FACTORS OF FOOD LOSS AND WASTE AT MARKET LEVEL IN KENYA: A CASE OF WAKULIMA MARKET, NAIROBI COUNTY

By

Gladys Wairimu Mariga

This dissertation is submitted in partial fulfilment of the requirements for the award of a Master of Development Studies (MDS) Degree from St. Paul's University

ST.PAUL'S UNIVERSITY

September, 2016

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Supervisor: Rev. Dr. Nason Vundi

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DECLARATION

This dissertation is the product of my own work and is not the result of anything done in collaboration. It has not been previously presented for a degree in any other university. I agree that this dissertation may be available for reference and photocopying, at the discretion of the University.

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SIGNATURE OF STUDENT _____ _____ Date_____

I confirm that the work reported in this thesis was carried out by the student under my supervision. This dissertation has been submitted for examination with my approval as the University Supervisor.

SIGNATURE OF SUPERVISOR_____ Date_____

Rev. Dr. Nason Vundi

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DEDICATION

This research is dedicated to women and men at all markets who despite various challenges work tirelessly towards positive well-being; my husband Albert Gatumu; and those who are involved in the achievement of the Great Balancing Act, for the fulfilment of humanity.

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ABSTRACT

Food loss and waste is a global issue that needs to be understood in order to improve the efficiency of the food system. In comparison to other stages of the value chain, food loss and waste that occurs at the market so far has not received much consideration. The general purpose of this study was to assess factors of food loss and waste at the market level in the Kenyan Wakulima market, Nairobi County. The 3 objectives of the study were to establish the types of food loss, to investigate the main factors of food loss and to identify interventions in place for reducing food loss and waste. A descriptive survey was used to assess factors contributing to wastage. The sample size was 177 respondents. However, 157 respondents were reached. Stratified sampling technique was used to select the sample size. Questionnaires were used to collect primary data on types of food wastage. Key informants interview were also conducted for the purpose of collecting data. Quantitative data from questionnaire items was analyzed using Statistical Package for Social Sciences (SPSS Version 20) software while qualitative data was analyzed using descriptive statistics of frequencies and percentages. Tables have been used to summarize and illustrate the findings of the study. Library research was also done so as to provide secondary data with regard to existing knowledge. The findings of the study were that the prevalence of types of wastage are rotting, breakage, rat bite and mould in that order. There are various factors contributing to food wastage. , mango and orange were confirmed to have the highest losses through over ripening and crashing, while water melon was noted to have the least wastage through rain contact which revert the ripening process causing rotting. The other factor contributing to food loss and waste are breakages that occur during moving of FFV while being moved to other parts of market and rotting of fruits and vegetables, which is caused by rain. The occurrence of wastages also depends on the season where during the rainy season more wastage is experienced. On the investigation of the available intervention to reduce food loss, there was minimal intervention since respondents reported a need to increase market space, installation of conditioning facilities, frequent garbage collection, improvement of drainage, daily market cleaning and frequent fumigation. The study derived recommendations that participation of traders and all actors would be key towards achieving food wastage reduction. Training of the traders on food wastage and exchange programmes to enable the traders and leaders learn new experiences. The East African Community to work together towards improving fair trade by control of quality and proper packaging.

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TABLE OF CONTENTS

DECLARATION iii
DEDICATION iv
COPYRIGHT v
ABSTRACT vi
ACKNOWLEDGEMENT vii
TABLE OF CONTENTS viii
LIST OF TABLES x
LIST OF FIGURES xi
ABBREVIATIONS/ACRONYMS xiii
CHAPTER ONE : INTRODUCTION 1
1.1. .Introduction 1
1.2. Background to the Study 1
1.3 .Problem Statement 5
1.4.General Purpose of the study 6
1.5. Research Objectives 6
1.6.Research Questions 6
1.7.Significance of the Study 6
1.8.Scope and Limitations of the Study 7
1.9.Assumptions of the Study 8
1.10. Operational definition of key terms 8
CHAPTER TWO : LITERATURE REVIEW 10
2.1. Introduction 10
2.2. Conceptual Clarifications 10
2.3. Food loss and waste in Kenya 11
2.4. Types of food loss and waste 12
2.5.Identification of the causes of food loss and waste 12
2.6. Implications of food loss and waste 19
2.7. Prevention of food loss and waste 21
2.8. Theoretical Framework 22

ST. PAUL'S UNIVERSITY

2.9.Conceptual Framework 24
2.10. Existing literature gaps……25
2.11. Conclusion……26
CHAPTER THREE: RESEARCH METHODOLOGY 27
3.1. Introduction..... 27
3.3. Research Design 28
3.3.1. Target Population..... ……29
3.3.2. Sampling Techniques and Sample Size.. 29
3.4. Data Collection Procedures and Techniques 31
3.5. Pilot Study……...32
3.6. Analysis of Data and Presentation 33
3.7. Ethical Consideration..... 34
3.8. Conclusion 35
CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION .. 36
4.1. Introduction..... 36
Demographic characteristics of the respondents……....37
4.3. Types of food loss and food waste..... 43
4.4. Loss and wastage.....44
4.4.Causes of food loss and waste 47
4.5.Intervention measures for food loss and waste reduction at Wakulima market 51
CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSSION AND RECOMMENDATIONS……...……..…59
5.1 Introduction..... 59
5.2 Summary..... 59
5.3 Conclusions..... 60
5.4 Recommendations..... 61
5.5. Recommendation for further research 62
REFERENCE LIST…….....63
APPENDIX I: Questionnaire for wholesale and retail traders……...70
APPENDIX II: Key Informants Interview Schedule……...75
APPENDIX II: St. Paul's University Research Authority ……..70

ST. PAUL'S UNIVERSITY

APPENDIX IV: NACOSTI Research Permit……...75
APPENDIX V: NACOSTI Authority Letter……..…79
APPENDIX VI: Nairobi County Research Authority..... ……**80**

ST.PAUL'S UNIVERSITY

LIST OF TABLES

Table 3.1: Target Population 29
Table 3.2: Population Sample Frame 30
Table 4.1: Gender of the respondents 37
Table 4.2: Age Categories of the Respondents 38
Table 4.3: Marital Status of the Respondents 39
Table 4.4: Level of Education of the Respondents 40
Table 4.5: Size of Household 41
Table 4.6: Incomes of Respondents 42
Table 4.7: Duration of Trade 43
Table 4.8: Awareness of Food Loss and Waste 43
Table 4.9:Types of fresh fruits and vegetables traded in Wakulima Market 44
Table 4.10: Types of food loss and food waste in Wakulima Market 45
Table 4.11: Standing on food wastage at Wakulima market 47
Table 4.12: Occurrence of food wastage at Wakulima market 48
Table 4.13: Accidental or voluntary wastage by respondents 49
Table 4.14: Standing on food loss and wastage at Wakulima market 49
Table 4.15: Accidental or voluntary wastage by respondents 50
Table 4.16: Problems faced in Fruits and vegetables handling 52
Table 4.17: Conditioner Facilities used at the Market 54
Table 4.18: Training offered by County Government 55
Table 4.19: Measures in place to reduce food loss and Waste at Wakulima Market 56
Table 4.20: Possible solutions to the problems at Wakulima Market 58

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LIST OF FIGURES

Figure 2.1: Conceptual Framework 25

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ABBREVIATIONS/ACRONYMS

ADB	Asia Development Bank
CFS	Committee on World Food Security
DESA	Department of Economic and Social Affairs of the United Nations
EAC	East African Community
EALA	East African Legislative Assembly
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FLW	Food Loss and Waste
FFV	Fresh fruits and vegetables
FSC	Food Supply Chain
HLPE	High Level Panel of Experts
KIIs	Key Informant Interviews
MGI	McKinsey Global Institute
POWL	Purdue Online Writing Lab
RSA	Research Solutions Africa
RUAF	Resource Centre on Urban Agricultural and Food Security
SSA	Sub-Sahara Africa
SLA	Sustainable Livelihood Approach
SPSS	Statistical Package for Social Science
UK	United Kingdom
UNEP	United Nations environmental Programme
USAID	United States Agency for International Development
WRAP	Waste and Resources Action Programme

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CHAPTER ONE

INTRODUCTION

1.1. Introduction

This chapter provide the focus and framing of the study. This includes the background of the study or problem and the problem statement. It also contains research objectives and research questions as well as the significant of the study, scope and limitation as well as the assumptions of the study, operational definition of key terms and a conclusion..

1.2. Background to the Study

Food loss and waste (FLW) is not only a global but also a profoundly contemporary phenomenon, but which is the least understood. There is consensus that the world is undergoing an extreme food shortage throughout the entire supply chain. According to 2016 Global Food Policy Report, the common and substantial problem of food loss and waste pose numerous challenges to food security and sustainability in the world. For instance, Food and Agriculture Organization (FAO) estimates that one-third of food produced all over the world is wasted annually (FAO, 2011). Several other estimates show similar range, for instance, in industrialized countries food waste is about 222 million tonnes. According to UK Waste and Resources Action Programme (WRAP), food wasted per year in the UK alone is 22-25% of that purchased (by weight) in the UK (WRAP 2009). Yet food loss and waste may not necessarily point to a similar phenomenon since they have different causes and as a result they require different definitions and solutions. Precisely, food loss refers to food that spills, spoils and acquires an uncharacteristic decrease in quality such as bruising or wilting, or otherwise food gets lost before it reaches final stage of the food chain (Lipinski, et al., 2013, p.1). Usually, food loss is the unintended outcome of the practices that are undertaken during production and the agricultural process or limitation arising from storage, infrastructure, packaging or marketing (Mejia-Lorio and Njie, 2012**)**. In contrast, food waste refers to good quality food fit for human consumption but which is not consumed because it is discarded either before or after it spoils (Lipinski, et al., 2013, p.1). Even so, both food loss and waste are related since they both take place almost simultaneously along food supply chains (FAO, 2012). Also, they contribute to a situation where people are denied access to the food they need for both consumption and economic

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empowerment. Both contribute to the necessity of substantially reducing the quantity of food lost and wasted (DESA 2013), especially at the market level and which has received little or no attention at all.

As noted above, food loss and waste is a global phenomenon, but research has demonstrated that Sub-Sahara Africa (SSA) has one of the highest prevalence of hunger and starvation affecting almost one in every four people. While this is very alarming, it is worsened by the observation that between 30% and 40% of food produced for human consumption is lost or wasted. This is different from the industrialized countries where much less food is lost and wasted at the consumer level. However, in SSA, the causes of food loss and waste mainly range from poor harvesting practices, careless handling of produce and inadequate or lack of proper storage facilities as well as transportation (Parfitt, Barthel and Macnaughton, 2010, p, 17; Spooner 2014). Nigeria provides a good illustration of food loss and waste in SSA. While the country is ranked 16th on the global tomato producing scale, accounting for 1.2% of world production of tomatoes, unfortunately, 45% of tomatoes harvested in the country is lost due to poor Food Supply Chain (FSC) management (Spooner 2014). This equally applies to other African countries, where figures could even be higher.

Kenya too is not an exception since estimates show that about 40 tons of food is lost and wasted per week (UNEP News Centre, 2013). It is on record that several Kenyan horticultural companies have claimed to have, on average, wasted between 15-35% of their crops due to the high conditions set for them by the European Union if they are to appear in European supermarkets. The same is in line with fruits and vegetables produced in Kenya and taken to Europe, Middle East, South Africa and South East Asia. It is approximated that 35%-40% of food waste occurs in these destinations (Spooner 2014). According to Winkworth-Smith, Foster and Morgan (2015), in Kenya more than 90% of fruits and vegetables are consumed locally and the majority of the exports sold to the European market. However 10.8 million people or a quarter of the total population go without food because of starve because of recurrent droughts facing the country, high cost of food production and high levels of food wastage, which is estimated to be between 20–50%.

While the above data on food loss and waste is caused by factors that are external and may require intervention through inter-governmental trade treaties, data on food loss and waste in Kenyan urban

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markets is certainly inadequate despite the fact that most post-harvest losses are experienced at the selling points mainly in urban centres (FAO 2014). This is surprising seeing that the global nature of food loss and waste has also been noted in urban markets all over the world. According to Elizabeth Royte (2014), high levels of food waste are not only on farms but also in wholesale and retail markets. She observes that unsold tomatoes fill the dumpster at a farmers market and so about 26% of fresh tomatoes never make it to the hands of the consumer.

The major problem on this is that strategies to reduce food loss and waste at the market level are complicated by the fact that much concentration has been dedicated on the other levels of food loss and waste. An, (2015) note that the majority of strategy for food loss and waste reduction is implemented at the institutional level and mostly focuses on the loss at the primary (i.e., agricultural production and post-harvest) and finish stages (i.e., food service and household consumption) of the food supply chain. The author continues to note that in comparison with other stages of the value chain, food loss and waste that occurs at the production level so far has not received much consideration because of its predictability. This may equally represent the situation on food loss and waste at the market. In a summary of the studies related to food loss and waste from 2004–2014, he noted improper markets, as a cause of food loss and waste without showing its frequency. He has also identified barriers to reduction of food loss and waste, which include lack of market access, inadequate storage and transport, infrastructures and fluctuating market price. Feedback Global (2015) notes that while there is an amount of food loss and waste both at harvesting and storage stages, food loss and waste at the market level is of high proportions due to marketing conditions.

The observation that most of the cited authors continue to make is that the few storage facilities make it very hard to preserve the overabundance harvest that are brought to the markets and which leads to high loss due to the lack of cold storage. Royte (2014) indicates that high levels of food waste are not only on farms but also in wholesale and retail markets. Munesue, Masui and Fushima (2014) indicate that food loss reduction is of great benefit to all actors in the food production and supply chains, to food security for poor people, improve climate resilience. Yet the information with regard to causes of food loss and waste as well as the barriers to the reduction of food loss and waste, especially at the Kenya urban market level, has not been sufficiently documented. However,

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this does not minimize the need to improve the efficiency of food system and to create awareness to food loss and waste at the market level in Kenya.

