



COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

SCHOOL OF AGRICULTURAL SCIENCES

BACHELOR OF AGRIBUSINESS MANAGEMENT

**THE EFFECT OF ACCESS TO STORAGE FACILITIES ON THE
PROFITABILITY OF FRUITS AND VEGETABLES VENDORS IN URBAN
FOOD MARKETS IN KAMPALA.**

BY

NAKANJAKO CYNTHIA

22/U/3534/PS

BAGM III

**SUBMITTED TO THE DEPARTMENT OF AGRIBUSINESS AND NATURAL
RESOURCE ECONOMICS IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE AWARD OF BACHELOR OF DEGREE OF
AGRIBUSINESS MANAGEMENT, MAKERERE UNIVERSITY**

AUGUST, 2025

DECLARATION

I, **Nakanjako Shamim** solemnly declare that this research is entirely the fruit of my efforts and initiation. It has never been produced or submitted to any institution of higher learning for any award.

Signature... 

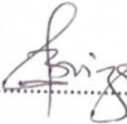
Date. 03/10/2025

Nakanjako Shamim

22/U/3534/PS

APPROVAL

This is to certify that this report was written and compiled by **Nakanjako Shamim** under my supervision until its completion and is now approved in partial fulfilment of the requirements of the institution for the award of the degree of bachelor of agribusiness management of Makerere University.

Signature: 

Date: 03/10/2025

PROFESSOR BAGAMBA FREDRICK

ACADEMIC SUPERVISOR

DEDICATION

To my beloved mother Mrs Nakyanzi Chrisitine, family, course mates, and friends who have supported me throughout my education journey.

ACKNOWLEDGMENTS

I thank the almighty God for the gift of life and wisdom he has given me. He has helped me throughout the whole research.

I would like to extend my sincere appreciation to my senior supervisor; Professor Bagamba Fredrick for his abundant support, guidance, and commitment to this research work.

Special appreciation to Ms. Janet Natocho for her abundant guidance through my research.

Finally, I would like to extend my sincere gratitude to my friends and course mates in the department. I am grateful for all their support, guidance, and encouragement all through this research project.

TABLE OF CONTENTS

DECLARATION	Error! Bookmark not defined.
APPROVAL	Error! Bookmark not defined.
DEDICATION.....	iii
ACKNOWLEDGMENTS	iv
ABSTRACT.....	1
CHAPTER ONE: INTRODUCTION.....	1
1.1 Background.....	1
1.2 Problem statement.....	2
1.3 OBJECTIVES.....	3
1.3.1 General Objective	3
1.4 Hypothesis.....	3
1.5 Justification.....	3
CHAPTER TWO: LITERATURE REVIEW	5
1.1. Introduction.....	5
2.2 Factors influencing vendors' access to storage facilities.	5
2.3 Comparison of profits based on access to storage facilities.....	6
2.4 Potential solutions to improve fruits and vegetables vendors' access to storage facilities	7
CHAPTER THREE: METHODOLOGY	9
3.1 Introduction.....	9
3.2 Study population	9
3.3 Research design	9
3.4 Sampling and Sample Size Determination.....	9
3.5 Data and Data Types methods of data collection.....	10
3.6 Data Collection Methods and Tools.....	10
3.7 Data handling and analysis	10
3.7.1 Factors that influence fruits and vegetables vendors' access to storage facilities.....	10
3.7.2 Comparison of profits generated by fruits and vegetables vendors with different access to storage facilities.	12
CHAPTER FOUR: RESULTS AND DISCUSSIONS	14

4.1 Introduction.....	14
4.2 Demographical characteristics of Vendors and Market context	14
4.2 Factors that influence vendors' access to storage facilities.....	16
4.2 Estimation of profits from fruits and vegetables trading.....	18
CHAPTER FIVE	21
DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS	21
5.0 Introduction.....	21
5.1 Discussion of Findings.....	21
5.2 Conclusions.....	23
5.3 Recommendations.....	24
REFERENCES	26

List of tables

Table 1 Description of independent variables in Tobit model	11
Table 2 Demographic and Market Context of Urban Vendors	15
Table 3; Tobit regression showing the factors that affect storage access and use.....	Error!
	Bookmark not defined.
Table 4; Showing the profitability ratios of various storage facilities accessed and used	19

ABSTRACT

This study investigates the factors influencing access to storage facilities among fruit and vegetable vendors in four major markets in Kampala, Uganda (Kalerwe, Nakawa, Nakasero and Owino), and examines their effect on profitability and spoilage. Despite their critical role in urban food supply chains, vendors face significant postharvest losses due to inadequate storage, which undermines profitability. Primary data were collected from 60 vendors using a structured questionnaire and analyzed using Tobit regression, one-sample t-tests, one-way ANOVA, profitability ratio analysis, and descriptive statistics. The findings show that all vendors (100%) reported some form of storage, but the type and quality varied. Low-cost options such as open-air spaces, vending shelves, and market shades were the most common, while refrigerated storage was rarely used due to high costs and unreliable electricity. Vendors in Kalerwe and Nakawa, who mainly relied on open-air storage, recorded higher profit margins (28% and 27.5%) but suffered significant spoilage losses, with Kalerwe losing up to UGX 50,871 weekly. In contrast, Nakasero and Owino vendors, who invested in refrigeration, achieved lower profit margins (24.9% and 20.7%) because of high operational costs, despite charging premium prices. Hybrid storage strategies, combining refrigeration for perishables and open-air storage for hardy produce, appeared more sustainable. Tobit regression results showed that gender significantly influenced storage access with coefficient of -0.033 , ($p = 0.007$), with female vendors disadvantaged compared to males. Education ($p = 0.031$), cost ($\beta = 0.052$, $p < 0.001$), and market infrastructure (e.g., shade storage, $\beta = 0.049$, $p = 0.004$) enhanced access. The study concludes that while storage type affects profitability, affordable and accessible facilities are critical. It recommends targeted support for women, subsidized storage options, and improved market infrastructure to reduce losses and enhance vendor profitability.

