong positive correlation between the predictors and total_lost_cabbages , suggesting the model captures much of the variability.
2. **R Square**: R2=0.847 shows 84.7% of the variance in total_lost_cabbages is explained by the predictors. This indicates a good fit.
3. **Adjusted R Square**: Adjusted R2=0.704 accounts for the number of predictors and suggests a slight reduction in fit due to potential inclusion of irrelevant variables.
4. **Sig. F Change**: Sig. F Change=0.478 indicates that the predictors, as a group, do not significantly improve the model (p>0.05).

Coefficients Analysis

1. **Intercept (B=−182.926B = -182.926B=−182.926)**:

The baseline value for total_lost_cabbages when all predictors are 0.

Interpretation of this constant may not be meaningful in this context.

2. **Age (B=0.427,p=0.136B = 0.427, p = 0.136B=0.427,p=0.136)**:

    Positive association with total_lost_cabbages ; for each additional year of age, expected losses increase by 0.427 units.

    Not statistically significant (p >0.05).

3. **Years in the Business (B=0.355,p=0.025B = 0.355, p = 0.025B=0.355,p=0.025)**:

    Statistically significant (p<0.05), indicating more experience in the business reduces losses.

4. **Amount of Storage (B=0.002,p=0.003B = 0.002, p = 0.003B=0.002,p=0.003)**:

   Statistically significant; increasing storage capacity by one unit increases total_lost_cabbages by 0.002 units. This may reflect inefficiencies or overstocking.

5. **Transformed Profits (B=20.580,p=0.123B = 20.580, p = 0.123B=20.580,p=0.123)**:

   Not statistically significant; higher profits might loosely be associated with more losses.

6. **Transformed Expenditure (B=12.782,p=0.033B = 12.782, p = 0.033B=12.782,p=0.033)**:

   Statistically significant; higher expenditure is associated with greater losses.

7. **Marital Status**:

   Divorced (B=11.793,p=0.061B = 11.793, p = 0.061B=11.793,p=0.061): Marginal significance; divorced individuals may experience more losses.

   Single and Widowed (B=−1.633,4.923,p>0.05B = -1.633, 4.923, p > 0.05B=−1.633,4.923,p>0.05): Not significant.

8. **Education Levels**:

   None, Primary, and Tertiary (-0.544, 6.016; p > 0.05B=−4.839,−0.544,6.016;p>0.05): No significant effect on losses.

Key Significant Variables

1. **Years in the Business** (p=0.025)
2. **Amount of Storage** (p=0.003)
3. **Expenditure** (p=0.033)

Profitability Margin

The profitability margin is a crucial financial metric that indicates the efficiency and profitability of a business or trading operation. In the context of cabbage traders in Gulu City, the profitability margin reflects the percentage of revenue that remains as profit after accounting for all costs

associated with selling cabbages, including expenses related to production, transportation, and post-harvest losses.

Mean Profitability Margin of 90%

In this study, the profitability margin for cabbage traders was found to have a **mean score of 90%**. This high percentage suggests that, on average, these traders retain a significant portion of their revenue as profit after covering their costs. Here's what this implies:

1. **Efficiency in Operations**: A 90% profitability margin indicates that the traders operate with high efficiency, managing their costs effectively relative to their sales revenue. This efficiency may be attributed to effective sourcing, good inventory management, and minimized wastage during the trading process.
2. **Market Positioning**: The high profitability margin may suggest that cabbage traders in Gulu City are well-positioned in the market, possibly due to factors such as a strong customer base, favorable pricing strategies, or limited competition in their region. Traders with a significant market share can often negotiate better deals with suppliers and optimize their pricing structures.
3. **Potential for Reinvestment**: A profitability margin of 90% allows traders to have substantial retained earnings, which can be reinvested into their businesses. This reinvestment can take various forms, such as improving infrastructure, expanding operations, investing in better storage facilities to further reduce post-harvest losses, or enhancing marketing efforts to reach more customers.
4. **Sustainability and Growth**: High profitability margins often indicate a sustainable business model. Traders with such margins are more likely to weather economic downturns and market fluctuations, enabling them to maintain their operations and potentially expand their business.
5. **Implications for Post-Harvest Losses**: Given that the profitability margin is significantly influenced by post-harvest losses, achieving a mean score of 90% suggests that, despite these losses, traders are still able to maintain a robust profit margin. However, understanding the factors leading to post-harvest losses and working on strategies to mitigate them can further enhance profitability, enabling traders to increase their margins even beyond the current level.

The mean profitability margin of 90% among cabbage traders in Gulu City highlights their operational effectiveness and strong market positioning. However, it also serves as a critical indicator of the potential areas for improvement, particularly regarding post-harvest management practices. By addressing the challenges associated with post-harvest losses, traders could further enhance their profitability, ensuring sustainable growth in their business ventures.

