ISSN: 2958-2326

AJoCsOpen
Sharing Knowledge in Business

African Journal of Commercial Studies

Publisher's Home Page: https://ijcsacademia.com/

AFRICAN JOURNAL OF COMMERCIAL STUDIES

Research Paper | Peer Reviewed | Open Access

An Assessment of the Factors Causing Food Waste along the Vegetable Supply Chain at Soweto Market in Lusaka

Misael Tembo[1]*, Bupe Getrude Mutono-Mwanza[2]

[1]*MSc. Candidate, Graduate School of Business, The University of Zambia*
[2]*Senior Lecturer, Graduate School of Business, The University of Zambia*
* Corresponding Author

African Journal of Commercial Studies, 2024, 5(4), 221–232
DOI Link: https://doi.org/10.59413/ajocs/v5.i.4.4

Article Info

Volume 5, Issue 4

Publication history:
Accepted on 23 Octomber 2024;
Published on 25 October 2024

Article DOI:
10.59413/ajocs/v5.i.4.4

Abstract

The food waste along the vegetable supply chain has become a major concern across the globe and measures are being sought to reduce its impact on food security, economy, environment and society. Soweto Market in Lusaka, Zambia is among the biggest markets where food waste along the vegetable supply chain is extensive. However, there is a significant research gap particularly on the causes of food waste along the vegetable supply chain at Soweto Market. To address this gap, this research aims to assess the factors causing food waste along the vegetable supply chain at Soweto Market. This research is envisioned to contribute to the existing body of knowledge on the reduction of food waste along the vegetable supply chain. The study adopted a deducted research approach and employed the descriptive research design. Empirical data were collected using survey questionnaires distributed to 110 smallholder farmers at Soweto Market who farm, package, transport, store and sale for themselves. Data analysis involved descriptive statistics, factor analysis and regression analysis using the Software Package for Social Sciences (SPSS). The stud intended to establish the type of food waste and was restricted to understand how factors such as market information, packaging, transportation, storage, processing linkage, quality and regulations as independent variables cause food waste along the vegetable supply chain The findings from descriptive statistics established that tomatoes, onions, carrots, okra and cabbages were among the types of food waste along the vegetable supply chain. It was also found that independent variables except for packaging showed high reliability and internal consistency. It revealed that processing linkage have a significant positive effect on food waste. These findings contribute to enhancing the reduction of food waste along the vegetable supply chain which ultimately improves food sustainability. It is recommended that stakeholders in the vegetable supply chain use the insights from this study to review processing linkages along the vegetable supply chain at Soweto Market.

Keywords: Food waste, Vegetable supply chain, Regulations, processing linkage, Supply chain management, Smallholder farmers, Wholesalers

1. Introduction

Food waste is discarded food that is fit to continue in the supply chain (Gustavsson, et al., 2011). Across the globe, 14% of the world's food valued at $400 billion continues to be wasted after it is harvested (FAO, 2019). Food waste along the vegetable supply chain is a major problem across the globe with latest studies pointing to one third of the food produced wasted worldwide (Ribeiro, et al., 2018). The vegetable production forms part of the huge food crops cultivated and are a major source of livelihood (Idah, et al., 2007). In the agricultural sector, the vegetable supply chain constitutes of processes from farms where production takes place to final consumers (Negi & Anand, 2016). It is expected that players that include farmers, transporters, wholesalers, retailers, sales agents, processors among others would prevent food waste along the vegetable supply chain.

In Zambia, vegetable production has increased from 157,500 tons in 1972 to 445,625 tons in 2021 (Knoema, 2021). In Lusaka, there is heavy dependance on regional food networks for vegetable supplies as 73% of vegetables are from outside Lusaka while 27% are produced within the administrative boundaries of the city (Nyawali, 2018). Results show that out of a total of 4621.3kgs of vegetables produced from Lusaka, 1429kgs are transported to Soweto Market (ACIAR, 2023). Food waste occurs along the vegetable supply chain before reaching consumers or processors (Marissa & Toshihiko, 2021).

1.2 Problem Statement

According to Hichaambwa and Tschirley, the dominance of open-air market at Soweto Market is most pronounced in vegetables and holds close to 87% of vegetables produced in Zambia (Hichaambwa & Tschirley, 2010). In the period between 2007 and 2008, Soweto Market Transacted over 50,000 metric tons of tomatoes, onions, rape per year valued over USD13 million. However, food waste along the vegetable supply chain at Soweto Market has continued to be a major problem (Hichaambwa & Tschirley, 2006) Hichaambwa and Tschirley further indicated that the wastage of vegetables at retail stage of the supply chain before purchase at Soweto Market ranges from 3% to 5%. The fruits and Vegetables Association of Zambia (FVAZ) revealed that 40% to 50% of tomatoes go to waste at Soweto Market (FVAZ, 2023). The consequences of food waste along the vegetable supply chain include increased cost of production, trade and distribution, reduction in income for farmers (Phiri, 2010). Despite the need for research in this area, there exist a gap in the body of knowledge and most of studies done focused on developed countries. This study seeks to bridge the exiting knowledge gap by assessing factors causing food waste along the vegetable supply chain at Soweto Market.

1.3 Objectives of The Study

The objectives of this study are as follows:

(i) To establish the major types of food waste generated along the Soweto Market vegetable supply chain
(ii) To determine the factors causing food waste along the Soweto Market vegetable supply chain.
(iii) To evaluate the influence of factors on food waste along the Soweto Market vegetable supply chain
(iv) To propose measure that can be applied to mitigate food waste along the Soweto Market vegetable supply chain.