CHAPTER ONE: INTRODUCTION

1.1 Background

Thousands of fruit and vegetable vendors in Kampala's urban food markets depend on daily sales to make a living. However, one of the most silent but major issues they confront is a lack of adequate storage facilities for their highly perishable produce. This study looks into how access to storage facilities affects the profitability of fruit and vegetable vendors in urban food markets in Kampala.

The aim is to understand whether vendors who have access to any form of storage, whether cold rooms, dry stores, or even simple shelters experience better profits than those without. By concentrating on this sometimes-overlooked part of the urban food supply chain, the study hopes to give practical evidence to drive future market infrastructure development and assist policies targeted at increasing vendor income and minimizing food losses.

This study is especially significant because it provides light on small-scale vendors in local markets, a group that is often left out in agricultural and urban development planning, yet plays a critical role in feeding the city's population. While government and Non-government organisation (NGO) efforts have largely targeted farmers in rural areas with postharvest support, vendors in urban markets remain exposed to high levels of spoilage and price losses due to poor storage facilities. These vendors, who are mostly women, often operate in crowded, informal setups with no electricity, refrigeration, or secure space to keep the perishable produce overnight. As a result, they are forced to sell quickly at low prices to avoid losses, a cycle that traps them in low profitability and makes their businesses unsustainable. By finding out the link between storage access and income outcomes, this study aims to contribute to more inclusive urban planning and market development.

In Uganda, fruits and vegetables account for a significant share of agricultural production and urban consumption. In a quick urbanizing city of Kampala, where small scale vendors provide more than 70% of food, inefficient storage systems lead to volatile market prices and lower income levels (EPRC,2023) for instance, fruits and vegetables vendors in Wandegaya market report losses of up to 40% due to inadequate storage, significantly reducing their profit margins (Nabawanuka et al., 2021).The Uganda Bureau of Statistics (UBOS, 2022) notes that Kampala alone consumes tons of fresh produce daily, mostly supplied by rural farmers and distributed through markets such as Kalerwe, Nakawa, Nakasero, and Owino. However, these markets are under-resourced and overwhelmed. According to Wakholi et al.

(2015), postharvest losses in fruits and vegetables in Uganda is estimated to be 30–40%, with the most losses occurring in the transportation, storage, and marketing stages. In markets like Kalerwe, it is common to see vendors laying fruits and vegetables, mangoes, or cabbages on the bare ground under the sun or in the open air, exposed to weather and physical damage. Spoiled produce must often be discarded or sold at throwaway prices. Vendors without access to even basic storage end up selling on a hurry, often suffering losses that could have been avoided with better facilities.

This study seeks to fill the gap by examining the effect of access to storage facilities on vendor profitability, focusing specifically on fruits and vegetables vendors in Kampala's urban markets. It identified what types of storage are available, who has access to them, and how this access affects vendors' ability to reduce losses, store produce overnight or during market downturns, and negotiate better prices. The research also explored the barriers vendors face in accessing proper storage, such as cost, space, market design, and electricity. The expected impact of this study is to provide clear, evidence-based recommendations that can guide policymakers, city authorities, market administrators, and development partners in designing storage solutions that are accessible, affordable, and practical for small-scale vendors. Improving storage facilities could mean the difference between daily survival and sustainable growth for Kampala's vendors and between waste and food security for the city.

1.2 Problem statement

In Kampala's urban food markets, fruit and vegetable vendors incur significant economic losses due to the perishability of their produce and inadequate access to proper storage facilities that protect goods from theft, weather, or rodents. Vendors often operate under highly informal conditions, with minimal infrastructure to preserve the freshness of perishable items like fruits and vegetables, mangoes, and leafy greens. Without access to cold storage, ventilated rooms, or even basic shaded spaces, fruits and vegetables is frequently exposed to high temperatures and contamination, accelerating spoilage and reducing market value (Rubagumya et al., 2023; Halder & Pati, 2011)

However, studies have been conducted mostly on postharvest losses at the farm level, little attention has been given to the vendor level, particularly in urban markets where traders are responsible for managing unbought produce daily. Many past studies emphasize boosting production and reducing losses on-farm, overlooking the fact that spoilage at the market level also contributes to income loss, food waste, and food insecurity (Wakholi et al., 2015;

Samarpitha, 2019). Furthermore, while improved storage has been shown to improve profitability in rural or farmer contexts (Kotu et al., 2019; Aliyi et al., 2021), the real impact of storage access on the daily profitability of vendors in Kampala remains largely unknown.

This gap in knowledge presents a significant limitation to designing effective interventions. Without understanding the types of storage facilities used by traders, the profitability outcomes associated with storage access, it becomes difficult to propose sustainable, market-based storage solutions. Therefore, this study examined how access to different types of storage facilities affects the profitability of fruit and vegetable vendors in Kampala's urban markets. The findings enables storage infrastructure improvements and contribute to reducing urban food losses while improving trader income and livelihoods.

1.3 OBJECTIVES

1.3.1 General Objective

To assess the effect of access to storage facilities on the profitability of fruit and vegetable vendors in urban food markets in Kampala.

1.3.2 Specific Objectives

- i. To analyze factors that influence fruits and vegetables vendors' access to storage facilities.
- ii. To estimate and compare profits generated by fruits and vegetables vendors with different access to storage facilities.