The Global Food Policy Report (2012) notes that to improve the good organization of food system and creating awareness to the types of food loss and wastage are an important aspect since the food chain has different levels of loss and wastages. The report continues to note that fresh fruits and vegetables contributed the greatest wastage. Research Solutions Africa (RSA) Ltd (2015) confirms this in noting that there are significant inefficiencies in the value chain in Kenya, particularly in marketplaces with regard to tomatoes, one of the most highly consumed vegetable. Tomatoes are grown for fresh market, processing and export market. However, during peak seasons most farmers sell their tomatoes at a throw away price while a substantial quantity also goes to waste since it is highly perishable. Therefore, as FAO (2014) notes, the exact causes of food losses and wastage vary throughout the world and are very much dependent on the specific conditions and local situation in a given country, region or production area. The report continues to note that food wastage and their prevention have an impact on the environment and climate change, food security and livelihoods for poor people. The cost of the solutions must not exceed the food loss and waste itself, should not compromise the health of consumers, should not burden the environment and should make more unnecessary food available to the people.

Despite the fact that there could be no concrete data with regard to food loss and waste in Kenyan urban markets, it is overwhelmingly probable that the percentage could be higher than that of markets in developed countries. FAO (2012) notes that the amount of food wasted in developed countries is lesser than that wasted in developing countries. FAO's recent estimations show that the weight of food wasted per capita by consumers in Europe and North America is indeed minimal when compared with the figures representing sub-Saharan Africa and South-East Asia. Also, in spite of various strategies by the government of Kenya and NGOs, the level of food loss and waste is still very high especially in urban markets. Yet various studies that have been undertaken to assess the quantities of food loss and waste have been at a national level and based on review of literature, statistical data, and stakeholder interviews. Also, studies that have been conducted mainly focus on the first world countries, whose context is different from that of third world countries. In addition, as noted above, most studies have concentrated on the initial stages of the food chain and

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not at the market and consumption levels. Apparently, a comprehensive analysis of this information revealed the existence of knowledge gap, which requires imminent attention if factors of food loss and waste are to be assessed with an aim of minimising food loss and waste in Kenya urban markets. There is no doubt therefore that food loss and waste is generally a global thorny issue, and which is particularly evident in Kenya. In fact, it is a scandal that so much food is wasted in a country with millions of people going to bed hungry every night. The problem is that research on food loss and waste at the urban market levels and what should be done to arrest the situation has not been done adequately, especially in Sub-Sahara Africa.

1.2. Problem Statement

As noted above, in Kenya, like all developing countries, food loss and wastage is a huge problem that require urgent attention because it has negative effects on the livelihood of the poor, on the environment, and food security (FAO 2012). Gustavsson et al., (2011) similarly note that the effect of food loss and wastage on food security, environment and economic development is enormous. The problem is that the wasted food in some parts of Kenya is used to feed cows and pigs in a country where 1.3 million people are food insecure and in need of assistance (Spooner, 2014). This serves as evidence that food loss and waste in Kenya is not well construed despite the growing public concerns in recent years. In particular, the prevalence of food loss and waste in Kenyan urban markets has not been studied extensively. Previous research has also noted that for a long time, research on food loss and wastage has mainly concentrated on the assessment of the best ways for improving food banks and food security (Munesue et al., 2014; Barilla, 2013; McPherson 2006). Yet, to the best of the researchers' knowledge, none of the researches that have been done so far have sought to study food loss and waste from an urban market level. This has continued to happen despite the fact that the quantities of rejected perishables food especially fruits and vegetables alone are so large that local markets cannot handle hence ending up in the bins. This has aroused anger amongst Kenyan farmers and suppliers who must bear the costs themselves. Despite being the second-largest category by production volume, fruits and vegetables contribute the most wastage, following cereal production. Therefore, this begs the question, what is the way forward? If effective action is to be taken, understanding what food and why it is being wasted is the first place to start. This study, therefore, seeks to assess factors of food loss and waste at the market level in Kenya; a case of Wakulima market in Nairobi County. The selected food variety was fresh fruits and

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vegetables and to the best of the researcher's knowledge, there has been no similar study undertaken in this area, especially in Kenya urban markets.

1.3. General Purpose of the study

The general objective of this study is to assess factors contributing to food loss and waste at the market level in Kenya; a case of Wakulima market in Nairobi County

1.4. Research Objectives

The specific objectives of the study were:

1. To establish the types of food loss and waste at Wakulima market
2. To investigate the main factors contributing to food loss and waste at Wakulima market
3. To identify interventions in place for reducing food loss and waste at Wakulima Market

1.5. Research Questions

This study will be guided by the following research questions.

1. What are the types of food loss and waste at Wakulima market?
2. What are the main causes of food loss and waste at Wakulima market?
3. How are the factors of food loss and waste intervened at Wakulima market?

1.6. Significance of the Study

This study is significant seeing that there is minimal or no research that has been conducted on the topic of food loss and waste at the market level. This has had far-reaching implications with regard to the documentation such that food loss and waste have received little attention in terms of policy making. For that reason, the findings of this study are useful to the government because they have provided the government with a starting point from where it can come up with pragmatic policy framework and regulations that may guide in addressing and tackling food loss and waste. The study has significantly provided and contributed to strategies that Government and policy makers can utilize whilst dealing with food loss and waste challenges, which are derailing a number of businesses especially those dealing with perishable commodities.

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The findings of study are equally useful to researchers to the extent that it provide literature for future research. It is also a contribution to the body of knowledge in this area and so it may help research bodies, for instance the Kenya parliament research department to embark on doing research on legislation that can mitigate for food loss, especially where other countries are involved. The study also plays a significant role in engineering further research into other aspects of the topic under consideration, other issues that came up during the stage of data collection and were not the central focus of this research or other related topics. This would provide solutions to some of the problems related to food loss and waste.

This study is also significant to relevant government departments and other organizations such as FAO. This is because it can enable them to have a better understanding of the factors of food wastage at the urban market level. The recommendations that the researcher has arrived at can help to form the foundation for addressing the problem of food loss, which is experienced across the not only in urban markets but also in the country and the whole world.

1.7. Scope and Limitations of the Study

The study was restricted to the assessment of food loss and waste prevention at the market level. The study was limited to the Wakulima Market, which is located at the eastern part of Nairobi County, Kenya. The study focused on perishables food products particularly fruits and vegetables. This is because the nature and incidence of losses can considerably vary across commodities, particularly when comparing the perishables and non-perishables.

According to Irungu (2007), Nairobi has 10 large markets where vegetables and fruits are traded in large quantities. The researcher would have wished to undertake additional studies in more markets in Nairobi County, so that the multitude of the study results provides significance trends and solutions. However, that was not possible due to research logistics, time and financial constraints. However, Wakulima dominates overall flows of Irish potato, carrot, onion, mango, watermelon, and orange. As such, the market provided a perfect example of the extent of food loss and waste, especially in the context urban markets in developing countries such as Kenya.

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The other limitation that the study faced was caused by some of the respondents who were not willing to reveal correct information that was required for this study. However, this was solved through explaining the objectives of the study to the respondents. The present study largely relied on quantitative methodology of data collection. Key informants had a problem of participation in the study due to their busy schedules. However, in the attempt to overcome this limitation, the researcher made prior arrangements with the respondents and adhered to set schedules.

It was also impossible to cover a larger number of respondents, since gaining contact with them required considerable time, resources and other logistics. The sample for the study was comprised of 177 respondents who were fresh fruits and vegetable traders. The sample also included the County market in-charge, County market supervisors, County market attendants and County cess officers who were not traders but offered particular services in the market. This sample was only a small proportion of the entire population of about 1,670. Due to time and research logistics, the data collection was confined to only 177 respondents as indicated above.

1.8. Assumptions of the Study

The researcher's assumption was that the variables under investigation were measurable and that the instruments that were used to measure these variables were valid and reliable. The researcher also assumed that the analysis method that was used and the size of the sample were sufficient to detect relationships between variables. Also, the researcher assumed that the results were generalizable beyond the sample that was studied. Additionally, the researcher assumed that the results of the study were relevant and meaningful to stakeholders.

1.9. Operational definition of key terms

Operational definition of terms refers to the meaning of unique terns that have been used in a study and which are listed below for this study.

Food wastage	Food loss and food waste.
Perishables	Fresh fruits and vegetables
Factor	Synonym of cause

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Assessment	Identifying issues related to a subject and making a judgment

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CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

The previous chapter provided the focus and faming of this study while this chapter reviews previous studies that have been undertaken on food loss and waste. These studies were obtained from Journals, reports, books, eBooks and internet sources as well as papers presented in different forums. The chapter provides a review by way of description, summary and also critical evaluation of each work as discussed by each scholar in relation to the study. It reviews the literature on types of food loss, causes of food loss and interventions to reduce food loss and waste. This chapter also presents the theoretical framework and conceptual framework. The final section provides a summary of the review and identifies some gaps in the previous research.

2.2. Conceptual Clarifications

2.2.1 Food loss and waste

Notable empirical studies have dealt with the topic food loss and waste prevention and there is no consensus among scholars on the definition of food loss or food waste (Schneider, 2013). The problem of definition starts with the description of what makes food to be called food. According to European Commission (2002, p. 23), "Food refers to any type of edible substance or product either in the processed or unprocessed form excluding unharnessed plants or animals which are alive unless these animals are being marketed for human needs". The HLPE (2014) notes the common problems that are encountered when defining food loss and waste and which are linked cultural customs of different people. HLPE notes that in some countries, cultural customs means that specific products are not commonly intended to be consumed by people such as animal lungs or other offal, while on others; these products are used for human consumptions. Again, animals which die or killed before they are placed on the market are not seen as food. This means that, for example, male calves which are killed because they cannot be used for milk production to male chicks which are killed because they cannot be used for egg production are not included as wasted

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food resources since they are not intended to be marketed for the consumptions by human beings. In simple terms, definitions of food loss and waste vary in accordance to regions, research or theoretical perspectives and so there is no standard or universally acceptable definition. Even so, Gustavsson et al. (2011, p. 22) defines food loss as the reduction in the amount of edible food items or mass across large part of the food supply chain or system leading to edible food for human consumptive needs; whereas food waste is the edible food which takes place at the far end of food chain.

Food waste can be viewed as a sub-set of what constitute food loss, Buzby and Hyman, (2012). Wastage of food normally occurs when food which can be potentially consumed by human beings ends up not being consumed for reasons best known to entrepreneurs, policy makers, government officials, and farmers, Buzby and Hyman, (2012). But as noted above on food waster, the various definitions of food loss and waste are not uniform across the world. For example, as Waarts et al., (2011) asserts, Buzby and Hyman's (2012) definition, which is based on the Dutch's Ministry of Economic Affairs, Agriculture, and Innovation, conceptualize food waste as including quality aspects, food residues, and waste that flows apart from the normal food loss. Also, according to Quested and Johnson (2009), Wastes & Resources Action Programme (WRAP) defines waste as any food item discarded by the owner.

In general, food loss includes reduction of food which can be consumed by human beings in the entire supply chain. It occurs during the production, post harvesting stage as well as processing stages during the supply chain. This research adopted this definition because it comprehensively clarifies the concept of food waste and where it occurs. In particular, the focus of this study is at the market stage of the supply chain.

2.3. Food loss and Waste in Kenya

Like the rest of developing nations, Kenya has been experiencing huge food loss and waste especially during the harvesting process. Some of the root causes range from infestations by pests, contamination or poor handling during the storage process. According to Okoth and Kola (2012), Kenya lost about180 bags of maize in 2011 that had been held in reserve for relief purposes in Kitui in Eastern part of the country after being contaminated by aflatoxin. Although there is little

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empirical evidence that has been provided on the amount of food loss and waste, some studies have tried to shed some light on this topic. For instance, research by Colbert (2015) which concentrated on the study of Food waste in Kenya mainly sought to uncover FLW with a focus on horticultural based exports and supply chains. The author was able to reveal that superficial standard requirements are the major causes of the losses that Kenyan farmers experience, leading them to waste up to a half of their harvests. The study also observed that some of the farmers were forced to dump almost their entire crops following cancellations of their orders (Colbert, 2015). While it is clear from the majority of researches that the huge food loss and waste experienced in Kenya is mainly on cereals, nothing much seem to have been documented on fresh fruits and vegetables, which was core to this research.

2.4. Types of food loss and waste

There are various types of food loss/waste in the food supply chains (FSC) with regard to cereals, fruits and vegetable as well as animal commodities. Under Vegetable commodities and products, postharvest handling and storage lead to losses arising from spillage and degradation during handling, storage and transportation from the farm to market. In Animal commodities and products postharvest handling and storage relating to pork and poultry meat, losses are in the form of death during transport to slaughter and condemnation at slaughterhouses. For fish, losses are in the form of spillage and degradation during icing, packaging, transfer to the store and transportation after arrival (Eriksson, 2012). In the case of milk, losses are due to spillage and degradation during transportation to the distribution point. In distribution, there are losses and waste in the market system, distribution losses. Yet previous studies seem to have not comprehensively documented the extent of FLW with regards to fresh fruits and vegetables at the market level, which this research did. The market system comprises wholesalers, supermarkets, retailers and wet markets but this research concentrated on urban market with Wakulima market as its case study.

2.5. Identification of the causes of food loss and waste

Kenya, like several other developing countries in the world, conjointly loses huge amounts of food throughout post-harvesting handling, either to pests, poor storage or contamination. It is estimated that about 40 tons of food are lost in Kenya per week due to stringent demands from the markets of the European Union (EU). In 2011, for instance, several bags of maize that were meant for relief

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were destroyed in Kitui, eastern Kenya, in front of starving people of Mutomo district, who had lost their crops to drought. The main reason given was that the maize had been contaminated with aflatoxins (Okoth and Kola, 2012). However, there were no explanations what had caused the aflatoxins contamination and what was to be done to prevent this from happening. In fact, cases of aflatoxin contamination of cereals have been reported in Kenyan media almost every year after the time the Okoth and Kola did their study. Identification of the root causes of food loss and waste (FLW) is a precursor to the coming up with strategies or measures to reducing the problem as well as key priorities. A report compiled by the High Level Panel of Experts (HLPE) on Food Security and Nutrition clearly shows that the major causes of food loss and waste range from actions, diseases, pathogens, products, chemical reactions, machines, technology, logistics, causes plus those occurring from the activities during sale among others (HLPE, 2014). According to the report, the role of these precursors differs depending on how the entire production process was undertaken, the circumstance, and the level of the food chain.