Therefore, the study attempts to answer the following questions:

(i) What are the major types of food waste along the Soweto Market vegetable supply chain?
(ii) What are the factors that cause food waste along the Soweto Market vegetable supply chain?
(iii) How do the factors influence food waste along the Soweto Market vegetable supply chain?
(iv) What are the measures that can be applied to mitigate food waste along the Soweto Market vegetable supply chain?

This study addresses factors causing food waste along the Soweto Market vegetable supply chain. By doing so, it endeavors to craft measure designed to reduce food waste along the Soweto Market vegetable supply chain.

2. Literature Review

2.1. Supply Chain

A supply chain is a network that links organizations or individuals, producers, distributors, through information systems to deliver products from the source to consumption (Dubey, et al., 2020). In a vegetable supply chain, wholesalers who are mostly farmers play a very key role in leaking with the retail side of the chain (Somashekhar, et al., 2014). Thus, farmers have a strategic role in the vegetable supply chain.

2.2. Vegetable Supply Chains in Developed Economies

Spain: It has been estimated that between 25% and 50% of food produced in Spain is wasted along the supply chain (Duque-Acevedo, et al., 2022).

Portugal: 17% of edible food produced for human consumption are wasted in Portugal, corresponding to 1 million tons per year of which 42% are fruits and vegetables (Magalhães, et al., 2021).

Turkey: 30% of vegetable production turns in loss during postharvest, storage, processing, packaging, and distribution, while 10% of vegetable production turns into waste during processing and packaging in Turkey (Surucu-Balci & Tuna, 2021).

Brazil: In 2020, the rate of fruit and vegetable waste in supermarkets was 5.5% of its gross revenue with packaging, refrigeration, transport being the contributing factors (Moraes, et al., 2022).

2.3. Vegetable Supply Chains in Developing Economies

Vietnam: according to the Ministry of Agriculture and Rural Development of Vietnam, post-harvest handling, storage, transport, transportation are the main causers of food waste along the supply chain of vegetables which was standing at 12% in 2019 (Ministry of Agriculture and Rural Development of Vietnam, 2019).

India: despite the enormous production of fruits and vegetables in India, wastage of fruits and vegetables stands at 70% of the total production causing 40% of economic losses (Anand & Barua, 2022).

South Africa: an approximate of 10 million tons of food is wasted in South Africa of which vegetables and cereals account for 70% (Mudau, 2022).

2.4. Types of Food Wastes along the Vegetable Supply Chain

Vegetables include white and red cabbages, tomatoes, beans, carrots, onions, peas, eggplant, green pepper (Maina & Mwangi, 2008). The main vegetables produced by smallholder farmers in Zambia are tomatoes, onions, watermelons, cabbage, pumpkins, beans, okra and lettuce (Phiri, 2010). Based on the revelations on the types of vegetables by the scholars, the study identified the following types of vegetables to establish whether they indeed go to waste along the supply chain in Zambia:

Tomatoes: According to the Common Market for East and Southern Africa (COMESA), most of the tomatoes go to waste in Zambia (African Farming, 2023). The Fruits and Vegetables Association of Zambia indicated that 40% to 50% of tomatoes go to waste every year (FVAZ, 2023).

Onion: According to the Vincent Corporation, onion processors generate 10,000 to 100,000 pounds of waste per day (Vincent Corporation, 2003). Onion is a major agricultural commodity accountable for 500,000 tons of annual waste which is a serious concern for the ecosystem (Sagar, et al., 2022).

Carrots: Carrot food loss ranges from 25% to 28% to a maximum of 58% of the total production (Valery, 2023). Valery observed that approximately 1% to 2% of the total retail sales of carrots goes to waste per week.

Okra: Okra is seasonal and highly perishable in its natural state after harvest causing huge post-harvest wastage during the production season (Olaniyan & Omoleyomi, 2013).

Cabbage: Cabbage makes up around 6.5% of the global vegetable production with around 30% wasted from farm to plate (Pradhan, et al., 2020). A head of cabbage loses 44% to 66% of its net weight before reaching the consumers because it gets trimmed at each node along the supply chain (Ortiz-Gonzalo, et al., 2021).

2.5. Factors Causing of Food waste along the vegetable supply chain

According to Mwanza and Telukdarie, interdependencies in the supply chains are complex and solving problem is not limited to single factors (Mwanza & Telukdarie, 2022). Factors that cause food waste along the vegetable supply chain include lack of packaging facilities, storage, poor handling at farm and market, lack of processing facilities, poor linkage between farmers and processing units (Gardas, et al., 2018). According to Gobel et al and Bernstad et al, storage, transportation, standard packaging, product quality and marketing are among the factors that cause food waste along the vegetable supply chain (Göbel, et al., 2015) (Bernstad, et al., 2017).

Arising from the above literature on factors causing food waste, the following factors causing food waste along vegetable supply chain were identified:

Market Information: According to Aschemann-Witzel, et al, market demand information is crucial in tackling food waste along the vegetable supply chain (Aschemann-Witzel, et al., 2016). Thus, if the vegetable farmer is not aware of the prevailing market price there is a high chance that they may overproduce and end up with waste due to low demand.