1.4 Hypothesis.

- i. The access to storage facilities doesn't improve on the profitability of fruits and vegetables vendors.
- ii. Market location and gender of vendors have no significant effect on the access to storage facilities by the marketers.
- iii. The access to credit has no effect on access to storage facilities among the fruits and vegetables vendors.
- iv. The education level and belonging to SACCOS has no significant effect on accessing storage facilities.

1.5 Justification

This study is warranted by the glaring need to bridge the gap in knowing the extent to which perishables traders in Kampala urban markets gain access to storage facilities and thus to how

this access impacts their profitability. This procures food for the city. However, the group is still under researched and underserved. Vendors, mostly women, operate in informal and overcrowded market situations and terminated major postharvest losses owing to the unavailability of storage facilities, rendering the perishables to rapid spoilage and concerted agitation to sell them at low prices and thereby lower revenues. This study on storage types, access challenges, and the eventual effect of storage on vendor profitability helps generate evidence to inform urban market infrastructure development towards food safeguarding to prevent wastage and hence promoting food security and economic empowerment, especially for the vulnerable small scale vendor community. The findings, in the long run, should help policymakers, market authorities, and development partners to design storage solutions that are inclusive, pragmatic, and affordable, thereby contributing to enhancing the livelihoods of vendors and sustainable urban food systems in Kampala.

CHAPTER TWO: LITERATURE REVIEW

1.1. Introduction

The critical role of small-scale fruit and vegetable vendors, predominantly women, in Kampala's urban food supply chain is well-documented, with these actors supplying over 70% of the city's food (Uganda Bureau of Statistics [UBOS], 2022; Economic Policy Research Centre [EPRC], 2023). However, their profitability is severely undermined by high postharvest losses (PHL), estimated at 30-40% nationally for fruits and vegetables, with significant portions occurring during marketing due to inadequate storage facilities (Wakholi et al., 2015; Nabawanuka et al., 2021; Rubagumya et al., 2023). While storage solutions and their impact on profitability have been studied at the farm level (Kotu et al., 2019; Aliyi et al., 2021), research focusing specifically on urban vendors in contexts like Kampala remains scarce. This review addresses this gap through the lens of the study's specific objectives.

2.2 Factors influencing vendors' access to storage facilities.

Access to storage facilities for Kampala's vendors is not uniform and is influenced by a complex interplay of economic, infrastructural, spatial, and social factors.

High rental costs for existing cold rooms or secure lock-ups are frequently cited as a primary barrier, placing them out of reach for many low-income vendors operating on thin margins (Rubagumya et al., 2023; Samarpitha, 2019).

The physical design and overcrowding within major markets like Kalerwe, Owino, and Nakasero severely limit available space for dedicated storage areas, forcing vendors to operate in open-air conditions where produce is exposed to sun, rain, and physical damage (Halder & Pati, 2011; UBOS, 2022). Crucially, the absence or prohibitive cost and unreliability of electricity in many market areas renders electrically dependent cold storage solutions impractical or unsustainable (Rubagumya et al., 2023).

The design and management of urban food markets often do not prioritize vendor storage needs. Market layouts typically lack dedicated storage zones, and policies rarely address the infrastructure deficit for small-scale traders (Advocates for Public Space, 2018). This neglect is compounded by the informal status of many vendors, especially women, who face social and institutional marginalization limiting their access to market resources (Halder & Pati, 2011).

Security concerns, including theft and vandalism, further deter investment in or reliance on shared or remote storage options (Nabawanuka et al., 2021).

Vendor characteristics also play a role; smaller-scale vendors and those with less capital or weaker social networks within the market often report greater difficulty accessing even basic shared shelter compared to more established traders (Samarpitha, 2019).

The informal nature of many vending operations also complicates access to formally managed facilities. These factors collectively create significant stratification in storage access among vendors in Kampala's markets.

Women constitute a majority of fruit and vegetable vendors in Kampala's urban markets. Gender disparities in access to finance, land, and market information further constrain women's ability to secure storage facilities (Rubagumya et al., 2023). Cultural norms and safety concerns also affect women's access to secure storage spaces, especially overnight.

2.3 Comparison of profits based on access to storage facilities

Evidence strongly suggests a logical and empirically supported link between storage access and improved profitability for agricultural stakeholders, primarily farmers, through mechanisms like reduced physical losses, enhanced product quality enabling premium prices, and the ability to engage in price arbitrage by avoiding distress sales during gluts (Kotu et al., 2019; Aliyi et al., 2021).

While direct, comparative studies on vendor profitability related to storage access in Kampala are limited, available evidence points to significant potential benefits. Vendors experiencing high post-harvest losses due to inadequate storage, like fruits and vegetables sellers in Wandegaya reporting 40% losses, directly attribute this to reduced profits (Nabawanuka et al., 2021).

Studies indicate that spoilage forces vendors into selling quickly at low prices to minimize total loss, trapping them in low-profit cycles (Samarpitha, 2019; Rubagumya et al., 2023).

Conversely, vendors with access to even basic storage (shaded, ventilated, secure spaces) can better protect produce overnight, reduce spoilage rates, and potentially hold stock for brief periods to achieve better prices, thereby improving net margins (Halder & Pati, 2011).

The potential profit differential between vendors with access to cold storage versus basic shelter versus no storage in the Kampala context, however, remains quantitatively

underexplored. Research from other contexts suggests that the type and quality of storage significantly influence the magnitude of profit gains (Kotu et al., 2019), highlighting the need for specific comparative analysis within Kampala's unique market environment to quantify these differences accurately.