Winkworth-Smith, Foster and Morgan (2015), cite several reports and authorities to show that Kenya is one of the largest producers of mangoes worldwide, with more than 0.5 million tons produced annually. However, they note that it is only 2% are exported, and which attracted a value of US$ 10 million in 2010. They also note that 5% was processed, partially due to the limited production of internationally preferred varieties and to large due to post-harvest losses of 45%, which some sources estimates being to be as high as 64% with regard to small scale farmers. They also cite a recent report that has estimated that as much as 30% of mangoes are not harvested due to market price which makes it uneconomic to harvest and that a further 30% of the remaining crop is lost during the post-harvest level, which certainly includes the market level. This happens even when mangoes have a short growing season, which results in all the fruit ripening at once, creating a surplus that cannot be marketed due to a lack of infrastructure. They were of the opinion that juicing or drying the surplus mangoes would open up new markets and help reduce their loss and waste. This is one of the rare studies that have shown the extent of the loss and waste that is incurred on mangoes during post-harvest but not on the loss and waste incurred at the market level, a gap that this study sought to address.

ST. PAUL'S UNIVERSITY

In the context of food loss and waste it would be beneficial to interpret food chain as a set of units or inter-related levels but which have a crucial point, with consideration to any action that can either cause FLW or lead to strategies for its reduction. Further, using this framework, it is possible to acknowledge that 'all the root causes are not entirely the same, (HLPE, 2014, p.39).

2.5.1. Government Policy

Government Policy can play a significant role in reducing food loss and waste. However, according to Artioch and Kornstein (2012), the regulations are weakly defined and, and the implemented regulations can thus impede innovation and trade. Tielens and Candel (2014, p. 16) similarly note that inefficient border posts cause the delay for trucks loaded with food resulting in food wastage. A country's legal system tends to have a strong bearing on the food loss and waste. In East Africa, particularly Uganda, there are several roadblocks which significantly lengthen journey time. This affects the time at which food reaches the market and as a result it may incur some loss and waste but there was no indication in these studies concerning the loss and waste that take place once food reaches the market.

In India, the government imposes limits or controls farm sizes hence creating investments difficulties and that the country's restrictions on farmers selling directly to retailers cause many additional layers in the supply chain (Artiuch and Kornstein, 2012). The Kenyan government also put levies on packages instead of considering their weights which encourage the use of large bags and consequent overfilling (Alexiades et al (2014). Precise measures to advance trade facilitation are, for example, the support for Trademark East Africa, an organization that facilitates regional trade through streamlined and simplified border regulations (Tielens and Candel, 2014). Yet, as the findings of this research below have shown, government policies with regard to food loss and waste at the market level are exceedingly wanting. The implementation of the meagre policies that are there becomes very difficult due to political interference.

2.5.2. Market Conditions and Infrastructure

Most of the farmers in developing countries rely on rain for production. This results to excess production after the rains. This applies to both horticultural produce and dairy, where there is high milk production after the rains due to increased fodder. Many horticultural products also have very

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short harvest seasons, for example, almost all mangoes from the Ivory Coast are harvested within a 4 to 6 week period in April and May, resulting in an overabundance of the fruit, with few storage facilities available to growers. The production driven market, as opposed to market driven production, leads to considerably lower prices for farmers and high levels of loss due to the lack of cold storage. In relation to infrastructure, poor road network greatly hampers the movement of food, (Artiuch and Kornstein, 2012). Approximately 2.6 billion people lack access to affordable and reliable energy services (Terrapon-Pfaff et al., 2014).

2.5.3. Insufficient management and maintenance of markets

Also included among the causes of food loss and waste are insufficient management and maintenance of markets. RSA's report of a study on fresh vegetables market in Kenya notes that poor physical infrastructure limits efficient food distribution and market access by farmers in areas with excess production. RSA also notes that many markets have insufficient management and maintenance, despite the fact that local authorities concerned often collect fees or levies, which according to the researcher's observation at Wakulima market during the time of collecting data, was done on daily basis. Also, market information systems remain inadequate hence unable to serve the needs of various users of agricultural information concerning the occurrences at the market level. RSA further notes that post harvest losses during transport and offloading are high and wholesalers, who already share a lopsided amount of the risk within the value chain, set prices that reflect these losses. Wholesale prices also reflect the costs absorbed by wholesalers to pay for services that should be provided by market management such as sanitation, trash removal and security.

2.5.4. Storage Conditions

Optimal storage conditions and good condition of the food item after harvesting enables food to be stored for a reasonable period as this helps in minimizing loss as it also enables the traders to delay marketing of their perishable items (Development, 2012). The lack of optimal storage units leads to significant losses. However, it is important to note that the shelf life depends on the prior activities of the supply chain. In the industrialized, storage facilities are quite modern right from the farm to the market level. Traders are facilitated with cold storage together with post-harvest technologies that enable to extend the shelf- life of perishable foods. In the third world countries, the major cause

ST PAUL'S UNIVERSITY

of post-harvest losses is poor storage facilities. Liu (2014) affirms that the most cause of post-harvest losses is poor storage and mostly cold storage technology is not existent or inadequate for the majority of smallholder farmers in the less developed world. Fruits and vegetables are highly perishable items so they need proper storage equipment with better conditions which mainly include temperature, relative moisture and gas composition. Proper initial storage needs to be put in place to prevent perishable items from easily going bad within a short time leading to loss (Rolle, 2006; Stuart, 2009). In the absence of proper storage facilities for perishable items, the traders in many cases experience losses.

2.5.5. Poor handling in the market

The retailers have the power to dictate the quality of the items displayed in their stalls and can, therefore, control the activities of the supply chain. The way in which the food is handled together with the conditions within the retail outlets such as relative humidity, ventilation as well as temperature has a great effect on quality, shelf-life and acceptability of the product (Prevention of Post-harvest Food Losses, 2010). Fruits and vegetables experience the highest losses at the market level. Losses and wastages at the retail and wholesale market level are even greater with poor packaging, poor temperature control, and absence of appropriate display to minimize handling by buyers. It also helps to have clean water in the markets which traders sprinkle on fruits and vegetables to avoid wilting and shrivelling under the hot sun. In the third world, water is scarce and this leads to unsafe foods that are rejected by customers and may end up being discarded due to the unclean water that is used. Some of the factors that are seen to contribute significantly to the heavy losses at the retail and wholesale market level include poor product display and efforts to foresee expectations of customers, including for convenience. Equally, water can damage fresh products given that too much water or any other liquid that gets into contact with fresh products encourages the growth of mould and other micro-organism that contribute to the deterioration of the texture of fruits or vegetables. This therefore means that the contact of water or any other liquid must be discouraged at the market level (James and Ngarmsak 2011).

Fruits and vegetables entail retailing fresh looking heaps that attract customer offering them a chance to choose fruits at different ripening stages (Prevention of Post-harvest Food Losses, 2010). Sometimes this may prompt harvesting of immature fruits hoping that they will ripen at different

ST. PAUL'S UNIVERSITY

stages. There is no doubt that the maturity of fruits and vegetables can affect their quality. Immature fruit more often than not lack flavour and can arouse complaint from consumers. Again, immature fruits could cause health problems because they are known to contain materials that can interfere with the normal human health. However, the maturity of fruits decreases the prevalence of these unhealthy materials. It is also advisable not to deal with overripe fruits because they are highly prone to damage during cutting hence unfit for any kind of processing as a final product for sale at the market level (James and Ngarmsak 2011). As such, the trend of retailing fresh looking heaps of fruits and vegetables is deceptive and it can lead to losses in three different ways at market level. Firstly, the fruits and vegetables are crushed under the weight of the heavy heap. Secondly, the riper fruits produce ethylene and affect the shelf life of the unripe fruits, which would otherwise keep longer. Thirdly, there is lower respiratory rate and mechanical damages as the buyers comb through the heap.

The trend adopted by traders in demanding identical and excellent products have made most retailers to set unrealistic standards for products supplied by the producer. This is a major factor that contributes to food loss and waste because failure to maintain such standards by the producers leads to rejection at delivery or plucking of the displayed products. This has led most retailers to experiment the fresh-cut where they pack the fruits and vegetables in bags or baskets to address the demand of customers. While this can provide a chance to try to improve on an item that failed to meet cosmetic standards, it is also critical to note that ready-made products are also more prone to spoilage – if they are not sold at the end of the day and at the end they are just discarded (Prevention of Post-harvest Food Losses, 2010).

Other studies have demonstrated that the packaging of fruits is a key factor that contributes to poor handling at the market level. There is no doubt that packaging is exceedingly important because it facilitates the delivery of good quality fresh-cut products to consumers. The importance of packaging is also clear given that it not only protects products from physical damage bit also prevents physical and microbiological contamination. More often than not, packaging has been proven to have delayed the spoiling of many products, especially cuts from fruits and vegetables that have potential to deteriorate more rapidly than the unpackaged products. Nevertheless, if packaging is not handled with utmost care it can cause food loss and waste at the market level.

ST. PAUL'S UNIVERSITY

There is no doubt that careful design as to the packaging of fresh-cut products is crucial since it provides assurance concerning the levels of oxygen within the package. Even so, it is also important to be maximally observant and vigilant because excessive levels of oxygen in a package may lead to yellowing and bruising of the surfaces that have been cut. Also, when oxygen is in short supply, this may cause anaerobic metabolism that can consequentially enhance the production of off-flavours and odours (James and Ngarmsak, 2011). It is extremely probable that most of the traders in urban markets may not be aware of this information, but which they have a constitutional right to access ((The Constitution of Kenya, 2010, Article 35.1 [a, b]).

Also, growth in fresh-cut produce has been impressed by consumer demand for fresh, healthy, convenient foods that are safe and nutritious (Nations, 2013). The fresh-cut items are prone to discoloration, rotting and dehydration due to damaged and exposed tissues and lack of protective skin. Poor packaging and temperature management is actually the main cause of deterioration of the fresh-cut produce. Even in the so-called first world or developed countries, where fresh-cut items are exposed to conditions of proper packaging and cold chain, discards of fresh-cut products are greatly high. This happens even though packaging at times can extend shelf life, for instance that of packed fruits and salads. However, these problems can be addressed if factors that influence market success can be put in place. Customers are always attracted by quality and taste hence it is essential to enhance the improvement of quality and taste as an influential factor for the purpose of attracting customers. Customers also have expectations for example on pricing and the way the product is presented. This also is a factor that can influence market success. The other factor to consider is the appeal of the consumer, especially the ability to respond to current social food values. These social values include fair trade (meaning that the price of the fresh products must not be exploitive) as well as health options (meaning that customers have no suspicion that what they are purchasing can be detrimental to their health). These factors are critical since they can attract customers' confidence, which is very critical in the prevention of high loss and wastage of fruits and vegetables. It is crucial therefore for those involved in marketing to provide information that would build customers' confidence and information that can enable observation of safety procedures needed both in the transportation of the fresh products to the markets and the handling of fruits and vegetables in the market. This information is critical since it can help not only to attract customers to the market but

ST PAUL'S UNIVERSITY

also to purchase fresh products and this will help in curbing food loss and waste (James and Ngarmsak 2011).

2.5.6. Rejections of delivery

Rejections in the market constitute a reasonable amount of food loss. The amount of pre-store loss has also been seen to be increasing in various markets around the world, this especially in fruit and vegetables. Since pre-store waste by definition is due to rejections, this trend shows a decrease in the quality of goods delivered. Many traders attach the increased rejections to decrease in quality of goods delivered and stricter quality requirements (Development, 2012). Since the quality requirements are not defined in detail by the suppliers or retailers, it is possible for traders to create an internal policy on recommended quality of fruits and vegetables. However, the success of this will also depend on whether the customers have that information hence effective, comprehensible and systematic communication becomes very important in the attempt to mitigate for food loss and waste

2.5.7. Customer expectations and demand

Most retail traders operate under the assumption that customers buy more from brimming, fully stocked displays, preferring to choose their fruits from a towering heap rather than from a scantly filled one. This, as noted above, contributes to overstocking leading to damage to items on the bottom from the accumulated weight as a result, food loss is incurred.

2.6. Implications of food loss and waste

In accordance with the above cited studies, the implications of food loss and waste have unavoidable interface with food (in) security, economic and environment. This study thus sought to assess the implication of food loss and waste on food that is already available in the market. This was vital since food loss and waste at the market level have implications on food (in) security, economic and the environment, but which seems to go unnoticed by the stakeholders, especially the policy makers in the national and county governments.

ST.PAUL'S UNIVERSITY

2.6.1. The implication of FLW on food availability

Apparently, the reduction of food loss and waste improves food security. However, it is still not very clear on what aspect or the level at which this happens hence this is an area that requires further research. In addition, most studies on food (in) security are basically based on generalized perspectives on food loss and waste yet different types of food products have a varying degree of influence if any on food security. The extent of food loss and waste may be influenced by prevailing geographical circumstances and the type of food products.

Various researchers indicate that there is a close link between food loss and waste and food (in) security (Kummu, et al., 2012). This is backed by the fact that the reduction of the level of food loss and waste usually reduces food insecurity worldwide especially in the developing world where most people exhibits hunger and starvations. Tilman, Balzer, Hill and Befort (2011) estimate that if it was possible for the world to maintain the current minimum food loss and waste and percentages in every food supply chain step, then there would be adequate food for human consumption; feeding more than a billion people world over. On the same note, Lipinski, *et al.,* (2013) notes that reducing food loss and waste by half, that is, from 24% to 12%, by 2050 the whole world will require only 1,314 trillion kcal less food per year. In a more recent study, Munesue, Masui and Fushima (2014) calculated that by reducing the levels of FLW by up to 50% in developed regions, the number of undernourished people would decrease by up to 63.3 million in developing regions (7.4% of undernourished people in 2007), with 25.8 million in Southeast Asia, 20.5 million in Eastern Asia and 10.6 million in Sub-Saharan Africa.