Packaging: The Food and Agriculture Organization (FAO) indicated that loses or waste at every stage of the food chain can reduced by appropriate packaging. Hence, developing countries are underscoring the need to focus on packaging solutions (Manalili, et al., 2014). Thus, packaging can cause food waste along vegetable supply chain.

Transportation: According to Guarnieri, et al, the agri-food supply chain specifically for fruits and vegetables, food waste occurs due to transportation related issues (Guarnieri, et al., 2021). Thus, improper transportation such as using non refrigerated trucks to transport perishable vegetables can cause wastage along the supply chain.

Storage: Storage is a key point of relevance because it constitutes the physical place where food is sold and thus, where food waste occurs (Gruber, et al., 2016). Gruber, et al, adds that retail and wholesale stores are the institutional actors closest to disposal recycling.

Processing Linkage: Linkage is connection with players in the supply chain and manages the flow and quality (Barratt & Barratt, 2011). Ensuring processing proficiency prevents food waste generation (Raak, et al., 2017). Thus, processing linkage is among the factors that cause food waste along the vegetable supply chain.

Quality: Given the perishable nature of vegetables and the demand for quality attributes needed to manage the flow of products through the supply chain (Narrod, et al., 2009). The potential quality of fresh vegetables in the horticulture supply chain is define in the period preceding harvest (Kyriacou & Rouphael, 2018). Suffice to mention that quality comes in different forms, it could be quality packaging, quality transportation, quality storage or quality products. Thus, quality still is among key factors that cause food waste along the vegetable supply chain.

Regulations: Lack of standardization contributes to the problem of food waste in the vegetable supply chain (Göbel, et al., 2015). Gobel, et al revealed that direct marketing with vegetables leads to less waste as there are fewer middlemen, fewer quality checks and less transport that cause food waste. Thus, regulations cause food waste along the vegetable supply chain because lack of regulations results in poor standards which then affects communication, packaging, transportation, storage, processing and quality along the vegetable supply chain.

2.6. Measures to reduce food waste along the vegetable supply chain

Enhancing Market Information sharing: The performance of the vegetable supply chain can be improved by more efficient information sharing (Kaipia, et al., 2013). Thus, information shared could be used to forecast and plan to mitigate

potential wastage of vegetables along the supply chain.

Using suitable packaging: According to Verghese, et al, food waste along the vegetable supply chain can be reduced by using packaging that improves product protection, ventilation and temperature control during transportation and handling (Verghese, et al., 2015).

Using appropriate transportation: The Global Agenda Council on Logistics and Supply Chains indicated that vegetables food waste is due to improper handling, and lack of proper cold transportation (Raut, et al., 2019). Raut, et al, explain that using appropriate transport does not only improve logistics performance but reduces food waste in the supply chain.

Using Proper Storage Facilities: According to Onwude, et al, refrigeration in the storage of vegetables is a key measure in reducing vegetable waste in the supply chain because it enhances the quality of fresh produce (Onwude, et al., 2020). Thus, storage with proper cooling systems would reduce food waste along the vegetable supply chain.

Linking Processing Units with Farmers According to Mwanza, et al, buyers along the supply chain are considered as an aspect of value addition (Mwanza, et al., 2019). Augustin, et al, explains that local processing companies are an important channel for farmers to send their produce for value-adding. The concept of having centrally located processing hubs will reduce food waste along the vegetable supply chain (Augustin, et al., 2020).

Enhancing Quality: Quality measures are needed to ensure that products flow through the supply chain while maintaining their quality all the way through to consumers (Narrod, et al., 2009). Thus, enhancing quality in products as they flow through the supply chain would reduce food waste along the vegetable supply chain.

Developing Policies to Standardize the Vegetable Supply Chain: According to Batt and Cadilhon supply chain modernization can facilitate the introduction of contract farming and forward purchase mechanism (Batt & Cadilhon, 2007). For example, EUREPGAP1 standards for fresh fruits and vegetables initiated by 13 European retailers in the late 1990s have now expanded its international role as one of the major international standards that link farmers and other suppliers (Gereffi & Lee, 2009). Thus, when policies aimed at standardizing the vegetable supply chain are undertaken, food waste can be reduced.

2.7. Conceptual Framework

A conceptual framework is an argument about why the topic is important and whether the proposed means of research are appropriate and rigorous (Jama, et al., 2024).

The conceptual framework for the study is shown in the figure 1 below.

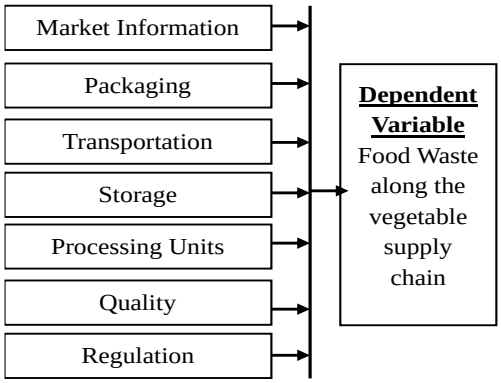

Figure 1: Factors Influencing Food Waste

In this framework, the factors relate to food waste along the vegetable supply chain. The framework focuses on how the factors cause food waste along the vegetable supply chain.

3. Methodology

3.1. Study Design

This study employed a descriptive research design as it was appropriate to determine the factors causing food waste along the vegetable supply chain because descriptive studies have a primary goal of answering the question of how, who, and what (Cong & Chau., 2012). This, through descriptive research design, a survey research strategy was adopted which enabled the collection of large amounts of data required to describe the variables and establish the nature of statistical relationships among them.