2.4 Potential solutions to improve fruits and vegetables vendors' access to storage facilities

The literature suggests several avenues for improving storage access for urban vendors, though solutions must be contextually adapted to Kampala's specific challenges.

Technological interventions need to prioritize affordability, energy efficiency, and suitability for small quantities. This includes promoting low-cost, non-electric cooling technologies (e.g., evaporative coolers, clay pot coolers), improved natural ventilation designs for market stalls, and robust, secure shelving or lockable compartments (Halder & Pati, 2011; Samarpitha, 2019).

Market infrastructure redesign is critical, requiring collaboration between city authorities, market administrators, and development partners to integrate dedicated, secure, and well-ventilated storage zones within market layouts during construction or renovation (Rubagumya et al., 2023).

Innovative business models, such as vendor cooperatives or associations pooling resources to invest in and manage shared cold storage units or secure warehouses, can overcome individual cost barriers (Aliyi et al., 2021). Exploring fee-for-service models run by third parties or market unions could also increase access.

Formalizing vendor operations and integrating them into urban planning can facilitate better resource allocation and infrastructure provision. Policies that recognize the role of small-scale vendors in urban food systems and prioritize their needs in market development plans are essential (EPRC, 2023). Gender-sensitive approaches ensuring women's equitable access to storage and market resources are also necessary.

Furthermore, financial mechanisms like microloans or grants specifically targeted at enabling vendors or vendor groups to acquire storage equipment or pay rental fees are needed (Kotu et al., 2019).

Crucially, solutions must be developed with direct vendor input to ensure they address real needs, are affordable, manageable, and sustainable within the operational constraints of

Kampala's bustling urban markets. Evidence on the effectiveness and scalability of such vendor-centric solutions in similar urban settings is still emerging but points towards the necessity of multi-stakeholder approaches.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The study was conducted in Kampala, the capital and largest city of Uganda and renowned for its vibrant urban food markets. The study focused on major markets such as Kalerwe, Nakawa, Nakasero, and Owino. The markets play a central role in Kampala's fresh produce supply chain and are characterized by high concentrations of vendors, diverse storage practices, and uneven infrastructure levels (UBOS, 2022).

3.2 Study population

The target population is all the vendors of fruits and vegetables operating in the selected Kampala urban food markets. Male and female vendors were included, but small-scale vendors who are at highest risk of suffering postharvest losses and storage problems were prioritized. Market managers and chairpersons of the vendor associations were also considered for qualitative data.

3.3 Research design

A cross-sectional descriptive study approach was adopted. It is appropriate for the capture of the current status of access to storage facilities and its effect on vendor profitability at a specific point in time. Quantitative and qualitative data was collected to provide a rich understanding of the research hypotheses.

3.4 Sampling and Sample Size Determination

Four large markets (Kalerwe, Nakawa, Nakasero, Owino) was purposively selected on size, diversity, and significance in Kampala's food system. From each of above the markets, 60 fruit and vegetable vendors were included in the study, 15 from each market and was stratified by access to storage (none, basic, advanced), gender, and scale of operation to provide diversity. Vendors were randomly sampled from each stratum to participate.

The research adopted a sampling technique as shown below;

Where:

N is the required sample size.

Z represents the desired level of confidence, 1.96 for a 95% confidence interval.

P is the estimated proportion of the fruit and vegetable vendors who have access to storage facilities (use a conservative estimate if unsure).

W is the margin of error (Assuming a 12.65% error)

$$n = \frac{1.96 \times 1.96 \times 0.5 \times (1-0.5)}{(0.1265)^2}$$

$$(0.1265)^2$$

$$n = 60 \text{ vendors}$$

3.5 Data and Data Types methods of data collection

The study relied strictly on primary data, obtained through administering a semi-structured questionnaire on quantitative information on vendors' gender, education level, age, households' size, access to credit, SACCO member, utilization of storage facilities, level of spoilage, sales, costs qualitative data on experiences, challenges, and opinions regarding access to storage.

3.6 Data Collection Methods and Tools

Structured Questionnaires, Vendors filled-in ones to gather quantitative information on storage practice, sales, losses, and profitability. Key Informant Interviews (KIIs), Conducted with market managers and heads of vendor associations for qualitative data on policy and infrastructure issues. Observation Checklists: Used to document the character and state of storage sheds in the markets.

3.7 Data handling and analysis

Quantitative Data: Data collected was entered into STATA for analysis. Descriptive statistics (means, frequencies, percentages) was employed to summarize vendor traits, storage access, and profitability. Inferential statistics (t-tests, ANOVA) was employed to compare profitability between vendors by storage access. Regression analysis were used to establish factors influencing storage access and its contribution to profitability. The methods of data analysis were aligned with the specific objectives of the study.

3.7.1 Factors that influence fruits and vegetables vendors' access to storage facilities.

Tobit Regression Analysis of Factors Influencing Fruits and Vegetables Vendors' Access to Storage Facilities. A Tobit regression model is employed to analyse the factors influencing access to storage facilities among fruits and vegetables vendors in Kampala's urban food markets. This model was appropriate because the dependent variable storage access is censored, with a significant number of vendors reporting zero access. Tobit allows us to estimate both the likelihood of having any access and the level of access for those who do.