2.6.2. Economic Implications of Food Loss and Waste

Economically, food loss and waste tends to adversely affect the economic status of many actors/people along the food system. For instance, food wastage at the wholesaling and consumer level usually costs US$ 1,600 per annum on average for a family of four people in the US and £680 (about US$ 1,000) annually for the average family in the UK (World Bank, Natural Resources Institute, and FAO, 2011). Every year, almost US$ 32 billion worth of food is wasted or lost in China (World Bank, Natural Resources Institute, and FAO, 2011). In Sub-Sahara Africa, which is characterized by meagre earning where most of the farmers get less than US $2 per day, post-harvest losses have a value of up to US $4 billion per annum (WRAP, 2009). The question that

ST.PAUL'S UNIVERSITY

arises from this data is on how the trend of the above economic implications relates to Wakulima Market. This has been explained and analysed in chapter four.

2.6.3. Implication of Food Loss and Waste on Environment

Food items are among the five most resource-demanding and polluting item groups globally. Various studies on energy use confirm that food is the second most energy demanding group after housing (Engström, 2004). Thus, it would be interesting to assess the implication of food that is produced but never consumed on the environment. Munesue (2004) indicates that fruits and vegetables have the highest loss and waste in volume. Looking at different life cycle assessment studies the lack of adequate data on food loss and waste is mainly solved through the application of personal assumptions or by paying no attention to the losses within the life cycle assessment (Engström, 2004). The latter decision means that in the case of large losses, paying no attention to the problem neglects the need for an increased food production in order to achieve a given amount of food consumption. Furthermore, results for energy and resource demand are undervalued with a higher quantity of pollutants being emitted. These considerations confirm that food loss and waste not only have impact on the environment at the stage of waste management but within the previous stages of the life cycle as well.

Undeniably, food wastage can result into a variety of challenges or problems in the management of waste. Problems commence from the time food is thrown into the waste bin and occur throughout the entire process of waste management (Terrapon-Pfaff, et al., 2014). This is particularly true because waste residues with a specific organic content must be pre-treated before land filling, according to existing legal provisions or guidelines. In addition, the biodegradation processes generate several toxic gasses and emissions and unpleasant odours. Also, the waste bins and collection vehicles are contaminated and unfit to be part of human habitation yet animals are attracted to feed on the wasted and lost and to lick the food waste bins (Terrapon-Pfaff, et al., 2014).

2.7. Prevention of Food Loss and Waste

Issues on food loss and waste prevention have attracted attention of policy makers because of the seriousness of food insecurity. As a result, there have been calls for the production of adequate or sufficient among of food products to avoid food wastage. This is because it has been established

ST.PAUL'S UNIVERSITY

that food is prone to loss or waste if it is in excess. However, according to Winkworth-Smith, Foster and Morgan (2015), improvement of several retailer practices could help to reduce food loss and waste but institutions need to be clearly committed. Setting of goals and execution of food wastage campaigns in their processes make some of the ways to achieve food wastage. Citing information from Hubert Reisinger of Umweltbundesamt, Austria, they reveal that there are significant problems in how food wastage data are presented. They consequently note that a core problem with food wastage prevention is the definition of system boundaries for food loss and waste statistics. They have also provided some measure that can be put in place so as to adequately deal with food loss and waste. These include writing code of practice and tax laws which could greatly contribute to food wastage reduction and breed positive change. However, they are honest and quick to recognize that regulations present some challenges due to great differences that exist between countries. They also include changes to policy or regulations but whose compliance is ensured by proper implementation, adherence and follow up. Finally, they recommend better sharing of information which is a vital requirement between all actors along the entire food system.

Food redistribution has been suggested as one of the measures which can help in reducing instances of food loss and waste. It is estimated that 1.5 million Kenyans were expected to need food aid in the early part of 2015 and therefore the redistribution of food that is currently being wasted should be a major precedence in the mitigation of food loss and waster in Kenya (Feedback Global, 2015). In the context of this proposed study, food redistribution refers to giving away food consciously and intentionally to avoid possible waste or loss. This approach usually applies at the stage when the crops are being produced which would otherwise not be harvested. It also applies at manufacturing stage usually with crop products that without such measures would be overproduced. At the levels of distribution and marketing, these foods would not be sold hence wasted.

2.8. Theoretical Framework

This study was based on the sustainable livelihoods framework model. This section reviews the theory highlighting main assumptions/tenets, strengths, and shortcomings as well as its relevance to the current study.

ST.PAUL'S UNIVERSITY

2.8.1. Sustainable Livelihoods Approach

Sustainable Livelihoods Approach (SLA) evolved from shifts in perspectives on poverty, participation and viable development (Sen, 1981; Chambers & Conway, 1992). However, in 1987, the World Commission on Environment and Development adopted the idea 'viable livelihoods' from the very beginning in discussions on resource ownership, basic needs, and rural livelihood security (Biggs et al., 2014). In the sustenance context at the local level, the question of environmental sustainability is geared towards whether livelihood activities maintain and enhance, or deplete and degrade, the natural resource base. In the context of this study, it may be associated with food loss and waste. The model offers an approach to development, which is people-centred and cuts across different disciplines. It targets at eliminating poverty, strengthening local capacities in achieving sustainability, as well as facilitating the understanding of the diverse and dynamic livelihood systems.

The main assumption of this perspective is the realization that people draw upon a range of assets to realize their livelihood objectives (Biggs et al., 2014). These assets are grouped into capitals, financial, natural, human, physical, political and social (FAO, 2008). Even though SLA provides important guidelines and insights, it has its own shortcomings. One of its weaknesses is the lack of focus in linking livelihoods and governance debates to development, lack of rigor in accounting for long-term large-scale environmental change, and a failure to adequately relate agrarian changes with long-term shifts in rural economies (Horsley et al., 2015).

2.8.2. Relevance of the Theory

Despite its shortcomings noted above, the Sustainable Livelihoods Approach (SLA) is useful for this study since its point of view is geared towards the eradication of poverty and the participation of all stakeholders with the aim of arriving at viable development as well as in the realization that people draw upon a range of assets to realize their livelihood objectives. It is also best suited for this study given that it seeks for an understanding of the concept of food loss and waste so that the realization of people's livelihood may not be undermined by FLW. As such, SLA offers useful insights to the researcher seeing that it works as a useful checklist while developing data collection tools and actual data collection, as well as data analysis. In using the SLA, this study paid attention

ST. PAUL'S UNIVERSITY

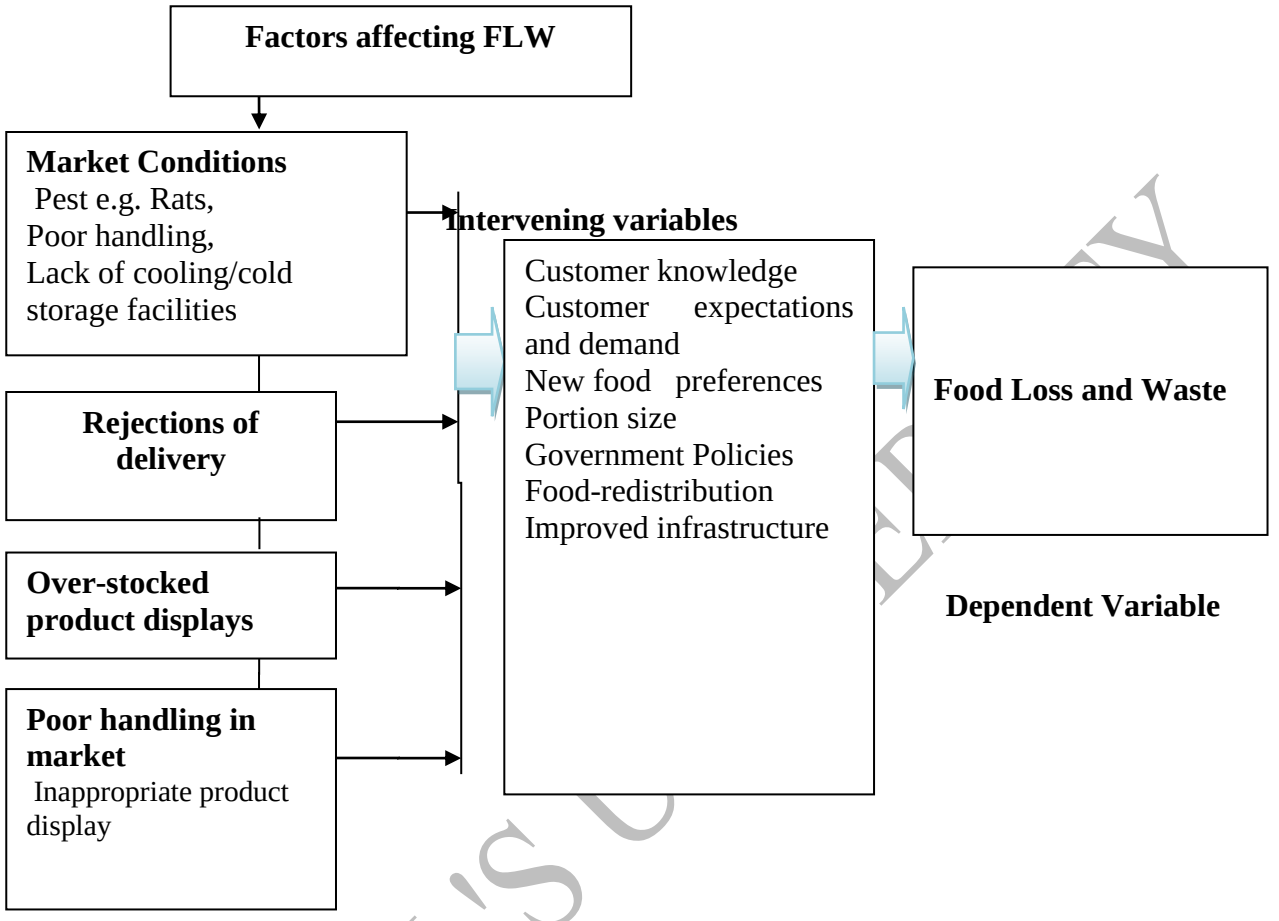
to the main causes of FLW and strategies that can be used to reduce FLW including utilization of a range of livelihood resources/capital assets in pursuing sustainable livelihoods.

2.9. Conceptual Framework

Figure 2.1 below reveals that food loss and waste is considered as a dependent variable, which is influenced by various independent variables. The independent variables in the context of this study are the various cause of FLW. It is worth noting that the overall causes and implications of FLW are further determined by the intervening variables, which in this case are the strategies available to minimize the level of FLW. It is conceptualized that market conditions, poor handling in market, overstocked produce displays and rejections of delivery influence food loss and waste. This, in turn, influences income, environment and food availability of communities. The existence of government policies, customer awareness, expectation and demands as well as food-redistribution, improved infrastructure, new food preference and portion further determine the existence of food loss and waste.

ST.PAUL'S UNIVERSITY

Figure 2.1: Conceptual Framework



2.10. Existing gaps in Literature Review

Literature focussing on food loss and waste at the market level is limited. This level of the food system offers initial insight into a fresh area of study including the types of wastage, their causes and possible prevention. From the literature review, most of the studies focus on food wastage occurring at the initial stages of the food chain. As noted by (HELPE, 2014), it would be beneficial, in the context of FLW, to interpret food chain as a set of units or inter-related levels but which are a crucial point because any action at a particular stage can either cause FLW or lead to its reduction. Development (2012) supports this argument of the author by noting that shelf-life depends on prior activities of the supply chain, making the market level equally important. The study contributed by filling in the gaps on the assessment of factors of food loss and waste at the market level.

ST.PAUL'S UNIVERSITY

2.11. Conclusion

The purpose of this chapter was to review previous studies on food loss and waste. The chapter mainly reviewed literature on types of food loss, its causes and interventions for its reduction. It also presented theoretical and conceptual frameworks. The chapter has made it clear that that food loss and waste is a global phenomenon, but which also has implications on food (in) security, economic welfare and safeguarding and maintaining the life of the environment. In view of this, the problem of food loss and waste requires attention, which has been provided in chapter on the presentation and analysis of data. However, before embarking on data presentation and analysis, it is critical to explain the research method and design that this study used to correct and analyse data, to which we turn in the next chapter.

ST.PAUL'S UNIVERSITY

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

The previous chapter dealt with literature review while this chapter concentrates with research methodology. Peter (1994) indicates that the chapter on research methodology deals with research design, target population, sample size, sampling techniques, data collection method, reliability and validity, data analysis methods and logistical and ethical considerations. This chapter followed Peter's format in the order explained above in this paragraph. The study area of the study is first described.

3.2. The description of the Study Area

The study was carried out at the Wakulima Market located in the eastern part of Nairobi County. The location of the study area can be viewed in the regional and local contexts. The regional context views the study area as part of the bigger Kenyan region, at the local context the study area is viewed in the context of Nairobi County. Wakulima market is within Nairobi and lies on 1.19^{o} south of the Equator and 36.59^{o} east of the Prime Meridian 70. Its altitude is between 1600 and 1850 meters above sea level. The climate is generally a temperate tropical climate, with cool evenings and mornings and becomes cold during the rainy seasons. The long rains in Nairobi fall between April and June, while the short rains are experienced between November and early December. The average daily temperatures range from 29^{o}C in the dry seasons to 24^{o}C during the rest of the year. The topography of the area in large can be described as gentle. It gently slopes from North West side to South East. The altitude of the area changes from a height of 1650m high to 1620m. Topography analysis is crucial as it helps determine the orientation of buildings to facilitate effective drainage in the marketplace.