3.2. Study Population and Sampling Strategy

The study employed the Taro Yamane (1977) formular (Etim & Kajang, 2019) as shown below.

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

The Taro Yamene formular was used to choose a sample of 110 smallholder farmers from a total of 15million smallholder farmers as indicated by the World Food Programme (WFP) in 2020. The formular considered 10% for non-response.

where n is sample size, N is total population and e is margin of error (Jama, et al., 2024).

3.3. Data Collection

Before the collection of data was undertaken, authority for ethical clearance was sought from the University of Zambia Humanities and Social Sciences Research Ethics Committee, which was granted on 24th May 2024 under reference HSSREC-2024-May-028 and consent was obtained from all participants during data collection. The confidentiality of the information from the participants was assured and maintained throughout the study.

Survey Questionnaires forms consisting of section 1 for general information, section 2 for food waste along the vegetable supply chain, section 3 for causes of food waste along the vegetable supply chain, section 4 for the impact of the causes of food waste and section 5 for the measures to mitigate the impact of food waste along the vegetable supply chain. Primary data was collected by physically administering the questionnaires to randomly selected participants at Soweto Market. Secondary data was collected from a variety of sources that includes books, academic articles, conferences, websites, research organizations and online blogs.

The Survey respondents consisted of individuals who were randomly selected from Soweto Market who were smallholder farm sales managers, General Managers, product managers among other. The respondents were given questionnaires to with rate statements using a five-point Likert scale of which 1 was for "strongly agree", 2 for "agree", 3 for "neutral", 4 for "disagree" and 5 for "strongly disagree". A total of 110 valid answers were received which was a 100% response rate. A 100% response rate indicates a good response rate. Questionnaires were physically administered to respondents.

3.4. Data Analysis

Data were analyzed using the IBM SPSS (version 25) and Microsoft Excel. Descriptive statics were used to analyze demographic characteristics of the respondents represented by frequency and distribution in percentages (Jama, et al., 2024). The frequency and percentage distribution measured the type of food waste, factors causing food waste, influence of the factors on food waste and measures to mitigate food waste (Adelodun, et al., 2021). Normality test checked for missing values and outliers to ensure normality (Yazid, 2022), assured reliability and internal validity (Stancu, et al., 2016), Factor Analysis established the dimensionality of constructs (Richter, 2017), Pearson Correlation Analysis examined the direction and strength of relationships among variables (Bozdağ & Çakiroğlu, 2021) while Regression Analysis measured the proportion of variance in food waste along the vegetables supply chain while (Bravi, et al., 2020).

4. Results and Discussions

4.1. Demographics

This segment provides a detailed outcome of the findings with statistical interpretations.

Figure 2 shows that out of the total of 110 participants 48.18% were Sales Managers, 44.55% were Marketing Managers. 5.45% were Product Managers and 1.82% were General Managers.

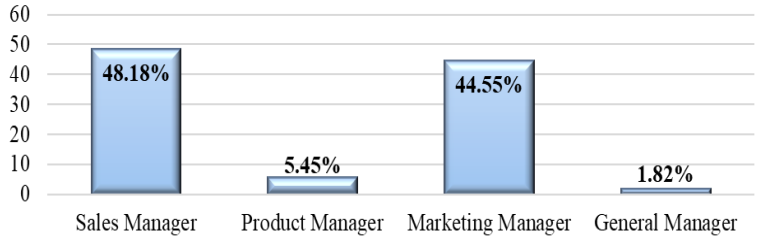

Figure 2: Position in Framing Business

Figure 3 shows that 50% of the participants were in the secondary and primary category, 21% were diploma holders, 18% were certificate holders, 10% were degree holders and 1% were master's degree holders. The findings confirm that the 50% of the participants were not graduates.

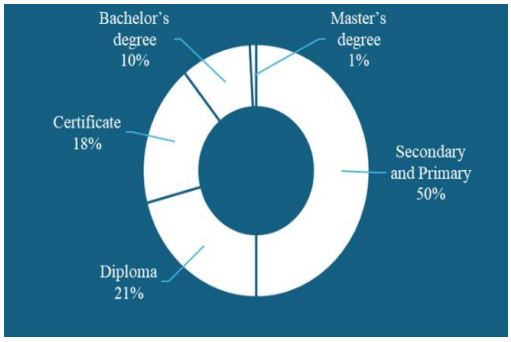

Figure 3: Position in Framing Business

Figure 4 indicates that of the 110 participants 92% have 5 hectors farms, 5% have 10 hectors, 2% have more than 20 hectors and 1% have 20 hectors.

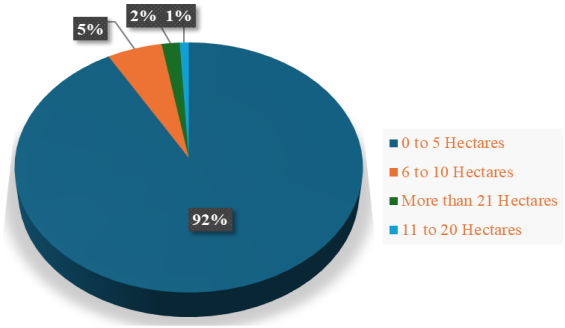

Figure 4: Farm Size for Participants

Table 1 presents the numbers of years each participant has been in the farming business. Table 1 shows that 58% of the total participants have 2 years' experience, 31.8% have between 3 to 5 years' experience and 9.1% have between 5 to 10 years' experience.