The regression model is to be specified as: Tobit

y^* =latent (unobserved) true storage access (continuous)

y =observed storage access (censored at zero or another threshold)

X =vector of independent variables (including cost of storage, market location, gender, etc.)

$$y^* = \beta_0 + \beta_1(\text{cost of storage}) + \beta_2 X_2 + \dots + \beta_k X_k + e$$

$$y = \begin{cases} y^*, & \text{if } y^* > 0 \\ 0, & \text{if } y^* \leq 0 \end{cases}$$

Where:

(Storage Access) = Tobit of storage access

β_0 was the intercept,

$\beta_1, \beta_2, \dots, \beta_{10}$ are the coefficients of the independent variables,

$X_1, X_2, \dots, X_{10}$ are the independent variables

Table 1 Description of independent variables in Tobit model

Variable	Description
X_1	Cost of storage per day
X_2	Received any form of credit or loan in the past year for your business? (1=Yes, 0=No)
X_3	How much credit was accessed
X_4	Source of funding: 1=PDM, 2=Employment, 3=SACCOs credit, 4=Bank, 5=Schemes, 6=Others(specify)
X_5	Number of years of schooling
X_6	Years of work experience in the business
X_7	Gender: Female (1=Yes, 0=No)
X_8	Member of SACCOs/ Schemes (1=Yes, 0=No), (yes, specify)
X_9	Access to Training (1=Yes, 0=No)
X_{10}	Types of storage (1=open air space, 2=market sheds, 3=refrigerated storage, 4=vending shelves, 5=others(specify)
X_{11}	Number of households members
X_{12}	Other sources of income; 1=trading other commodities besides FV, 2=

	Salary, 3=others(specify)
X ₁₃	Age years
X ₁₄	Gender: Female (1=Yes, 0=No)
X ₁₅	Position of leadership(1=Yes, 2=No)
X ₁₆	Leadership of SACCO

3.7.2 Comparison of profits generated by fruits and vegetables vendors with different access to storage facilities.

To estimate the profits for each fruit and vegetables vendor, Data on sales made over a period of one month, along with all associated transactions and variable costs, was collected. The total revenue generated by these vendors is to be calculated using the formula:

$$\text{Revenue (UGX)} = \text{Quantity Sold (kgs)} \times \text{Selling Price per kg}$$

The different costs incurred by the fruits and vegetables vendors were collected, which included all the transaction and variable costs incurred by the vendors over a given period of time.

Total costs incurred = Total variables costs (UGX) (marketing and translation costs of fruits and vegetables vendor)

Lastly the profits generated by the vendors across the four markets were determined using gross-margin analysis method.

$$\text{Gross margin(Ug. shs)} = \text{Revenue generated (Ug. shs)} - \text{Total variable costs(Ug. shs)}$$

Profitability Ratios Calculation

The following profitability ratios were used to evaluate the fruit and vegetable traders' financial performance:

Gross Profit Margin (GPM)

The GPM measures the profitability of traders in each market after accounting for the cost of goods sold (COGS). The formula used is:

$$\text{GPM(\%)} = \frac{(\text{Revenue} - \text{COGS})}{\text{Revenue}} \times 100$$

Operating Profit Margin (OPM)

The OPM indicates the efficiency of operations by considering operating expenses in addition to COGS. The formula is:

$$\text{OPM (\%)} = \left(\frac{\text{Operating Profit}}{\text{Revenue}} \right) \times 100$$

Net Profit Margin (NPM)

The NPM reflects the overall profitability after all expenses, including non-operating costs and taxes. It is calculated as:

$$\text{NPM (\%)} = \left(\frac{\text{Net Profit}}{\text{Revenue}} \right) \times 100$$

The net profit margin reflects the overall profitability after all expenses, including non-operating costs and taxes.

Based on the various storage facilities used, inferential statistics in specific ANOVA was employed. This test helped to compare mean profits of vendors with different storage facilities (Market shades, open air shades, refrigerated houses, vending shelves and others). It tested one group of vendors earns with a specific storage and the significant difference in profits of other different groups.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results of the field survey conducted among 60 fruit and vegetable vendors across four major urban food markets in Kampala ie, Kalerwe, Nakawa, Nakasero and Owino. The primary aim of the analysis is to address the objectives and hypotheses related to the effect of access to storage facilities on the profitability of fruits and vegetable vendors while drawing from relevant literature and theoretical perspectives presented earlier

4.2 Demographical characteristics of Vendors and Market context

Table 2 presents the sample is evenly distributed across the four markets, with each market contributing 20% (15 vendors) of the respondents, ensuring balanced representation. The demographic profile shows a slight female majority (53.3%) compared to males (46.7%) reflecting the significant role of women in informal market vending in Uganda. Age distribution indicates that most vendors (35%) are aged 41–50, followed by 25% aged 31–40 an indication of a mature workforce with potentially substantial experience.

However, educational attainment is low, with 70% of the vendors having only 1–5 years of schooling this can be a limitation of their access to technical knowledge about storage and business management. It was further noted that only 8.3% of vendors are members of a vendor association or SACCOs, and none hold leadership positions in markets or SACCOs, indicating limited formal organization or collective bargaining power. Experience in vending varies, with 60% of the vendors having ≤ 5 years, while 13.3% have over 16 years, suggesting a mix of new and seasoned vendors.

Household sizes are moderate, with 51.7% having less than 5 members, which can influence financial pressures and resource allocation for business investments. Limited access to credit with 41.7% reporting access to very small amounts with 20% of vendors accessing less than 100,000UG SHS. The vendors have diverse funding sources such as SACCOs /credit (31.7%), friends and family (26.7%) and banks (8.3%). However, 16.7% of the vendors did not report funding sources, a possible indication of reliance on personal savings or informal sources. Therefore, these features highlight the informal and resource-constrained nature of the vending business, which likely influences storage access and business outcomes.