According to Irungu (2007), Wakulima market is the main wholesale market for farming produce in Nairobi. Other studies, for instance, Tschirley and Ayieko (2009), Wakulima market handles an estimated 56% of the value and 67% of the volume of fresh fruits and vegetables (FFV) flowing into the city's wholesale markets, controlling the entry of carrots, onions, Irish potatoes, oranges,

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mangoes and watermelon entering the city. The market also includes a retail section, USAID, (2013).

3.3. Research Design

The research design serves as a master plan for the researcher since it helps the researcher to define research questions, identify appropriate variables of the study, determine the methods of data collection as well as decide accurate analyzation of data and presentation of the findings. The section on research design is the phase at which the researcher decides and implements a relevant data collection and data analysis method for the research (Creswell and Clark, 2007).

This study employed the descriptive survey research design in studying factors of food loss and food waste at Wakulima market. Kothari, (2008) contend that surveys are excellent means of collecting original data meant for studying attitudes and orientations of a very large population. The author continues to argue that the large population can be studied with only a portion of that particular population being used to provide the required data. According to Kombo & Tromp (2009), a descriptive survey research design is all about collecting and describing data on phenomena, events and issues the way from the representative sample population who take part in the study without altering or manipulating the environment. The descriptive research design is useful whenever a researcher wishes to collect data on people's attitudes, opinions, habits or any of the various educational or social issues. The descriptive design proved to be very useful in this study for collecting information regarding aspects of food loss and waste at the Wakulima market since descriptive data was collected using questionnaires. These questionnaires were structured and specifically designed to measure the characteristics described in the research questions. The descriptive research design therefore allowed the researcher to collect large data from the respondents and also the method was cost effective. For that reason, this design was considered as the most suitable method with regard to fulfilling the research objectives of this study. The design also sought to establish the ways in which who, what, when, where and how questions were responded to. This design also allowed for collection of data from a representative sample of a population the way things were without any unjustified alteration and generalization of findings as (Kombo & Tromp 2009) noted.

ST.PAUL'S UNIVERSITY

3.3.1. Target Population

Cox, (2010) defines a target population as the entire set of units for drawing data to be used for interpretations or making inferences. According to USAID (2013), the population of retailers is made up of approximately 990 traders while that of wholesalers is made up of approximately 680 traders. Since the study was limited to traders dealing with fresh fruits and vegetables at Wakulima, market, this study therefore targeted 1,670 wholesalers and retailers. In addition, the study also targeted 11 market staffs that are not necessarily traders but offer particular services in the market on a regular basis. They included five (5) market supervisors, five (5) market cess officers and one (1) market manager. Therefore the target population for this research was 1681 respondents and they comprised of 56.03% of the entire population. This indicates that the study targeted to collect data from more than half of the population of fresh vegetables and fruits at Wakulima market. Table 3.1 below shows the target population.

Table 3.1: Target Population

Category of Respondents	**Number of Respondents**
Wholesalers	680
Retailers	990
Market Supervisors	5
Market Cess Officers	5
Market Manager	1
Total	1,681

3.3.2. Sampling Techniques and Sample Size

Kumar (2011) defines a study sample as a sub-group within a given target population and which is a focus of a given inquiry usually selected carefully to represent the whole population. Given the heterogeneous nature of traders at the Wakulima market where various fresh fruits and vegetables are traded, this study used stratified random sampling to select the sample size. The researcher divided the target population into strata or different groups, then randomly select the final subjects of respondents proportionally from each stratum. The respondents were divided into sub-units of

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traders who sell onions, oranges, mangoes, potatoes and water melon. Using this sampling technique, the respondents were grouped into three strata: The sampling size for the first stratum was drawn using simple random sampling technique to select members of the wholesalers and keeping in mind the subjection of target population to a 10% as indicated by Mugenda, (2009). The same technique was also used to select the members of the retailers in the second strata. A sample from market staffs was drawn from the third stratum. The market staffs were included in the study to enable access of information about the market trends from professionals who were not necessarily traders. This technique provided every member of the population, irrespective of the type of vegetables and fruits they sold with an equal chance of being counted to participate in the study. However, since the market manager was only one, saturated sampling was used. Kothari, (2005) recommends strata random sampling since it allows the researcher to classify respondents into groups according to unique characteristics. He also recommends this technique because it is accurate and it enhances better representation across strata as it does not leave out any group of potential respondents. Kumar (2011) supports the recommendation of this technique by noting that it has no bias in the selection of respondents and each respondent has an equal chance of being selected to participate in the study. Peter (1994) similarly notes that stratified sampling ensures each unit of the target population to have an equal chance of being counted into the sampling frame**.** The sample size of the study drawn from the wholesalers was 68 respondents while that of the retailers was 99 respondents. All 5 market supervisors, 4 cess managers and the market manager were selected giving a total of 177 respondents. Frankfort-Nachmias, Nachmias and DeWaard (2014) support the idea that 10% of the target population sufficiently suffice for a descriptive study if the population units are more than 30. Thus, a sample size of 177 respondents, representing 10.5% of the target population, was used. Table 3.2 below interprets the target population and the sample size.

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Table 3.2: Population Sample Frame

Category of Respondent	Target Population	Sample Size
Wholesalers	680	68
Retailers	990	99
Market supervisors	5	5
Market cess officers	5	4
Market In-charge	1	1
Total	**1681**	**177**

3.4. Data Collection Procedures and Techniques

These refer to methods used to capture data for the purposes of the study. To achieve the objectives of the study, the researcher adopted both primary and secondary data. To achieve the objectives of the study, the researcher adopted both primary and secondary data. In this study, primary data on types of food wastage, main factors contributing to food wastage and interventions available for reducing food wastage at Wakulima market was collected directly from the fresh fruits and vegetables wholesalers and retailers as well as from key informants who were employees of the County government. The researcher used questionnaires to collect data from fruits and vegetable wholesalers and retailers. The researcher conducted key informant interviews (KII) to collect data from the County government market staffs that comprised of the market In-charge, market cess managers and market supervisors. This data collection instrument was used to gather information from key participants in order to develop comprehensive ideas on the issues raised in the research questions. The KII were important to this study because as Kombo and Tromp, (2009) assert, they make it possible to obtain data required to meet the specific objectives of the study. Two types of data were obtained from these two procedures. The administered questionnaire had both open and closed questions and since closed questions have predetermined answers, quantitative data was

ST PAUL'S UNIVERSITY

obtained. Open ended questions from both the questionnaires and KII generated qualitative data. The researcher distributed out the questionnaires to the respondents and collected the same from them. The use of questionnaire ensured collection of data from 167 respondents within a short time and respondents were free to give relevant information since they were assured of anonymity. The researcher interviewed 10 key informants the key. The use of the KII ensured comparatively wide and in-depth information on factors contributing to food wastage at Wakulima market.

The researcher additionally conducted secondary research, also known as desk top research to generate information on food wastage. According to Sunny Crouch and Matthew Housden (2003, p.19), secondary research involves the summary, collation and/or synthesis of existing research where data is collected from research subjects or experiments. For the purpose of this study, secondary data was collected through the review of both empirical and theoretical data from books, e-Books, journals, dissertations, reports and the internet sources. The importance of the secondary research in this study is clear since it provided the answer to research questions and hence complimented the data from primary research. Secondary research conducted also assisted in identifying problems of theoretical interest.

3.5. Pilot Study

A pilot study is a pre-test of the research instrument on a small sample of respondents in preparation before undertaking the actual study. Peter (1994, p. 89) notes that even the most perfectly constructed research instruments cannot guarantee results free from errors and therefore a pre-test becomes necessary. The author suggests a sample of at least ten respondents who do not have to be representatives. Young (1992, p. 207) notes that after research instruments have been pre-tested the researcher then carefully check out for errors on procedures and omission which would affect the validity and reliability of data.

3.5.1 Validity

Mugenda & Mugenda, (2009) defines validity as the capability of a research tool to quantity what it is supposed to measure. Validity addresses two main issues: accuracy of the instruments used for measurement and the actuality in measuring what they are meant to measure. Kothari, (2011) also

ST.PAUL'S UNIVERSITY

looks at instrument validity as the degree to which differences found with a measuring tool mirror actual dissimilarities among what is being tested. The appearance and items validity of the research tools was established by discussing the samples with two research professionals from St. Pauls University who suggested and gave opinions towards adjustments.

3.5.2. Reliability

A good test has a characteristic of reliability. A research tool is said to be reliable if it produces results that are stable when scored at different periods to a similar population. Reliability is the extent to which a test produces consistency repeatedly. According to Kothari (2011), reliability refers to the ability of a measuring tool to give results that are steady. Kendal (2007) and Kasomo, (2006) concur with the author by indicating that reliability is the extent to which a particular measuring procedure provides the same results when measured a number of times. Mugenda & Mugenda, (2009) similarly notes that reliability is the ability of a research instrument to produce unwavering results in a particular time when measurements are administered to the same group. To ensure high data reliability, a pilot study was conducted at Kangemi market in order to determine the consistency of the research tools as well as their construction and sequence. Kangemi market fruits and vegetables traders have similar characteristics as those of fruits and vegetable traders in Wakulima market and this helped the researcher to familiarize with data collection procedures. The researcher distributed the research tools to 18 wholesalers and retailers and collected after the group had willingly responded to the questions. After the pilot test, amendments of the items of the instruments was made to make them simpler to ensure that the language was clear to the intended respondents and that the questions had the right perspective were incisive enough to occasion accurate responses and eliminate prejudice. The researcher was careful not to include the findings of the pilot study in this study. Any changes and improvements made on the draft questionnaire based on the feedback received from the respondents were effected into the final questionnaire to ensure that difficulties in answering the questions by respondents in the final study were eradicated.

3.6. Analysis of Data and Presentation

Data Analysis, which is the process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and evaluate data, uses various analytic procedures to provide a

ST. PAUL'S UNIVERSITY

means of drawing inductive inferences from data and distinguishing the phenomena of interest from statistical fluctuations (Bryman and Bell, 2015).

The completed questionnaires were edited for completeness and consistency. Quantitative data collected was analyzed through the use of descriptive statistics such as frequencies and percentages. Information presentation was consistently presented using frequency tables. Data analysis was also carried out using the regression model with the help of Statistical Package for Social Sciences (SPSS) Version 20 and was presented using descriptive statistics.

3.7. Ethical Consideration

Ethical considerations in research are necessary and most important given that ethics consists of values and virtues for conduct, which is critical in differentiating right from wrong. Of necessity, ethics help to clearly bring out the difference between acceptable and unacceptable behaviours (Bryman & Bell, 2015). In the context of research, ethical standards and virtues guard against the fabrication or falsifying of data and therefore, promote the pursuit of knowledge and fact which is the primary goal of research. According to Flick (2009), researchers must also adhere to ethical standards and virtues so that the public can support and believe in the findings of the research. The public therefore needed to be assured that the researcher followed the suitable guidelines that deal with issues of human rights, compliance with the law, conflicts of interest, safety in the workplace and so on.

Prior to data collection, the researcher sought written permission from National Commission for Science and Technology and also from the County Government of Nairobi, whose documents are attached in this study as part of the appendixes. The researcher visited the Wakulima market In-charge to request to set dates for the key informant's interviews and also to give assurance that the study would not interfere with the normal running of the market. The timings of the interview schedules were highly adhered to. The researcher also wrote a consent letter to the respondents requesting them to partake in the study on their own accord. This study considered ethical concerns of the respondents all through. Informed consent and confidentiality were the two ethical aspects that were greatly and importantly considered. The respondents were clearly informed about the purpose of the study and also assured that their names were not going to appear in the study.

ST. PAUL'S UNIVERSITY

3.8. Conclusion

This chapter has provided the research design of this research as well as the methods of collecting, presenting and analysing data. The chapter also provided the ethical consideration that the research observed and which were known by the respondent. Having done all that, what remains now is to turn on to the presentation, analysis and interpretation of data in the following chapter.

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CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSIONS

4.1. Introduction

The previous chapter provided the research methodology for this research while this chapter provides an analysis, presentation and interpretation of the data gathered. Peter (1994,p. 63) notes that this is the diagnostic stage that deals with analyzing responses to key items so as to draw their meaning. The author also notes the importance of accurate data interpretation so as to realize the required conclusions hence solving the research problem. The study sought to assess factors of food loss and waste at the market level in Kenya using Wakulima market in Nairobi County as the case study market. This study generated a response rate of 89%, which amounts to 157 persons who responded out of the targeted population of 177 persons. The support and cooperation rendered by the Wakulima market superintendent enable the researcher easily get in touch with the traders and county officers facilitated the high response rate. .

Noticeably, the 89% response (157 respondents) shows that the researcher was unable to attain a 100% response rate. This is because some of the questionnaires were destroyed by water and dirt from the normal activities of the market. This compelled the researcher to discard some questionnaires that had major response-errors. The data that was analyzed and presented was based on the responses that were made to the items in the administered questionnaires and key informants interview schedules wherein content analysis has been used. The question items were both from open ended and closed ended questions, giving two categories of data, that is, qualitative and quantitative data respectively. Quantitative data from questionnaire items was analyzed using Statistical Package for Social Sciences (SPSS Version 20) software while qualitative data was analyzed using descriptive statistics of frequencies and percentages. Tables were used to summarize and illustrate the findings of the study.

The chapter was divided into the following four sections based on the research questions although the demographic characteristics of the respondents were also considered in the data collection instruments:-

1. Demographic characteristics of the respondents

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2. The types of food loss and waste
3. The causes of food loss and waste
4. The intervention measures in place for food loss and waste reduction

4.2. Demographic characteristics of the respondents

The purpose of this study was to assess the factors of food loss and food waste at the market level in Kenya using the case study of traders in Wakulima market in Nairobi County. Traders at Wakulima market are not a component of a homogenous group but rather framed within several other dimensions such as gender, age as well as marital status, level of education and length of time the respondents have been trading in fresh fruits and vegetables at Wakulima market. These distinct dimensions with regard to demographic character of the respondents were considered in the data collection instruments to generate responses which were representative of general view of fruits and vegetables traders operating at Wakulima market where the study was undertaken.