Table 1: Years in Business

	Frequency	Percent	Valid Percent	Cumulative Percent
0 to 2 Years	64	58.2	58.2	58.2
3 to 5 Years	35	31.8	31.8	90
6 to 10 Years	10	9.1	9.1	99.1
Above 10 Years	1	0.9	0.9	100
Total	110	100	100	

Figure 5 outlines that 55.5% of the participants have sales between ZMW10,000 and ZMW50,000 in period of high demand while 34.5% of the participants have sales below ZMW10,000. The findings reaffirms that the participants were indeed smallholder farmers.

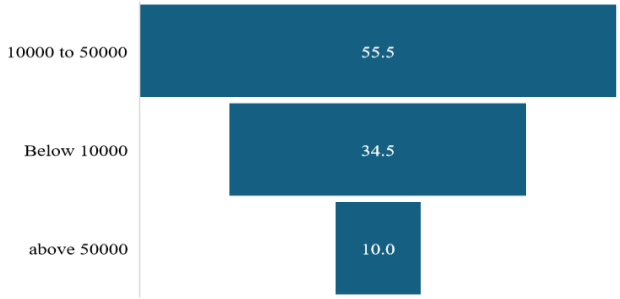

Figure 5: Average Sales Per day

4.2. Descriptive Analysis of Study Variables

Descriptive Analysis indicates that food waste along the vegetables supply chain has a mean of 3.75 representing a moderate level with a standard deviation of 0.510 and variance of 0.260. Independent variables (Market information, Packing, Transportation, Storage, Processing Linkages, Quality, and Regulations) had means ranging from 3.7 to 4 denoting small to high values. Skewness ranged from -2.530 to 2.530 implying some values were slightly skewed but not severely.

4.3. Normality Test

The Normality Test in figure 6 presents trimmed means at 5% with no extreme scores exerting significant influence on the means. Thus, data met the assumption for further analysis.

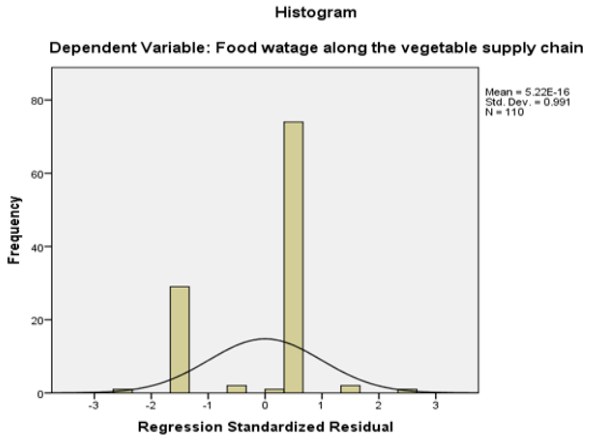

Figure 6: Regression Standard Residue

4.4. Reliability Analysis

Reliability Analysis reveals that exploratory variables except for packaging had a high Cronbach's Alpha of 0.8 implying excellent reliability and internal consistency. The KMO Test values were > 0.8 and the significant Bartletts test of sphericity $p<0.001$ signaling that the data was suitable for factor analysis.

4.5. Factors Analysis of Study Variables

Table 2 presents Factor Analysis indicating that independent variables Market information, Packaging, Transportation, Quality, Storage, Processing Linkage and Regulation have Cronbach's Alpha ranging from 0.544 to 0.988 implying varying levels of internal consistency.

Table 2: Factor Analysis

Factor analysis					
Variable Description	**No. of items**	**Cronbach's Alpha**	**KMO Test**	**Bartlett's Test**	
				Ap. Chi-square	*Sig.*
Dependent variable					
Y= food wastage along the vegetable supply chain	4	0.971	0.587	975.635	0.00
Independent variables:					
X_1*= market information*	4	0.972	0.820	300.767	0.00
X_2*= packaging*	4	0.544	0.856	332.850	0.00
X_3*= transportation*	4	0.952	0.850	362.218	0.00
X_4*=quality*	4	0.972	0.847	322.192	0.00
X_5*=storage*	4	0.959	0.845	340.145	0.00
X_6*=processing linkages*	4	0.917	0.833	315.336	0.00
X_7*=regulation*	4	0.988	0.849	329.224	0.00

4.6. Correlation Analysis

Table 3 presents correlation coefficients for the dependent variable (Food waste along the vegetable supply chain) and independent variables (market information, transportation, storage, process linkage, quality and regulations). Table 2 reveals weak correlations between below 0.8 between certain variable pairs. Strong correlations above 0.7 were observed among other variables. Thus, the alternative hypothesis that processing linkage has a positive influence on food waste

along the vegetable supply chain was proved whereas the alternative hypothesis that Market Information, Packaging, Transportation, Storage and Quality has a positive influence on food waste along the vegetable supply chain was not proved.

Table 3: Pearson Correlation Analysis

Correlations among independent variables							
		Market information	Transportation	Storage	Processing linkages	Quality	Regu
Market information	Pearson Correlation	1					
	Sig. (2-tailed)						
Transportation	Pearson Correlation	.911**	1				
	Sig. (2-tailed)	.000					
Storage	Pearson Correlation	.748**	.408**	1			
	Sig. (2-tailed)	.000	.000				
Processing linkages	Pearson Correlation	.911**	1.000**	.408**	1		
	Sig. (2-tailed)	.000	.000	.000			
Quality	Pearson Correlation	1.000**	.911**	.748**	.911**	1	
	Sig. (2-tailed)	.000	.000	.000	.000		
Regulation	Pearson Correlation	.913**	.665**	.953**	.665**	.913**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed).							