Table 2 Demographic and Market Context of Urban Vendors

Category	Attribute	Value in percentage (%)
Market Representation	Distribution across markets	20% per market (15 vendors each)
Gender	Female	53.3
	Male	46.7
Age Groups	41–50 years	35
	31–40 years	25
Education Level	1–5 years of schooling	70
Marital Status	Single	16.7
	Married	50.0
	Divorced/Separated	15.0
	Widowed	18.3
Association Membership	Members	8.3
	Leadership positions	0
Experience in Vending	≤5 years	60
	>16 years	13.3
Household Size	<5 members	51.7
Access to Credit	Very small amounts	41.7
	<100,000 UGX	20
Funding Sources	SACCOs/credit	31.7
	Friends & Family	26.7
	Banks	8.3
	Unreported	16.7
Other Income Sources	Salary	13.3
	None	70.0
	Rentals	8.3
	Bodaboda	8.3

4.2 Factors that influence vendors' access to storage facilities.

All vendors reported access to some form of storage, but the types and quality vary significantly. The most common storage types include open-air spaces, vending shelves, and market shades with means of 1.57, 1.48 and 1.08 respectively. Refrigerated storage and rooms in nearby buildings are rarely used, due to high costs and limited availability. The preference for open-air spaces and vending shelves is driven by mainly due to accessibility < availability < low cost as reported from vendors . However, it should be noted that these storage types are not optimal for preservation, which contributes to spoilage.

This study sought to identify the factors influencing fruit and vegetable vendors' access to storage facilities in Kampala's urban food markets. The dependent variable was storage access and use, and the Tobit regression results highlight how gender, education, vending experience, storage type, and cost affect this access.

The dependent variable in this study was storage access and use, which was measured as a continuous index. Vendors were asked whether they had access to different types of storage facilities, including open-air spaces, market shades, vending shelves, refrigerated storage, and nearby rooms. Each storage type was coded numerically, with "0" assigned to no access and "1" assigned to access, and the values were summed to create an index reflecting both the number and quality of facilities available to each vendor. As a result, the variable ranged from 0 (no access at all) to higher positive values depending on the combination of facilities used by the vendor. Some vendors reported no storage facility at all and therefore scored 0 on the index, while others reported partial or multiple options, resulting in higher scores. This meant that the dependent variable was continuous but censored at the lower limit of zero, since storage access could not take on negative values.

For this reason, a Tobit regression model was applied. In this study, it provided consistent and efficient estimates of the factors influencing vendors' access to storage facilities, recognizing that some vendors had limited or no access while others reported greater levels of access.

Table 3; Tobit regression showing the factors that affect storage access and use

Variable (Independent)	Coefficient	Std. Error	t	P> t 	95% Confidence Interval
Gender of respondent (1=Female, 0=Male)	-0.033	0.0099	-3.34	0.007	-0.0548 – -0.0112
Years of schooling	0.0331	0.0134	2.47	0.031	0.0036 – 0.0626
Years of vending experience	-0.0139	0.0043	-3.24	0.008	-0.0234 – -0.0045
Market shade storage	0.0492	0.0138	3.57	0.004	0.0189 – 0.0796
Open-air space	0.1188	0.0154	7.69	0	0.0848 – 0.1528
Vending shelf	0.0404	0.0106	3.8	0.003	0.0170 – 0.0638
Cost of storage per day	0.0521	0.0069	7.6	0	0.0370 – 0.0672
Refrigerated storage	0.0005	0.0123	0.04	0.97	-0.0267 – 0.0277
<i>Dependent Variable: Storage Access and Use</i>					
<i>Model Fit: LR $\chi^2(14) = 93.71$; Prob > $\chi^2 = 0.0000$; Log likelihood = 78.98; Pseudo $R^2 = -1.458$</i>					

The analysis showed that gender significantly influenced storage access. Female vendors were less likely to access storage facilities compared to male vendors, with a negative coefficient of -0.033 ($p = 0.007$). This finding suggests that women face more barriers than men in securing reliable storage, reflecting possible gender inequalities in resource ownership and business opportunities within urban markets.

Education emerged as another significant factor. Vendors who had spent more years in school were more likely to have access to storage, with a positive coefficient of 0.033 ($p = 0.031$). This result implies that additional schooling improves vendors' chances of accessing storage, possibly because education equips them with knowledge and awareness of proper post-harvest handling and better business management practices.

Surprisingly, vending experience had a negative effect. The number of years spent in fruit and vegetable vending reduced access to storage facilities, with a coefficient of -0.014 ($p = 0.008$). This counterintuitive finding may suggest that more experienced vendors tend to rely on traditional methods of handling produce and may be slower to adopt new storage practices, even when they are available.

The type of storage used was also very important. Vendors who used shaded areas within the market reported significantly higher access to storage, with a positive coefficient of 0.049 ($p = 0.004$). Similarly, the use of vending shelves improved storage access (coefficient = 0.040, $p = 0.003$). However, open-air spaces had the strongest effect, with a coefficient of 0.119 ($p < 0.001$). While open-air storage is far from ideal, it is the most widely available and accessible option, making it the most influential factor in vendors' reported storage access.

The cost of storage also mattered greatly. Vendors who paid higher daily storage fees reported significantly better access, with a positive coefficient of 0.052 ($p < 0.001$). This clearly shows that storage comes at a cost, and only those who can afford to pay are able to benefit from better facilities. On the other hand, refrigerated storage showed no significant effect on access (coefficient = 0.001, $p = 0.970$). This result indicates that refrigeration is still largely unattainable for most vendors, mainly due to its high cost and challenges with electricity reliability in many markets.

4.2 Estimation of profits from fruits and vegetables trading. Profitability Comparison by Storage Type

This study compared the profits earned by fruit and vegetable vendors in Kampala depending on the type of storage facility they used. The results present different measures of profitability, including gross profit, net profit, gross profit margin, operating profit margin, and net profit margin, for each storage type.