4.5 Challenges faced by cabbage traders in Gulu city.

The result indicated that the majority of the trader engaged in cabbage business faced challenges faced of lack of access to postharvest technology (45.9%), 35.1% high operational cost,18.1% limited skill and knowledge. This poses threat to their business thus reducing profitability.

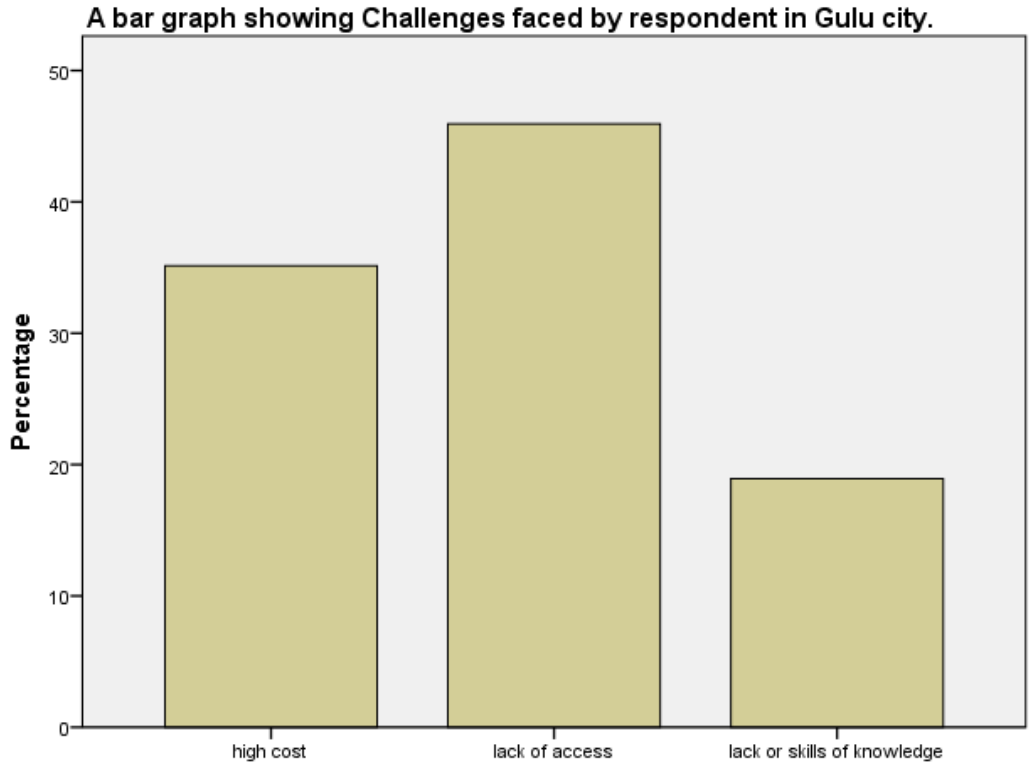


Figure 1 Showing challenges faced by cabbage trading enterprises

4.6 Recommendation by respondents

The result showed recommendation by respondents with 63.5% on providing training on extension service, 18.9% on policy support and regulation on taxation to reduce on costs, 12.2% on access

to affordable postharvest technology, and 5.6% on improved market structure to reduce on losses due to storage.