4.2.1. Gender of the respondents

The representation of the fruits and vegetable traders in the study area is (34.4%) males while the females represent (65.6%) as outlined in table 4.1.

Table 4.1: Gender of the respondents

Gender	Frequency	Percent	Valid Percent
Male	54	34.4	34.4
Female	103	65.6	65.6
Total	157	100.0	100.0

Source: Researcher, 2016

The data in table 4.1 illustrates that there were more female respondents than male. This could be associated to a report by the RUAF resource centre on agriculture and food security (2004), which

S UNIVERSITY

noted that women form the majority of vegetable market and street food traders in several African countries. In Kenya, the majority of vendors are specifically women and she is popularly known as 'Mama Mboga', which literary means "mother of vegetables".

4.2.2. Age of Respondents

In accordance to table 4.2 below, the highest age prevalence of respondents in terms of percentage in the study area (67%) or 30 persons were those above 35 years. The second highest were those aged between 18 to 23 years with only (19.1%) or 30 person. This group surprisingly outnumbered those aged between 24 and 29 years who were expected to be among the leading cohorts but whose prevalence was (13.4) or 21 persons. The other surprise is on the prevalence of those above 35 years of age, which was at (3.8) % or 6 persons.

Table 4.2: Age Categories of the Respondents

	Frequency	Percent	Valid Percent
18-23 years	30	19.1	19.1
24-29 years	21	13.4	13.4
30-35 years	100	63.7	63.7
Above 35 years	6	3.8	3.8
Total	157	100.0	100.0

Source: Researcher, 2016

The age categories described in table 4.2 above raises the question as to why people above 35, and who are more productive in other sectors of life, seem to be less productive at the market level. While this may require some further research, it is evident that the youthful ages are well represented. This also raises some question whether it has happened due to the much publicised affirmative action as to the youths not only on matters of trade but also on matters pertaining to access of job opportunities. According to Zepeda et al (nd), p.269), the majority of young people have no formal employment due directly to the scarcity of formal job openings and the incapacity of young people to create an attractive enough job in the informal market for themselves or to find one

working under someone else. Yet the majority of the youth at Wakulima market seems to have created jobs for themselves in the market. However, this may require further research.

4.2.3. Marital Status of the Respondents

Table 4.3 below presents the marital Status of the respondents. The respondents were single, married, widowed or divorced.

Table 4.3: Marital Status of the Respondents

	Frequency	Percent	Valid Percent
Single	100	63.7	63.7
Married	30	19.1	19.1
Widowed	20	12.7	12.7
Divorced	7	4.5	4.5
Total	157	100.0	100.0

Source: Researcher, 2016

The majority of respondents in the sample (63.7%) indicated their marital status as single. Respondents who were married followed with (19.1%), while the widowed were at (12.7%). The separated or divorced had the least percentage (4.5%). One of the respondents brought in the angle of the respondents lacking a social life being that they start their activities when the market opens at 4.30 am and continue confining them to the market. It may be that the demanding work as fresh fruits and vegetable traders rob them quality time to commit to marriage. This data may also prompt research as to why the single people were the majority and not the married who are supposed to be working hard to provide for their family. However, what requires to be seen is the ways in which the marital status influenced the respondents' views on food loss and waste, which are most critical valuables for this research

ST.PAUL'S UNIVERSITY

4.2.4. Level of education of the respondents

Table 4.4 below evidently indicates that that majority of the respondents, representing about 63.7% had attained secondary level of education, followed by college level, at about (19.1%). Nearly 7 of the respondents, representing approximately (4.5%), never went to school. Responses from key informants indicated that Wakulima market has traders who had attained high level of education, some up to master level. They also reported that a few of the traders have no education. The sampling of the fresh fruits and vegetables showed that this information was accurate since findings revealed the reported trend as in Table 4.4 below. Key informants informed the researcher that they look forward to the commencement of training programmes for the trader on trade empowerment and other areas. The key informants reported that they believed that the participation of traders in such programmes would result to positive transformation and mainly because most of the traders had capacity from the formal education they held. The few who had no schooling would get assistance from their colleagues in understanding and applying the trainings. The market is view as a work place where only illiterates operate but from these findings, the participation includes people who are learned. This could be as a result of employment scarcity. Table 4.4 below presents the findings of the level of education of respondents.

Table 4.4: Level of Education of the Respondents

	Frequency	Percent	Valid Percent
No School	7	4.5	4.5
Primary	20	12.7	12.7
Secondary	100	63.7	63.7
College	30	19.1	19.1
Total	157	100.0	100.0

Source: Researcher, 2016

4.2.5. The size of Household

While answering the question on the size of the household of the respondents, the majority belonged to the category of a family between 1 and 3 people (63.7%) or 100 people. This was

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followed by those in a family of between 4 to 6 people (22.3%) or 35 people. The group that had more than 6 members received the lowest representation (14%) or 22 people

Table 4.5: Size of Household

Category of Family	Frequency	Percent	Valid Percent
1-3 People	100	63.7	63.7
4-6 People	35	22.3	22.3
> 6 People	22	14.0	14.0
Total	157	100.0	100.0

Source: Researcher, 2016

The evidence described in table 4.5 above with regard to the size of the family begs a question. Did category with the highest percentage of family members have low expenditures on food while those with low percentage experienced more spending on food? While this study was not intended to answer that question, the researcher assumed that the respondents also served as customers for the fruits and vegetables they traded. One woman described the purchases amongst themselves as barter trade. "It is very hard for any trader to go home without food because those trading in potatoes and onions exchange their produce with melon, mangos and oranges. This saves us money as well as saving on produce that would otherwise waste". In the same way with consumers, spending on food as a percentage of total household expenditure has steadily declined due to convenience resulting from rapid increase in the number of food stores and supermarkets outside the city. This has brought change in portion size, preference for packed fruits and vegetables and so on. However, the traders operate the barter exchange as described above. The small households may have been prevalent since as observed in table 4.5 above, the marital status of most respondents were single. Household size of 4-6 people followed with a percentage of (22.3%) while the least percentage (14.0%) was for households with more than six members.

ST. PAUL'S UNIVERSITY

4.2.7. Duration of Trade

The respondents were also asked to give the month and year when they began trading. Traders who had traded for six years at (36.3%) had the highest prevalence. Those who had traded for more than six years followed at (25.5 %) prevalence.

Table 4.6: Duration of Trade

Duration of Trade	Frequency	Per cent	Valid Per cent
Two years	35	22.3	22.3
Four years	25	15.9	15.9
Six years	57	36.3	36.3
More than six years	40	25.5	25.5
Total	157	100.0	100.0

Source: Researcher, 2016

The highest percentage of respondents had traded in fruits and vegetables for more than six years representing (36.3%) Respondents who had traded for more than six years followed at a prevalence of (25.5%). Respondents who had traded for two years and four years were at an occurrence of (22.3) and (15.9%) respectively. These findings indicated a level of stability in terms of occupation and therefore trade in fresh fruits and vegetables is not a quick fix trade but rather a long term involvement.

4.2.8. Awareness of food Loss and Waste

The research also sought to establish the level of the awareness of food loss and waste at Wakulima market as depicted in table 4.8.

ST.PAUL'S UNIVERSITY

Table 4.7: Awareness of Food Loss and Waste

Awareness	Frequency	Percent	Valid Percent
Yes	147	93.6	93.6
No	10	6.4	6.4
Total	157	100.0	100.0

Source: Researcher, 2016

The great majority of the respondents had heard about food loss and food waste. From Table 4.8 above, it is evident that 147 respondents confirmed their awareness of the food loss and waste. This was about 93.6%. The rest of the respondents who were 10 in number, making a (6.4%) prevalence indicating that they were not aware of any food loss and waste at Wakulima market. This number (10) represented 6.4% but it provides some evidence that a smaller percentage is ignorant about the challenge of food loss and waste at this market. This could be attributed to the fact that may be they could still be new in the market or they are mall traders who usually take a small stock that they managed to store well or even sell all of it rapidly. Equally, the respondents may not have any information on what food loss and waste entails or they may have seen the throwing away of destroyed or damaged fruits and vegetables as a normal thing to do. This indifference trend would also be as a result of ignorance and due to illiteracy since(4.5%) of the respondents were not exposed to any schooling.

4.3. Types of food loss and food waste

The data that was gathered in response to the types of food loss and waste helped the researcher to accomplish the objectives of the study by answering the following question: - What are the types of food loss and waste at Wakulima market? In this regard, respondents were first asked to indicate the produce they traded in as this was very important display of the main fresh fruits and vegetables dominant in Wakulima market. Table 4.9 presents the findings of the study which actually put it out very clearly the types of FFV traded at this market while Table 4.10 offers a clear picture of types of losses at the same market. Frequencies and percentages of respondents selling oranges and mangoes were the highest respectively. Potatoes, melons and onions followed in that order.

ST.PAUL'S UNIVERSITY

Undeniably, Wakulima market is exceedingly flooded by the flow of water melons, onions, oranges, mangoes and potatoes. It was discovered that oranges were heavily traded in at this market, making (33.1%), followed by mangoes at (28.7%), potatoes at (22.3%), and water melon at (9.5%) prevalence. Onions at (6.4%) had the lowest prevalence. It was further gathered from the interviews on key respondents that a bigger percentage of these fresh fruits originate from the neighbouring countries mostly Tanzania and Uganda. The flow of fruits and vegetables at Wakulima markets corresponds to the study done by Irungu (2007) on 10 markets in Nairobi County. The researcher observed that Wakulima dominates among the 10 markets with flow of Irish potatoes, carrots onions, mangoes, watermelons and oranges. However, this study did not include carrots due to time factor. The findings on the types of fresh fruits and vegetables traded in Wakulima market and their prevalence are summarized in table 4.9 below.

Table 4.8: Types of fresh fruits and vegetables traded in Wakulima Market

Type	Frequency	Percent	Valid Percent
Mangoes	45	28.7	28.7
Potatoes	35	22.3	22.3
Water Melon	15	9.5	9.5
Oranges	52	33.1	33.1
Onions	10	6.4	6.4
Total	157	100.0	100.0

Source: Researcher, 2016

4.4: Loss and wastage suffered by each product at Wakulima Market

The respondents were further asked to state the types of food wastage suffered by each of the produce they traded in Wakulima Market. Having established the type of FFV that are mainly sold at Wakulima market, the researcher also sought to establish the loss and wastage associated with each of the products sold in this market. It emerged that oranges suffered the highest loss and wastage at (40.8%) prevalence followed by mangoes at (28.7%) and then potatoes at (18.5%). However, the loss and wastage attributed to onions and melon was less than (10%) for each. The wastage and loss for water melon stood at 9.5% while that of onions stood at (4.5%).

Table 4.9: Loss and wastage suffered by each product at Wakulima Market

Products	Frequency	Percent	Valid Percent
Onions	7	4.5	4.5
Water Melons	12	7.6	7.6
Mangoes	45	28.7	28.7
Potatoes	29	18.5	18.5
Oranges	64	40.8	40.8
Total	157	100.0	100.0

Source: Researcher, 2016

The researcher also conducted interviews with key informants who included the market in-charge, five market supervisors, and four cess officers. The key informants had been working at Wakulima market for a period that ranged between two and half to fifteen years. Those who had worked there for a long period were the supervisors and cess officers. Answering the question, what was their observation on food loss and waste in Wakulima Market, what emerged from the interviews was that every produce had its unique loss and waste. Among the fruits under study, oranges and mangoes had the highest losses through over-ripening and crashing as a result of improper packaging. This certainly is in agreement with James and Ngarmsak, (2011, p. 42) who were cited on literature review chapter asserting that packaging of fruits is a key factor that contributes to poor handling at the market level. They also noted the importance of packaging given that it not only protects products from physical damage but also prevents physical and microbiological contamination. Also, more often than not, packaging delayed the spoiling of many products, especially cuts from fruits and vegetables that have potential to deteriorate more rapidly than the unpackaged products. For that reason, if packaging is not handled with care, it can hinder the delivery of good quality fresh-cut products to consumers consequently causing food loss and waste at the market level. Melons had the second least wastage of (9.5%) through rain contact, which reverts the ripening process consequently causing rotting.

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Breakages and rotting were said to have been caused by rain. At a prevalence of (4.5%) onions had the least wastage because of the method of packaging in nets that unless they get into contact with water or if they are harvested immaturely, they are hardy. Among the vegetables under study, potato had more losses through rotting at prevalence, moulds and breakage while onion had minimal wastage of rotting, moulds and shooting. The occurrence of wastages also depended on the season wherein during the rainy season, more wastage was experienced. During some seasons, supplies of mangoes were of the traditional variety which were hardier and had longer life-span than the supplies of exotic varieties from Mombasa and Tanzania, which are less hardy and had lesser life-span. Loss and wastages also depended on the amount of produce the traders purchased. Sometimes the traders purchased in big quantities of which the market officers did not have control. Table 4.11 below presents results for the types of food loss and waste at Wakulima market.

Table 4.10: Types of food loss and food waste in Wakulima Market

Types of loss and waste	Frequency	Percent	Valid Percent
Moulds	10	6.4	6.4
Rotting	76	48.4	48.4
Rat bite	34	21.7	21.7
Breakage	37	23.6	23.6
Total	157	100.0	100.0

Source: Researcher, 2016

If preventative measures of food loss and waste were to happening, gaining more information more than just the loss and wastage suffered by each product at Wakulima Market was critical. For that reason, the researcher sought to know the types of food loss and waste prevalent at Wakulima market as table 4.11 below describes. Seventy six (76) of the respondent representing (48.4%) indicated that the highest type of food loss was rotting. This was followed by breakage which was caused through offloading or when fruits and vegetables were being arranged or being moved to another part of the market. This accounted for (23.6%), followed by rat bites. 34 of the respondents

ST. PAUL'S UNIVERSITY

indicated that rat bite was another type of food loss. This number of the respondents translated into about (21.7%) of the responses. The other type which was noted was mould by ten (10) of the respondents highlighted, which translated into about (6.4%) of the responses. It was discovered that rotting was partly due to packaging, especially the fruits from the neighbouring countries, which according to traders are mainly packaged in polythene bags that made a huge contribution as to the fresh fruits becoming bad in quality within a very short period of time. The other types of food loss and waste are also presumable because of human negligence. This therefore implies that they are not beyond rectification since all what is needed is human commitment, transparency and accountably in the line of duty. There is no doubt that lack of human responsibility to duty is the main cause of the identified types of food loss and waste.