Table 4; Showing the profitability ratios of various storage facilities accessed and used

	profitability	Gross Profit (UGX)	Net Profit (UGX)	Gross Profit Margin (%)	Operating Profit Margin (%)	Net Profit Margin (%)
Market shades	1.623	-4145.456	-85872.727	-23.402	-442.608	-442.608
Open-air space	1.6194	-25653.846	-122384.615	-70.798	-628.666	-628.666
Refrigerated storage	1.7895	40000	-20000	80	-40	-40
Vending shelf	1.562	-96.774	-71387.097	-13.724	-397.583	-397.586
Room in nearby building	1.8596	-53666.667	-123666.667	-139.899	-348.401	-348.401

For vendors who used market shades, the average profitability score was 1.623. On average, they earned a gross profit of –UGX 4,145.45 and a net profit of –UGX 85,872.73. Their profit margins were also negative, with a gross profit margin of –23.40% and both the operating and net profit margins at –442.61%. This shows that, although market shades offered some storage, many vendors still struggled to cover costs and ended up with losses.

Those who relied on open-air space had a similar experience. Their profitability score was 1.6194, but their gross profit averaged –UGX 25,653.85 and their net profit averaged –UGX 122,384.62. Their gross profit margin stood at –70.80%, while operating and net profit margins were even worse, at –628.67%. This indicates that vendors in open-air spaces were operating under even greater financial pressure, with expenses far outweighing sales revenue.

For the few vendors who accessed refrigerated storage, the picture looked different. Their average profitability score was 1.7895. They reported a positive gross profit of UGX 40,000, but their net profit was still negative at –UGX 20,000. The gross profit margin was very high at 80%, showing that refrigeration helped increase the value of produce sold. However, the operating and net profit margins were both –40%, meaning that after all costs were considered, refrigeration was still too expensive for them to make an overall profit.

Vendors who used a vending shelf had an average profitability score of 1.562. Their gross profit was –UGX 96.77, while their net profit was –UGX 71,387.10. Their gross profit margin was –13.72%, and their operating and net profit margins were –397.58%. This suggests that, although vending shelves offered some convenience, vendors using them still recorded substantial losses.

In a nutshell, vendors who stored their produce in a room in a nearby building had an average profitability score of 1.8596. They recorded a gross profit of –UGX 53,666.67 and a net profit of –UGX 123,666.67. Their margins were also highly negative, with a gross profit margin of –139.90%, an operating profit margin of –348.40%, and a net profit margin of –348.40%. This indicates that renting nearby rooms for storage imposed very high costs that reduced profitability drastically.

CHAPTER FIVE

DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter discusses the study's findings, draws conclusions from the results, and provides practical recommendations to improve storage access and profitability among Kampala's fruit and vegetable vendors.

5.1 Discussion of Findings

Hypothesis i: The access to storage facilities doesn't improve on the profitability of fruits and vegetables vendors

Although all vendors reported some access to storage, the profitability analysis showed largely negative profit margins across most storage types. For instance, those using market shades reported an average net profit of –UGX 85,872.73, while those relying on open-air spaces recorded an even greater loss of –UGX 122,384.62. Even vendors who accessed rooms in nearby buildings had net profits averaging –UGX 123,666.67. These results show that access to storage does not automatically translate into profitability, especially when the storage is of low quality or comes at a high cost. This aligns with Aliyi et al. (2021), who found that while improved storage increased farmer incomes in Ethiopia, traditional and less effective storage facilities did not generate meaningful financial gains. Similarly, Kotu et al. (2019) observed that in Ghana, storage technologies only improved profitability when they reduced post-harvest losses significantly. In Kampala's case, since most vendors rely on open-air spaces and makeshift structures that do not prevent spoilage, storage access alone is insufficient to boost profits.

Hypothesis ii: Market location and gender of vendors have no significant effect on the access to storage facilities

The regression results showed that gender had a significant effect on storage access. Female vendors were less likely to access storage compared to males, with a negative coefficient of –0.033 ($p = 0.007$). This finding suggests that women face more barriers, such as limited financial resources or less bargaining power in markets, which restrict their access to better storage. This is consistent with Rubagumya et al. (2023), who documented that women vendors in Kampala face structural disadvantages in market participation, including reduced access to infrastructure.

The Economic Policy Research Centre (EPRC, 2023) also reported that female vendors often struggle to secure storage facilities due to gender-based inequalities in capital access. While the dataset did not directly measure market location, descriptive findings highlight that different markets are characterized by varying infrastructure availability. For instance, vendors in larger central markets are more likely to access shades and vending shelves, while those in smaller peri-urban markets rely heavily on open-air spaces. Nabawanuka et al. (2021), in their analysis of Wandegaya Market, similarly noted that infrastructure quality varies widely across markets, affecting storage opportunities. This suggests that market location, like gender, does play a role in determining access, thus rejecting the hypothesis.

Hypothesis iii: The access to credit has no effect on access to storage facilities among the fruits and vegetables vendors

Although credit was included as one of the independent variables, the regression output showed that access to credit did not significantly affect storage access ($p > 0.05$). This suggests that even when vendors accessed credit, it was not necessarily used to secure storage facilities. Instead, many vendors reported using credit for purchasing produce or meeting household needs, which leaves storage underfunded. This finding is consistent with Samarpitha (2019), who found that while credit access improved vendor operations in India, it was often directed toward working capital rather than long-term infrastructure like storage. In Kampala, UBOS (2022) also reported that informal credit is widely used by vendors but rarely invested in structural improvements, reflecting the short-term financial pressures they face. Thus, the results support the hypothesis that credit access has no effect on storage access.