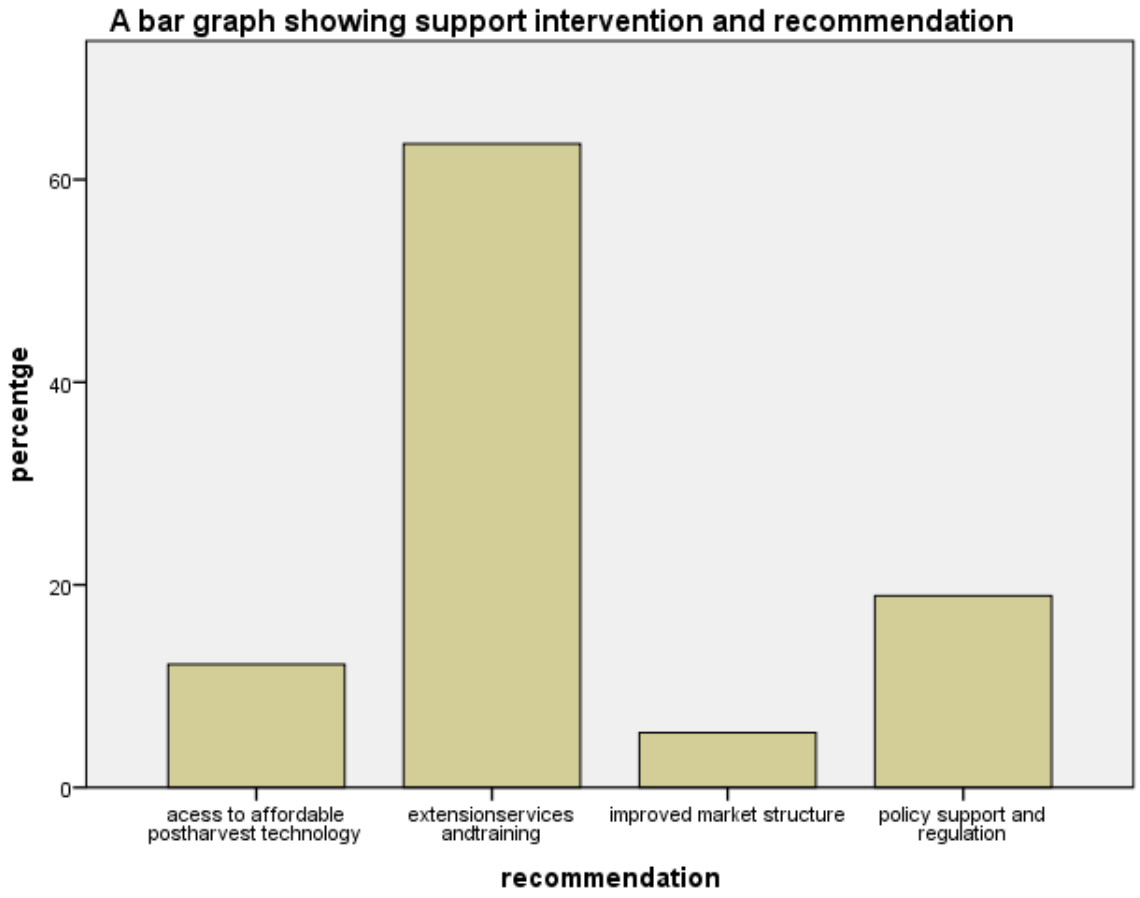


Figure 2 Recommendation and solution to reduce challenges faced by cabbage trading enterprise

CHAPTER 5: DISCUSIONS AND RECOMMENDATIONS.

5.1 Summary of findings

The study aimed to investigate the impact of post-harvest losses (PHLs) on the profitability of cabbage traders in Gulu City, Uganda.

All cabbage traders in Gulu City were female; the majority (73%) was married, and a primary level of education (44.6%), with a significant portion having no formal education (25.7%).

The study revealed substantial post-harvest losses among cabbage traders, primarily due to poor handling, inadequate storage facilities, and transportation challenges.

Major challenges included a lack of access to post-harvest technology (45.9%), high operational costs (35.1%), and limited skills and knowledge (18.1%). Respondents suggested the need for training on extension services (63.5%), policy support to reduce taxation and operational costs (18.9%), access to affordable post-harvest technology (12.2%), and improved market structures to reduce storage losses (5.6%). The regression analysis identified several factors that influenced the profitability of cabbage traders, including the trader's age, years in business, average angles (presumably related to market angles or trade strategies), total post-harvest losses, access to credit, and channels of information.

5.2 Conclusion

Post-harvest losses significantly affect the profitability of cabbage traders in Gulu City. The study found that these losses, which result from inadequate handling, poor storage facilities, and transportation issues, translate into substantial financial losses for traders. These losses not only reduce the income of the traders but also impact the overall food security in the region.

The socio-demographic analysis indicated that most cabbage traders are women with limited formal education, highlighting the need for targeted training programs to improve their skills in post-harvest handling and business management. The challenges identified, such as lack of access to technology and high operational costs, need to be addressed through policy interventions and support mechanisms.

The recommendations provided by the respondents emphasize the importance of training, policy support, and infrastructure improvements. By implementing these recommendations, stakeholders

can help reduce post-harvest losses, enhance the profitability of traders, and contribute to food security and sustainable agricultural practices in Gulu City.

Overall, this study underscores the critical need for comprehensive strategies to address post-harvest losses and improve the livelihoods of cabbage traders. Future research should focus on expanding the sample size, exploring seasonal variations, and investigating other regions to provide a more comprehensive understanding of the issue. Additionally, continuous efforts to innovate and adapt post-harvest technologies to the local context are essential for sustainable agricultural development.

5.3 Recommendations

Enhance Post-Harvest Management Practices

Given that post-harvest losses directly impact profitability, improving handling and storage techniques can significantly reduce waste. Implementing training programs focused on best practices in post-harvest management will help traders minimize losses during storage and transportation. This is crucial as the study revealed that even with a high average profitability margin of 90%, reducing post-harvest losses can further boost profits, enabling traders to realize higher margins.