While it is therefore worth noting that the highest type of food wastage at Wakulima market is rotting, this could be addressed when some measures are put in place. Also, all the types of food loss and waste noted in table 4.11 above can be corrected if and when adequate and effective measures recommended below are put in place.

4.4. Causes of food loss and waste

Data on causes food loss and food waste deals with objective two to answer the following research question: What are the main causes of food loss and waste at Wakulima market? However, before establishing the causes of food loss and waste, the researcher sought to investigate whether the respondents had thrown away any food produce. For that reason, the respondents were asked to indicate whether they had thrown any food at all in the market. The frequency and percentages of how the traders had thrown food is summarized in table 4.12 below.

Table 4.11: Whether respondents had thrown away any food produce

Admission of wastage	Frequency	Per cent	Valid Per cent
No	5	3.2	3.2
Yes	152	96.8	96.8
Total	157	100.0	100.0

Source: Researcher, 2016

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The findings indicated that about 157 respondents representing (96.8%) of the sample population confirmed that they had actually thrown food. This was an indication that food loss and was at Wakulima market was very high. It was only 5 respondents representing (3.2 %) of the sample population who indicated that they had not experience any food loss and waste. This is in fact strange since the data on the rate at which food was thrown at Wakulima market analysed below did not show any respondent unaware. Perhaps this may mean that while the 5 respondents according to data described in Table 4.12 above may have not personally thrown food, they were aware of the rate of at which food was lost and wasted at Wakulima market.

The researcher attempted to establish the rate at which food is thrown at this market. In doing the respondents were requested to indicate the rate at which they through food. The responses summarised in table 4.13 were as follows.

Table 4.12: Rate at which food is thrown at Wakulima

Rate	Frequency	Percent	Valid Percent
Very Often	2	1.3	1.3
Often	149	94.9	94.9
Rarely	6	3.8	3.8
Total	157	100.0	100.0

Source: Researcher, 2016

Apparently, it is clear that those who threw food very often and often represent the majority of the sample population giving a total of 151 respondents, representing (96.2%). It was only a minimal number of 6 people of the sample population representing (3.8%) who confirmed that food was thrown rarely at Wakulima market, but all the same it was thrown.

ST.PAUL UNIVERSITY

The researcher also sought to establish the reasons that made the respondents to throw away food at Wakulima market. Throwing away of food is nothing but loss and wastage. The standing on food loss and wastage at Wakulima market is summarized in the table 4.14 below.

Table 4.13: Standing on food loss and wastage at Wakulima market

Reasons for food wastage	Frequency	Per cent	Valid Per cent
Deterioration of quality	97	61.8	61.8
Non-compliance with safety standards	20	12.7	12.7
Others	40	25.5	25.5
Total	157	100.0	100.0

Source: Researcher, 2016

Almost every respondent was aware of food produce having been thrown lost and wasted. The data entries on Table 4.14 clearly demonstrate evidence that much of the food in Wakulima market is lost or go to waste as a result of deterioration of quality. The majority of respondents, 97 in number representing 61.8%, confirmed that much of food waste at this market is due to deterioration of quality. Twenty (20) of the respondents, representing 12.7% indicated that wastage of food at this market is due to non-compliance with safety standards, while about forty (40) of the respondents, representing 25.2% confirmed that there are also other causes of food waste at this market. It is critical to note here that according to Winkworth-Smith, Foster and Morgan (2015), the improvement of food safety standards can help in the enforcement of better hygiene practices, hence prevent food loss and waste.

The researcher also sought after finding out whether there were fruits and vegetables that were either left to deteriorate or discarded accidentally or voluntarily, which is summarized in table 4.15 below.

ST.PAUL'S UNIVERSITY

Table 4.14: Accidental or voluntary wastage by respondents

Wastage	Frequency	Percent	Valid Percent
Yes	23	14.6	14.6
No	101	64.3	64.3
Undecided	33	21.0	21.0
Total	157	100.0	100.0

Source: Researcher, 2016

The findings were that highest percentage of respondents had accidentally or voluntarily wasted food was discovered to be 14.6% as per the views collected from the respondents. 101 respondents representing 64.3% confirmed that there was no known wastage, either voluntarily or accidently. Thirty-three (33) of the respondents representing 21.0% were undecided on this matter. This could be interpreted to mean that if there are any losses accidently or voluntarily, then they are rather minimal as indicated by the statistics of those who said no. The researcher noted from the findings summarized in Table 4.11 above, food losses at Wakulima Market are as a result of factors that can be addressed. It is evident that very few people at this market voluntarily throw food, and also those that are thrown are those already rejected by the clients.

The findings above clearly correspond to observations made by Searchinger et al. (2010) that in general, food wastage that takes place at the market and consumer stages in the food value chain is as the result of negligence or a willing decision to throw food away. The researcher associated this to overstocking of similar produce by traders, customer preference or damages that occur at the preceding levels and that cause rejection by consumers. Deterioration could be due to the longer period that fresh fruits take at Wakulima market because of excess supply. According to some respondents, exposure to direct sun light for a prolonged period of time, also make the fruits lose the

ST. PAUL'S UNIVERSITY

appealing colour and as a result, end up not being bought by the clients. In such cases, the traders opt to throw away such products. This finds support from James and Ngarmsak (2011, p. 20), who have demonstrated that excessive exposure of tomatoes to excessive sunlight can, for example, result in sunscald or sunburn. As such, intense sunlight can increase fruit temperatures that potentially contribute to fruit damage and loss of firmness. Some respondents also confirmed that movement from one part of the market to another, given that the roads and/or lanes are extremely damaged and as a result of the rough movement, some fruits either fall off or hit against each other thus interfering with the taste. This is an area that definitely requires immediate attention to curb it if, as James and Ngarmsak (2011, p. 6) notes, supplying quality fresh products that meets the customer's taste is important since it is one of the many factors that influence the success of sales in the market.

4.5. Intervention measures for food loss and waste reduction at Wakulima market

Noticing prevalence of food wastage is one thing and intervention to curb the same is another. However, this study would have been incomplete without identifying the interventions that can be put in place curb waste at Wakulima market. Such interventions are important because they are the basis on which authentic transformation of the entire food chain and of the livelihood of the traders stand. This must be seen as a very urgent intervention since both the traders who responded to the questionnaires and the market officials who were interviewed attest to a high frequency of food loss and waste. However, before providing intervention measures, it was critical to establish whether the respondents, who were also traders and Wakulima market, were aware of any problem that may have hindered them from actualizing their dreams. In arriving at a credible data, the researcher first attempted to establish the problems experienced by the traders at Wakulima Market and so the respondents of the questionnaire provided in appendix II were asked to identify the problems they had experienced. The findings are summarized in table 4.16 below.

The findings were that dirty environment was on top of the list at 22.3%, followed by Small space at 18.5%. Rejection by customers was at 15.3% while rodents and limited market time stood at 14.0%, bad smell 12.7 % respectively. Bad debts stood at the bottom with a frequency of 3.2%. These findings confirmed to the researcher that there was much more that needed to be done to help reduce the food loss and waste at Wakulima market.

ST.PAUL'S UNIVERSITY

Table 15: Problems faced in fruits and vegetables handling

Problems	Frequency	Percent	Valid Percent
Small space	29	18.5	18.5
Bad smell	20	12.7	12.7
Dirty environment	35	22.3	22.3
Rodents	22	14.0	14.0
Rejection by Customers	24	15.3	15.3
Limited market time	22	14.0	14.0
Bad debts	5	3.2	3.2
Total	157	100.0	100.0

Source: Researcher, 2016

A critical problem that was noted by the key informants during the interviews was about the packaging of produce, particularly the imported orange and mango from Tanzania. This contributed to food loss and waste at Wakulima market because brokers from Kenya, who supply fruits at Wakulima market, were not being allowed entry to Tanzania in order to select and do the packaging themselves. As a result, fruits that enter into the market are not only with wrong packaging but also with low quality of the packed fruits and vegetables. Such fruits and vegetables are packaged in nylon sacks with polythene lining, but which accelerate faster ripening. However, in answering the question what challenges hindered them from serving better, their responses portrayed them as not being in control of some issues. The majority noted that they had no control over what was supplied to the traders from Uganda, Tanzania and even from different parts of Kenya. They felt concerned when traders experienced some loss yet they were required to pay cess fees whether they lose or not. They also noted that Wakulima market was a strong hold for politics and sometimes it was impossible to effect orders due to political interference.

They also noted family dominion as a major issue within the market. Even though family dominion had the potential to break the cycle of poverty that may run in families, simultaneously it had the potential of negatively affecting the implementation of regulations at the market. Limited space for packing of food trucks that led to congestion was another challenge they experienced. They also

ST PAUL'S UNIVE

experienced the challenge of heavy traffic, which caused delays of flow of trucks into the market. Finally, they also experienced some moral challenges that they attributed to lots of money that changed hand at Wakulima market. As a result, they noted high levels of immorality resulting to illegitimate sex and drug peddling, which unfortunately resulted to very high prevalence rate of HIV. The prevalence of HIV, which was not among the expected findings, certainly requires some intervention through counselling that is geared towards the transformation of morals not only at Wakulima market but also to the entire nation of Kenya.

Nevertheless, the key informants provided some suggestions on how the challenges they had encountered could be addressed. They were united in suggesting that it would be of great help for the trading community if the Governments of Kenya, Tanzania and Uganda through the East Africa Community work to improve fair trade by control of quality and packaging of produce. As it was noted in the literature review, packaging of produce is an important factor, particularly with the imported orange and mango from Tanzania. Brokers from Kenya are not allowed entry to Tanzania to select fruits and vegetables that have not been damaged and do the packaging themselves. The ultimate consequence of this practice is wrong packaging and the packing of low quality fruits and vegetables. The suggestion by the key informants made the researcher curious as to whether the governments that form the East African Community (EAC), especially the East African Legislative Assembly (EALA), are aware of the role they should and can play in order to curb food loss and waste. Perhaps there is need for a clearly stipulated treaty that would enable traders from the EAC countries to benefit without incurring massive food loss and waste at the market level.

Apparently, the views of Winkworth-Smith, Foster and Morgan (2015) on writing regulations and tax laws that could greatly help reduce food loss and bring about a number of changes should be taken on board. This is critical even though they have also recognized that regulations may pose some difficulties due to significant differences between different countries. Yet this is doable since it has happened in other economic blocks such as the European Union (European Union, 2010). So what is needed are changes to policy or regulations, but which must be properly implemented, adhered to and monitored to ensure compliance (Winkworth-Smith, Foster and Morgan 2015). It is of the essence to note that according to Artioch and Kornstein (2012), as cited in the chapter on literature review, regulations are weakly defined, and for this reason, the implemented regulations

ST.PAUL'S UNIVERSITY

can impede innovation and trade. Yet the importance of making regulations and implementing them cannot be underrated, even though Tielens and Candel (2014, p. 16) have been cited above noting that inefficient border posts cause the delay for trucks loaded with food resulting in food wastage. In that case, a country's legal system is likely to strongly affect to have a strong bearing on the food loss and waste. In the eastern part of Africa, particularly Uganda, there is the existence of several roadblocks which cause significant journey delays of trucks ferrying food. This is the reason as to why EALA should become a player in the quest to curb food loss and waste by making legislations that are capable of being implemented by all EAC states.

The key informants also recommended that it was important for elected leaders to work together with the county Government and the market leadership and the traders towards the welfare of the trading community. However, the problem, which they key informants noted and which is cited above is that Wakulima market was a strong hold for politics and sometimes it was impossible to effect orders due to political interference. They also noted that the construction of a new market and road was in progress, which they appreciated as a commendable effort from both the national and county governments because it was meant to ease problems of limited space and traffic. They also highly recommended the initiation of clear counselling programmes for the traders already infected and affected by HIV. Alongside this, they also recommended embarking and strengthen prevention campaigns by the ministry of Health together with the County government. Finally, they also recommended for a deliberate anti-drugs campaigns, which they believed would help in sensitizing the market community.

The researcher also sought to know whether Wakulima market had modern cooling storage facilities, which are known to minimize food loss and waste in urban markets globally. The findings from the respondents are summarized in table 4.17

Table 4.16: Conditioner Facilities used at the Market

	Frequency	Percent	Valid Percent
None	157	100.0	100.0

Source: Researcher, 2016

ST PAUL'S UNIVERSITY

When the traders were asked about the use of conditioner facilities at the market, the findings indicated that there was none at the market, as summarized in the table 4.17 above. This is in agreement with what has been noted in the section on background of the problem and in the chapter on literature review among the causes of food loss and waste as being lack of proper storage. This is indeed a very serious omission given that cold storage of fruits and vegetables is not new and was very much used during the less technologically advanced era. Yet studies have shown that fruits and vegetables are the most vulnerable food category, especially because of the lack of cold storage facilities. What is very clear is that cold or air conditioned storage prolongs the live of fruits and vegetables after harvest, especially in by preventing fruit tissue respiration (El-Ramady, et. al., 2015). There is no doubt therefore that there is a relationship between food loss and waste and storage. It is also clear that refrigerated market as well as refrigerated transport could be the way forward to curb food loss and waste. This is what the researcher is recommending to be done by both national and county government at Wakulima market.

The researcher also wanted to know whether either the national or county government had offered any form of training to traders at Wakulima market. Training is in fact critical because it adds value not only to the traders themselves but also in their business. But when the respondents were asked whether they had received any training, the response was 100% negative, which are summarized on table 4.18 below.