4.7. Regression Analysis

Table 4 indicates the model that predictors such as regulations and procession linkage have a significant proportion of variance on food waste along the vegetables supply chain with R2 = 0.110, F (2,102) = 6.625, p = 0.002. The adjusted R2 value 0.094 and the significant F value indicates that the regression model is a better or moderate fit (Ajirowo, 2024).

Table 4: Regression Model Summary

Model Summary[b]									
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	.332[a]	.110	.094	.486	.110	6.625	2	107	.002
a. Predictors: (Constant), Regulations, Processing linkages (units)									
b. Dependent Variable: Food wastage along the vegetable supply chain									

Table 5 presents unstandardized (B) and standardized (Beta) coefficients for predictors. The results show that Processing Linkages has a positive effect on food waste along the vegetable supply chain with B=0.918, Beta = 0.417 and p = 0.001 whereas Regulation has a non-significant effect on food waste along the vegetable supply B=0.354, Beta = -0.163 and p = 0.186.

Table 5: Model Coefficient

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.474	.883		1.668	.098		
	Processing linkages (units)	.918	.269	.417	3.416	.001	.558	1.791
	Regulations	-.354	.266	-.163	-1.332	.186	.558	1.791
a. Dependent Variable: Food wastage along the vegetable supply chain								

Therefore, processing linkage was found to be a significant predictor of food waste along the vegetable supply chain. Thus, focus should be drawn on processing linkage as a key area to mitigate food waste. Notwithstanding, it is important to note that market information, packaging, transportation, quality and regulation cannot be ignored when addressing processing linkage as they form part of the supply chain mix.

5. Conclusion and Recommendations

The study assessed the factors causing food waste along the vegetable supply chain at Soweto Market in Zambia. The results highlighted the criticality of processing linkage along the vegetable supply chain. The study suggests that regulation, although not significant, still plays a key role in reducing food waste along the vegetables supply chain. Important to note is that secondary data source through literature review pointed to the fact that factors such as market information, packaging, transportation, storage, quality and regulations cause food waste along the vegetables. The study in this case concludes that within processing linkage there are other subcomponents such as market information, packaging, transportation, storage, quality and regulations that should be addressed to enhance processing linkage. Thus, sales managers for smallholder farmers at Soweto Market should employ their efforts to reach out to processers and demonstrate the capacity to meet their needs. Policy makers identify the key stakeholders for the purpose of developing regulations to enhance standards in the vegetable supply chain at Soweto Market.

The Limitation of the study is that its sample size was limited to 110 respondents focused on Soweto market. Future studies should consider larger samples size with industry generalization. The study noted that the area of study is one that is merging hence most of the studies on the topic or similar topics were very few and most cases done with financial support. Thus, it was challenging to search for local literature on the topic. The study suggests that this area of study be explored more as it has an immediate impact on the viability of the agriculture sector which the Government of the republic of Zambia has been emphasizing to adopt as part of diversification from mining.

Acknowledgement

This study is part of the requirements for the award of Master of Science Degree in Operations, Projects, and Supply Chain Management by the University of Zambia.

Declaration of competing interest

The authors declare that they are not aware of any competing financial interest or personal relationships that may have influenced the work described in this document.

Fundings

The research did not receive any financial support or grant from any public or private, nonprofit, commercial funding organization

References

ACIAR, 2023. Managing Food Value Chains for Improved Nutrition for Urban Vulnerable Populations in Lusaka City (Zambia) (AfricitiesFood) , LUSAKA: Australian Centre for International Agricultural Research (ACIAR).

Adelodun, B., Kim, S. H. & Choi, K.-S., 2021. Assessment of food waste generation and composition among Korean households using novel sampling and statistical approaches. Waste Management, Volume 122, pp. 71-80.

African Farming, 2023. COMESA TIPS ZAMBIA ON TOMATO VALUE ADDITION, Lusaka: African Farming.

Ajirowo, W. O., 2024. Assessment of Entrepreneurial Ecosystems and SMEs' Growth in Ilorin Metropolis, Kwara State. African Journal of Management and Business Research, 15(1), pp. 3027-2971.

Anand, S. & Barua, M., 2022. Modeling the key factors leading to post-harvest loss and waste of fruits and vegetables in the agri-fresh produce supply chain. Computers and Electronics in Agriculture.

Aschemann-Witzel, J., Hooge, I. d. & Normann, A., 2016. Consumer-Related Food Waste: Role of Food Marketing and Retailers and Potential for Action. Journal of International Food & Agribusiness Marketing, 28(3), pp. 271-285.

Augustin, M. et al., 2020. Recovery of wasted fruit and vegetables for improving sustainable diets. Trends in Food Science & Technology, Volume 95, pp. 75-85.

Barratt, M. & Barratt, R., 2011. Exploring internal and external supply chain linkages: Evidence from the field. Journal of Operations Management, 29(5), pp. 514-528.

Batt, P. & Cadilhon, 2007. Fresh produce supply chain management: overview of the proceedings and policy recommendations. Agricultural and Food Market, pp. 8-22.