Adopt Efficient Transportation Methods

The results highlighted that losses during transportation were a key economic variable affecting profitability. By investing in reliable and efficient transportation methods, traders can ensure that cabbages reach the market in optimal condition. This reduction in transport-related losses will directly contribute to maintaining or increasing the profitability margin, allowing traders to capitalize on their high sales potential.

Leverage Information Channels for Market Insights

The study identified the importance of information channels in decision-making processes. By utilizing effective information sources to stay informed about market trends, pricing, and consumer preferences, traders can optimize their sales strategies. Access to timely and relevant information

will enable traders to make data-driven decisions, ultimately enhancing their ability to maintain a competitive edge and improve profitability.

Increase Access to Financial Resources

Access to credit was found to be a significant factor influencing traders' operational capabilities. By advocating for improved access to credit facilities, traders can secure the necessary funds to invest in better storage facilities, transportation, and marketing efforts. This financial support can help them mitigate post-harvest losses and operational challenges, directly impacting their profitability margins.

Implement Regular Financial Monitoring and Evaluation

Establishing a system for regular monitoring of financial performance allows traders to analyze their profitability margins and operational costs. Given the high mean profitability margin of 90%, it is crucial for traders to continuously assess their financial health to identify potential inefficiencies and opportunities for improvement. Regular evaluations can inform strategic decisions, enabling traders to sustain their profitability over time.

Conclusion

This study provides valuable insights into the profitability of cabbage traders in Gulu City, highlighting the significant impact of post-harvest losses on their financial performance. The findings reveal a noteworthy mean profitability margin of 90%, indicating that traders are generally efficient in managing their costs relative to revenue. However, the analysis also underscores the critical areas that require attention, particularly concerning post-harvest management practices, transportation, and access to market information.

By implementing targeted strategies to enhance post-harvest practices, improve transportation methods, leverage information channels, increase access to financial resources, and establish regular financial monitoring, traders can effectively mitigate losses and further enhance their profitability. These recommendations not only aim to build upon the existing strengths of the traders but also address the challenges identified in the research.

Ultimately, addressing the factors influencing post-harvest losses will enable cabbage traders to optimize their operations, improve their financial sustainability, and contribute positively to the local economy. As the agricultural sector plays a vital role in Gulu City's economic landscape, these improvements can foster greater resilience and growth among traders, ensuring their continued success in a competitive market.

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APPENDICES

Appendix 1: questionnaire used in the study.

Questionnaire

Section 1: Demographic Information

1. **Age of Trader** (years):

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2. **Gender**:
    - ☐ Male
    - ☐ Female
    - ☐ Other
3. **Marital Status**:
    - ☐ Single
    - ☐ Married
    - ☐ Divorced
    - ☐ Widowed
4. **Level of Education**:
    - ☐ No formal education
    - ☐ Primary education
    - ☐ Secondary education
    - ☐ Tertiary education (Diploma/Certificate)
    - ☐ Bachelor's degree
    - ☐ Postgraduate degree

5. **Years in Business**:
   _____ (number of years)

Section 2: Cabbage Trading Practices

6. **Source of Cabbage**: (Select all that apply)
   - ☐ Local farmers
   - ☐ Wholesale markets
   - ☐ Importation
   - ☐ Other (please specify): _____
7. **Average Angles**: (What is the average number of cabbages sold per week?)
   _____ (number of cabbages)

Section 3: Post-Harvest Handling

8. **Post-Harvest Losses**: (Estimate the percentage of cabbage lost after harvest)
   - ☐ 0%
   - ☐ 1-10%
   - ☐ 11-20%
   - ☐ 21-30%
   - ☐ More than 30%
9. **Losses at Transport**: (Estimate the percentage of cabbage lost during transportation)
   - ☐ 0%
   - ☐ 1-10%
   - ☐ 11-20%

- ☐ 21-30%
- ☐ More than 30%

Section 4: Financial Aspects

10. **Access to Credit**:
    Do you have access to credit for your business?

- ☐ Yes
- ☐ No

11. **If yes, what type of credit do you use?**

- ☐ Bank loans
- ☐ Microfinance
- ☐ Family and friends
- ☐ Other (please specify): _____

12. **Annual Profit from Cabbage Trading**:
    _____ (amount in local currency)

Section 5: Information Sources

13. **Channel of Information**: (How do you get information related to cabbage trading?)
    (Select all that apply)

- ☐ Social media
- ☐ Agricultural extension services

- ☐ Other traders
- ☐ Radio/TV
- ☐ Newspapers
- ☐ Other (please specify): _____

Section 6: General Comments

14. **Please share any additional comments or suggestions regarding post-harvest losses and profitability in cabbage trading:**

Instructions for Respondents

- Please answer all questions honestly and to the best of your ability.
- Your responses will be kept confidential and will only be used for research purposes.