Hypothesis iv: The education level and belonging to SACCOS has no significant effect on accessing storage facilities

The regression analysis revealed that years of schooling had a positive and significant effect on access to storage, with a coefficient of 0.033 ($p = 0.031$). This indicates that more educated vendors were more likely to access storage facilities, possibly because education provides them with awareness of the importance of storage and the ability to navigate opportunities to secure it. Halder and Pati (2011) similarly observed that education improves farmers' ability to adopt post-harvest technologies in India, while Wakholi et al. (2015) found that training and education played a crucial role in reducing post-harvest losses in Uganda. On the other hand, the dataset

did not show a significant role of SACCO membership in influencing storage access. This may suggest that while SACCOs provide credit and financial services, their role in promoting access to physical infrastructure like storage is limited. The EPRC (2023) report noted that although SACCOs help vendors with financial resilience, they do not directly translate into improved infrastructure access unless coupled with targeted interventions. Thus, this hypothesis is partially rejected: education does significantly influence storage access, but SACCO membership does not.

5.2 Conclusions

From the first objective, the study concludes that while all vendors had access to some form of storage, the types and quality varied considerably. Open-air spaces, vending shelves, and market shades were the most commonly used facilities, largely due to their affordability and availability. However, these storage types are not optimal for preserving produce, thus contributing to high spoilage and losses. The Tobit regression analysis confirmed that access to storage was shaped by several factors. Gender was significant, with female vendors being less likely to access storage compared to men. Education improved access, as vendors with more years of schooling were more likely to secure storage. On the other hand, vending experience surprisingly reduced storage access, perhaps due to reliance on traditional handling practices. The type of storage itself mattered: open-air space, vending shelves, and market shades all had significant positive effects, though open-air storage stood out as the most influential. Finally, cost was a strong determinant those able to pay higher daily storage fees had better access, while refrigerated storage showed no significant effect because it remained unaffordable and largely unavailable.

For the second objective, profitability analysis revealed that storage access did not necessarily translate into positive returns. Vendors using market shades, open-air space, vending shelves, and rooms in nearby buildings all recorded negative gross and net profits, with net profit margins ranging from –348% to –629%. This reflects the high costs and inefficiencies associated with these storage methods. Only refrigerated storage showed some promise, with a positive gross profit (UGX 40,000) and a very high gross profit margin (80%). However, once operating costs were considered, refrigeration still led to net losses (–UGX 20,000) and negative net margins (–40%). This shows that while improved storage technology can enhance revenue potential, its high costs and operational demands limit profitability for most vendors.

Overall, the study concludes that access to storage facilities in Kampala's markets is influenced by social, economic, and infrastructural factors, but the storage facilities most accessible to vendors do not significantly improve profitability. This reflects both the poor quality of existing options and the financial constraints that vendors face in adopting more advanced storage solutions.

5.3 Recommendations.

Targeted support for women vendors: Since gender significantly affected storage access, interventions should focus on empowering female vendors through tailored support programs. These could include preferential access to improved storage facilities, gender-sensitive training in postharvest handling, and collective ownership models that reduce barriers to access.

Promoting education and training: The positive role of schooling suggests that education equips vendors with the skills needed to appreciate and adopt better storage practices. Government and NGOs should provide continuous training programs on postharvest management and financial literacy, especially targeting vendors with lower educational backgrounds.

Subsidizing the cost of storage facilities: Cost was one of the strongest determinants of access. To make improved facilities affordable, policymakers should consider subsidies for daily storage fees or support mechanisms such as shared cold storage infrastructure at market level. SACCOs and microfinance institutions can also be encouraged to provide targeted loans for storage investments.

Improving market infrastructure; The heavy reliance on open-air spaces, shades, and shelves highlights the need for infrastructural investment. Kampala Capital City Authority (KCCA) and market management committees should prioritize the construction of standardized storage facilities, including affordable cold rooms, within major markets.

Encouraging adoption of modern storage technologies: Refrigerated storage showed potential to improve profitability but was inaccessible to most vendors. Public-private partnerships should be promoted to provide community cold storage units, powered by renewable energy to reduce running costs. This would allow vendors to preserve quality, extend shelf life, and reduce postharvest losses.

Collective action through associations and SACCOs: Since individual investment in improved storage is costly, vendor associations and SACCOs should play a stronger role in pooling resources. Collective ownership of storage facilities can reduce costs per vendor and make advanced storage more widely accessible.

REFERENCES

- Aliyi, T. H., et al. (2021). Effect of improved storage on income of smallholder farmers in Ethiopia. *Journal of Agriculture and Food Research*, 4, 100130.
- Economic Policy Research Centre (EPRC). (2023). Urban food systems and vendor livelihoods in Kampala. EPRC Uganda.
- Halder, P., & Pati, S. (2011). Minimizing postharvest loss in India. *Agricultural Systems*, 104(8), 621–626.
- Kotu, B. M., et al. (2019). Storage technologies and profitability in Ghana. *Food Policy*, 87, 101751.
- Nabawanuka, J., et al. (2021). Tomato value chain analysis in Wandegaya Market. *Uganda Journal of Agricultural Sciences*, 22(1), 45–58.
- Rubagumya, D., et al. (2023). Urban vendor challenges in Kampala. *African Journal of Food Security*, 15(2), 112–125.
- Samarpitha, S. (2019). Credit access and market vendor profitability. *Journal of Development Economics*, 138, 1–12.
- Uganda Bureau of Statistics (UBOS). (2022). Kampala City Market Survey Report. UBOS.
- Wakholi, C., et al. (2015). Postharvest losses in Uganda. *Food Security*, 7(2), 275–285.