Bernstad, A. K., Cánovas, A. & Valle, R., 2017. Consideration of food wastage along the supply chain in lifecycle assessments: A mini-review based on the case of tomatoes. Waste Management & Research, 35(1), pp. 29-39.

Bozdağ, A. N. S. & Çakiroğlu, F. P., 2021. Determination of the factors affecting the Amount of food waste generated from households in Turkey. Future of Food: Journal on Food, Agriculture & Society.

Bravi, L., Francioni, B., Murmura, F. & Savelli, E., 2020. Factors affecting household food waste among young consumers and actions to prevent it. A comparison among UK, Spain and Italy. Resources, Conservation and Recycling, Volume 153.

Cong, Q. & Chau., P. Y., 2012. Relationship, contract and IT outsourcing success: Evidence from two descriptive case studies. Decision Support Systems, Volume 9, pp. 859-86.

Dubey, S. et al., 2020. A BRIEF STUDY OF VALUE CHAIN AND SUPPLY CHAIN. Agriculture Development and Economic Transformation in Global Scenario, pp. 177-183.

Duque-Acevedo, M., Belmonte-Ureña, L. J., Terán-Yépez, E. & a, F. C.-F., 2022. Sustainability and circularity in fruit and vegetable production. Perceptions and practices of reduction and valorization of agricultural waste biomass in south-eastern Spain. Journal of Environmental Management, Volume 316.

Etim, D. G. S. & Kajang, J. L., 2019. MARKETING DETERMINANTS AND TEACHERS' JOB PERFORMANCE IN UNIVERSITY OF CALABAR - NIGERIA. British Journal of Marketing Studies (BJMS), 7(2), pp. 62-70.

FAO, 2019. The State of Food and Agriculture 2019. Moving forward on food loss and waste reduction, Rome: Food and Agriculture Organization of the United Nations.

FVAZ, 2023. 'SET UP TOMATO PROCESSING PLANT' [Interview] (Thursday August 2023).

Gardas, B. B., Raut, R. D. & Narkhede, B., 2018. Evaluating critical causal factors for post-harvest losses (PHL) in the fruit and vegetables supply chain in India using the DEMATEL approach. Cleaner Production, Volume 199, pp. 47-61.

Gereffi, G. & Lee, J., 2009. A GLOBAL VALUE CHAIN APPROACH TO FOOD SAFETY AND QUALITY STANDARDS, s.l.: Global Health Diplomacy for Chronic Disease Prevention Working Paper Series.

Göbel, C. et al., 2015. Cutting Food Waste through Cooperation along the Food Supply Chain. Sustainability, 7(2), pp. 1429-1445.

Gruber, V., Holweg, C. & Teller, C., 2016. What a Waste! Exploring the Human Reality of Food Waste from the Store Manager's Perspective. Journal of Public Policy & Marketing, 35(1), pp. 3-25.

Guarnieri, P., Aguiar, R. C. C. d., Thomé, K. M. & Watanabe, E. A. d. M., 2021. The Role of Logistics in Food Waste Reduction in Wholesalers and Small Retailers of Fruits and Vegetables: A Multiple Case Study. Logistics, 5(4).

Gustavsson, J. C. C., Sonesson, U., Otterdijk, R. V. & Meybeck, A., 2011. Global Food losess and food waste, s.l.: s.n.

Hichaambwa, M. & Tschirley, D. .., 2010. How are Vegetables Marketed into Lusaka? The Structure of Lusaka's Fresh Produce Marketing System and Implications for Investment Priorities. Gates Open Res, pp. 1092-2016-87669.

Hichaambwa, M. & Tschirley, D., 2006. Zambia horticultural rapid appraisal: understanding the domestic value chains of fresh fruits and vegetables. No. 1093-2016-88053.

Idah, P., Ajisegiri, E. & Yisa, M., 2007. Fruits and Vegetables Handling and Transportation in Nigeria. Department Agricultural Engineering, Federal University of Technology Minna, Niger State, Nigeria , 10(3), pp. 175-183.

Jama, E. M., Mwanza, B. G. & Mwanaumo, E. M., 2024. Strategies for E-Procurement Adoption by Small and Medium-sized Enterprises: Insights from South Sudan. African Journal of Commercial Studies, 4(3), pp. 207-224.

Kaipia, R., Dukovska-Popovska, I. & Loikkanen, L., 2013. Creating sustainable fresh food supply chains through waste reduction. International Journal of Physical Distribution & Logistics Management, 43(3), pp. 262-276.

Knoema, 2021. Available at: https://knoema.com/atlas/Zambia/topics/Agriculture/Crops-Production-Quantity-tonnes/Vegetables-primary-production. [Online] Available at: Available at: https://knoema.com/atlas/Zambia/topics/Agriculture/Crops-Production-Quantity-tonnes/Vegetables-primary-production [Accessed 2024].

Kyriacou, M. C. & Rouphael, Y., 2018. Towards a new definition of quality for fresh fruits and vegetables. Scientia Horticulturae, Volume 234, pp. 463-469.

Magalhães, V. S., Ferreira, L. M. D. & Silva, C., 2021. Using a methodological approach to model causes of food loss and waste in fruit and vegetable supply chains. Journal of Cleaner Production.

Maina, S. & Mwangi, M., 2008. Vegetables in East Africa. Elewa Publications, Farming Resources Series.

Manalili, N., Dorado, M. & van Otterdijk, R., 2014. Appropriate Food Packaging Solutions for Developing Countries, Italy Rome: Food and Agriculture Organization of the United Nations.

Marissa, M. & Toshihiko, M., 2021. Impact of Reducing Food Wastage to the Environment and Economics: A Preliminary Finding of Indonesia Case.. Chemical Engineering Transactions, pp. 67-72.

Ministry of Agriculture and Rural Development of Vietnam, 2019. FOOD LOSS AND WASTE IN VIETNAM AND CHALLENGES OF FOOD SECURITY AND CLIMATE CHANGE, s.l.: Ministry of Agriculture and Rural Development of Vietnam.

Moraes, C. C. d. et al., 2022. Causes and prevention practices of food waste in fruit and vegetable supply chains: How is Brazil dealing with these issues?. Waste Management, pp. 320-330.

Mudau, H. C., 2022. Food waste management challenges within a fruit and vegetable processing plant in Gauteng. University of Johannesburg.

Mwanza, B. G., Arnesh, T., Mbohwa, C. & Chuks, M., 2019. Value Addition to Plastic Solid Wastes: Informal Waste Collectors Perspective. 16th Global Conference on Sustainable Manufacturing- Sustainable Manufacturing for GLobal Circular Economy, Volume 33, pp. 391-397.

Mwanza, B. G. & Telukdarie, A., 2022. Supply chains risks: an interpretative structural modelling approach. Int. J. Supply Chain and Operations Resilience,, 5(2).

Narrod, C. et al., 2009. Public–private partnerships and collective action in high value fruit and vegetable supply chains. Food Policy, 34(1), pp. 8-15.

Negi, S. & Anand, N., 2016. Factors Leading to Losses and Wastage in the Supply Chain of Fruits and Vegetables Sector in India. Energy, Infrastructure and Transportation "Challenges and Way Foreward ", pp. 89-105.

Nyawali, J., 2018. Impact of urbanisation on vegetable cultivation and supply for the traditional markets in Zambia: a case study of selected markets in Lusaka District. University of Cape Town ,Faculty of Science ,Department of Environmental and Geographical Science.

Olaniyan, A. M. & Omoleyomi, B. D., 2013. Characteristics of Okra under Different Process Pretreatments and Different Drying Conditions. Food Processing and Technology, 4(5).

Onwude, D. I. et al., 2020. Recent Advances in Reducing Food Losses in the Supply Chain of Fresh Agricultural Produce. Advances in Postharvest Process Systems, 8(11).

Ortiz-Gonzalo, D. et al., 2021. Food loss and waste and the modernization of vegetable value chains in Thailand. Resources, Conservation and Recycling, Volume 174.

Phiri, A., 2010. Post-harvest Losses of Fruites and Vegetables in Zambia. Technology on Reducing Post-harvest Losses and Maintaining Quality of Fruits and Vegetables Proceedings of 2010 AARDO Workshop, pp. 197-204.

Pradhan, S. et al., 2020. Optimization of process and properties of biochar from cabbage waste by response surface methodology. Biomass Conversion and Biorefinery , Volume 12, p. 5479–5491.

Raak, N. et al., 2017. Processing- and product-related causes for food waste and implications for the food supply chain. Waste Management, Volume 61, pp. 461-472.

Raut, R. D., Gardas, B. B., Narwane, V. S. & Narkhede, B. E., 2019. Improvement in the food losses in fruits and vegetable supply chain - a perspective of cold third-party logistics approach. Operations Research Perspectives, Volume 6.

Raut, R. & Gardas, B. B., 2018. Sustainable logistics barriers of fruits and vegetables: An interpretive structural modeling approach. Benchmarking: An International Journal, 25(8), pp. 2589-2610.

Ribeiro, I., Sobral, P., Peças, P. & Henriques, 2018. A sustainable business model to fight food waste. Journal of Cleaner Production, Volume 177, pp. 262-275.

Richter, B., 2017. Knowledge and perception of food waste among German consumers. Journal of Cleaner Production, Volume 166, pp. 641-648.

Sagar, N. A. et al., 2022. Onion waste based-biorefinery for sustainable generation of value-added products. Bioresource Technology, Volume 362.

Somashekhar, C. I., J.K.Raju & HemaPatil, 2014. Agriculture Supply Chain Management: A Scenario in India. Research Journal of Social Science and Management, 4(7).

Stancu, V., Haugaard, P. & Lähteenmäki, L., 2016. Determinants of consumer food waste behaviour: Two routes to food waste. Appetite, Volume 96, pp. 7-17.

Surucu-Balci, E. & Tuna, O., 2021. Investigating logistics-related food loss drivers: A study on fresh fruit and vegetable supply chain. Journal of Cleaner Production.

Valery, N., 2023. Assessment of the food losses and waste along the tomato and carrot value chain in Sweden: A value chain analysis approach. Department of Earth Sciences, p. 62.

Verghese, K., Lewis, H., Lockrey, S. & Williams, H., 2015. Packaging's Role in Minimizing Food Loss and Waste Across the Supply Chain. Packaging technologyn and science, 28(7), pp. 603-620.

Vincent Corporation, 2003. Vincent Corporation. [Online] Available at: https://www.vincentcorp.com/content/onion-waste/#:~:text=One%20very%20challenging%20application%20has,with%20top%20and%20bottom%20trims). [Accessed 20 December 2023].

Yazid, M., 2022. Factors Affecting Food Waste In Traditional Markets In Prabumulih City of South Sumatra, Indonesia.