Table 4.17: Training offered by County Government

Training	Frequency	Percent	Valid Percent
None	157	100.0	100.0

Source: Researcher, 2016

It appears therefore that there are no policy on any government with regard to adding value and empowering the traders. The researcher highly recommends that both the national and county government should consider training the traders. This may not just enhance the live of the traders

ST PAUL'S UNIVERSITY

but it can also enhance the national and county governments' revenue collections. These because the more trained traders are on how to handle their business, the more income they will generate and the more levies they pay to the government. Also, this training will help them to avoid food loss and waste, which will also raise their income and improve the livelihood of their family. The county and national governments ought to take this recommendation seriously since it is a constitutional requirement for citizen of Kenya to access information either held by the state or by another person (The Constitution of Kenya, 2010, Article 35.1. a, b)

The researcher also sought to know from the respondents if there were measures that had been put in place to reduce food loss and waste at Wakulima market. Table 4.19 below summarizes the information that the respondents gave.

Table 4.18: Measures in place to reduce food loss and Waste at Wakulima Market

Measures in place	Frequency	Percent	Valid Percent
No proper measures available	67	42.7	42.7
Irregular garbage collection	55	35.0	35.0
Partial Market cleaning	35	22.3	22.3
Total	157	100.0	100.0

Source: Researcher, 2016

The data on Table 4.19 gives a very gloomy picture on the measures that had been inaugurated to address food loss and waste. The response of the 157 respondents was as follows. Sixty-seven (67) of the respondents representing 42.7% indicated that there were no proper measures available. The other respondents confirmed to the researcher that while there were some measures in place, these were not regular. Fifty-five (55) respondents accounting for about 35.0% indicated that there was irregular garbage collection at the market. The remaining 35 of the respondents representing 22.3%

confirmed that there was partial Market cleaning, which could help to reduce some problems at the market.

However, the key informants were categorical that there were some interventions that had been put in place already, which included daily cleaning, de-ratting and frequent garbage collection. While this only helps on a day to day basis, the key informants were of the idea that more interventions ought to be put in place. As a result, they recommended other measures that they believed were of paramount importance in reducing food loss and waste at Wakulima market. They highly recommend for the construction of a modernized market with conditioning for reduction of wastages. They also highly recommended training for the trading community on food wastage management. Finally, they recommended exchange visits to other markets in more developed countries for the county market officers and the section heads, who are also traders at Wakulima market, to enable them, learn and share new experiences.

The challenges that traders and managers at Wakulima face cannot be left to remain just as they are without any attempt to seek to provide some solutions. For that reason, the researcher further sought to establish from the respondents and interviewees what they felt could be possible solutions to these problems. The responses were as follows. About 25.5% of the respondents indicated that there was need for garbage collection program to be put in place. About 20.4% felt that market space increase would help reduce congestion and as a result reduce loss and wastage. About 19.1% felt that drainage improvement could also be a solution. The rest felt that daily market cleaning, 13.4%, purchase of conditioner facilities, 12.7% and fumigation, 8.9%, would help in addressing food loss and waste at Wakulima market by reducing the rodents and at the same time improving the shelf life of the fresh fruits and vegetables. The findings are summarized at Table 4.19 below.

ST.PAUL'S UNIVERSITY

Table 4.19: Possible solutions to the problems at Wakulima Market

Possible Solutions	Frequency	Percent	Valid Percent
Market space increase	32	20.4	20.4
Garbage collection	40	25.5	25.5
Daily market cleaning	21	13.4	13.4
Conditioner Facilities	20	12.7	12.7
Drainage improvement	30	19.1	19.1
Fumigation	14	8.9	8.9
Total	157	100.0	100.0

Source: Field data, 2016

The following chapter provides a summary and the general conclusion of the whole study as well as the recommendations given to policy makers and for areas that may require further research.

ST.PAUL'S UNIVERSITY

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary, conclusions and recommendations for this study on the food loss and waste at the Wakulima market, Nairobi County.

5.2 Summary

The main purpose of this study was to assess factors of food loss and waste at the market level in Kenya; a case of Wakulima market in Nairobi County. Food loss and waste was noted to be a global phenomenon even though prevalent in SSA. This was confirmed by a deliberate review of previous studies that had been conducted on food loss and waste in the world in general and SSA in particular. Some of these studies were focused on the Kenya problem of food loss and waste but very little was documented on the extent of food loss and waste at the urban market level. The selected food variety was fresh fruits and vegetables and it was noted that, to the best of the researcher's knowledge, there was no similar study undertaken in this area, especially in Kenya urban markets. The study was guided by the following three objectives; to establish the types of food loss and waste at Wakulima market, to investigate the main factors contributing to food loss and waste at Wakulima market and to identify intervention in place for reducing food wastage at Wakulima market.

In relation to the types of food losses, wastage was unique to a particular food produce. Seventy-six (76) of the respondents who represented 48.4% confirmed that the highest type of food loss was rotting. This was followed by breakage when FFV are offloaded or when arranged in heaps or being moved to another part of the market, which represented 23.6% of the respondents. There are also other causes of food waste at Wakulima market other than the types tested as confirmed by (25.2%) respondents. Among the fresh fruits covered by this study, mango and orange were confirmed to have the highest losses through over ripening and crashing, while water melon was noted to have the least wastage through rain contact which revert the ripening process causing rotting. The other

ST.PAUL'S UNIVERSITY

factor contributing to food loss and waste are breakages and rotting of fruits and vegetables, which is caused by rain. Among the vegetables under study, potatoes were discovered to have more losses through rotting, moulds and breakage while onion has minimal wastage of rotting, moulds and shooting. The occurrence of wastages also depends on the season where during the rainy season more wastage is experienced. It was further discovered that during some season, supplies of mango are of the traditional variety which is hardier and have longer life span than that of supplies of exotic varieties from Mombasa and Tanzania which are less hardy and have lesser life span. Wastages also depend on the amount of produce the traders purchase. Some time they purchase in big quantities which the market leadership do not have control of. On the investigation of the available intervention to reduce food loss, there was minimal intervention since respondents reported a need to increase market space, installation of conditioning facilities, frequent garbage collection, improvement of drainage, daily market cleaning and frequent fumigation.

5.3. Conclusions

Based on the findings of this study, the researcher came up with the following conclusions:

1. The highest type of food wastage was rotting as noted by 48.4% of the respondents followed by breakage as a result of offloading or through arranging or moving fruits and vegetables to another part of the market according to 23.6% of the respondents. This was followed by rat bites according to 21.7% of the respondents. The other type was mould according to 6.4% of the respondents. It was discovered that rotting was partly due to packaging, especially the fruits from the neighbouring countries. It was also discovered that mangoes and oranges had the highest losses through over-ripening and crashing as a result of improper packaging. Melons had the second least wastage through rain contact, which reverts the ripening process thus causing rotting. Onions had the least wastage because of the method of packaging in nets. Among the vegetables under study, potato had more losses through rotting, moulds and breakage while onion had minimal wastage of rotting, moulds and shooting.
2. The findings were that the main cause of food loss and waste was deterioration of quality. This was confirmed by 61.8% of the respondents. The other reason was non-compliance with safety standards as confirmed by 12.7% of the respondents. Twenty five percent

ST. PAUL'S UNIVERSITY

(25.2%) of the respondents confirmed that there are also other causes of food waste at this market.

3. The conditions at Wakulima market were not conducive according to the findings hence several interventions were necessary. The, findings according to majority of the respondents (22.3%) were that the environment of the market was dirty. Another finding was that the market space was small according to 18.5% of the respondents. Fifteen percent (13.3%) of the respondents cited the rejection of produce by customers while and 12.7% cited while rodents and limited market time tied at 14%. Bad smell (12.7 %) and bad debts (3.2%). stood at the bottom in that order. These findings confirmed to the researcher that there was much more that needed to be done to help reduce the food loss and waste at Wakulima market. Concerning the interventions that had been put in place, the findings were contradictory. The respondents of the questionnaires noted that very little had been done (42.7%). Thirty-five percent (35.0%) indicated that there was irregular garbage collection at the market and 22.3% of the respondents confirmed that there was partial cleaning at the market. The KIIs categorically noted that some interventions, such as daily cleaning, de-ratting and frequent garbage collection had been put in place. Even so, the key informants were of the idea that more interventions ought to be put in place, such as the construction of a new market and road was in progress.

5.4. Recommendations

According to the findings of this research, the following recommendations can be made:

1. The elected leaders to work together with the County Government, the market leadership and the traders towards positive wellbeing of the trading community.
2. The ministry of Health together with the County government to embark counselling for the traders already infected and affected by HIV as well as prevention campaigns. Also, to embark on anti-drugs campaigns in order to sensitize the market community.
3. It would also be important to organize exchange visits to other markets in more developed countries for the County market officers and the section heads who are also traders to enable them learn and share new experiences.

ST PAUL'S UNIVERSITY

4. Training for the trading community on food wastage management as this would help in addressing the challenges of food loss and waste.
5. The market leadership to embrace participation by traders in deciding on how to enhance frequent cleaning, garbage collection and de-ratting.
6. The Governments of Kenya, Tanzania and Uganda through the East Africa Community to work on improving fair trade by control of quality and packaging of produce.

5.5. Recommendation for further research

Further research is recommended on areas that raised some questions with regard to what motivated the respondents to respond the way they did. For that reason, further research is recommended on the following areas.

1. Other researchers should replicate this study in other urban markets to determine whether the situation is similar or different in order to come up with more comprehensive interventions. A case study of Wakulima market is just a one-time investigation and the situation could change in other markets at different seasons.
2. A study should be undertaken to investigate the effects of the reported HIV prevalence on food loss and waste.

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APPENDIX I:

Questionnaire for wholesale and retail traders in Wakulima market, Nairobi County

My name is Gladys Wairimu Mariga, a student at St. Paul's University Limuru pursuing a Master Degree in Development Studies. I am conducting a study on "An assessment of factors of food loss and food waste at the market level in Kenya: a case of Wakulima market, Nairobi county" as a fulfilment of the requirements for the award of the masters degree. This study will be significant to relevant Government departments and other organizations, as it will enable them to have a better understanding of the factors of food wastage at the market level. The recommendations that I will arrive at will help to form the foundation for addressing the problem of food loss, which is experienced across the country. Please respond to the questions as accurately as you can. The information you provide will solely be used for this study. Your name will not be featured anywhere. All information collected will be held in confidence.

Instructions

Please indicate the answer by ticking **(✓)** the most appropriate answer and writing information on the spaces provides where applicable.

Section A: Inventory Section (please tick (✓) the most appropriate answer)

Gender

[ ] Male

[ ] Female

Age

[ ] i.18-23 years

[ ] ii.24-29 years

[ ] iii.30-35 years

[ ] iv. Above 35 years

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Marital status

[ ] i. Single

[ ] ii. Married

[ ] iii. Widowed

[ ] iv. Divorced/Separated

Level of education

[ ] i. No School

[ ] ii. Primary

[ ] iii. Secondary

[ ] iv. College

Size of Household

[ ] 1-3 People

[ ] 4-6 People

[ ] More than 6 people

What is your monthly Income?

[ ] Less than Ksh.5000

[ ] Kshs. 5000-10000

[ ] Ksh 10001-150000

[ ] Ksh. 15001-20000

[ ] Ksh. 20001-25000

[ ] More than Ksh.25000

Q7. For how long have you been a trader in fruits and vegetables at Wakulima market?

[ ] Less than 12 months

[ ] 1-2 Years

[ ] More than 3 Years

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Q8. Have you heard about food loss and waste?

□ Yes □ No

Section B: Assessing the types of food loss and food waste at Wakulima Market

Q9. What fruits and vegetable products do you trade in?

a) b)

c) d)

e) f)

Q10. For each product in question 9 above, which wastage do they suffer?

a) b)

c) d)

e) f)

Section C: Assessing the causes of food loss and waste at Wakulima Market

Q11. Have you ever thrown away any food produce?

A. Yes

B. No

Q12. If, yes, how often?

A. Very Often

B. Often

C. Rarely

Q13. Are there foods that are either left to deteriorate or are discarded accidentally/ voluntarily at Wakulima market?

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A. Yes

B. No

Q14. Which of the following reasons may motivate you to throw away food produce?

A. Deterioration of quality

B. Non-compliance with food safety standards

C. Others

Q15. How do you store your fruits and vegetables products once they reach the market?

.....

.....

.....

Q16. What conditioner facilities do you use for your fruits and vegetables in the market**?**

.....

.....

.....

Q17. What kind of training are you offered by the County Government at the market?

.....

.....

.....

Section D: Assessing Possible solutions to food loss waste at Wakulima Market.

Q18. What problems do you face in fruits and vegetables handling?

.....

.....

.....

Q19. What would help fix these problems?

.....

.....

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.....

.....

Q20. Which measures are in place to reduce food loss and waste in this Market?

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.....

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.....

.....

<The End>

Thank You for your Participation

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APPENDIX II

Key Informants Interview Schedule (Market manager, Market supervisors and Cess managers)

My name is Gladys Wairimu Mariga, a student at St. Paul's University Limuru pursuing a Master Degree in Development Studies. I am conducting a study on "An assessment of factors of food loss and food waste at the market level in Kenya: a case of Wakulima market, Nairobi county" as a fulfilment of the requirements for the award of the masters degree. This study will be significant to relevant Government departments and other organizations, as it will enable them to have a better understanding of the factors of food wastage at the market level. The recommendations that I will arrive at will help to form the foundation for addressing the problem of food loss, which is experienced across the country. Please respond to the questions as accurately as you can. The information you provide will solely be used for this study. Your name will not be featured anywhere. All information collected will be held in confidence.

Preliminary information

1. What is the full name of the organization responsible for managing this market?
2. What is your designation?
3. How long have you worked in the current organization?
4. What services do you provide to the market?
5. What is your observation on food loss and waste in Wakulima Market?
6. In your opinion, what are the factors that affect food loss and food waste in Wakulima market?

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7. What challenges of food loss and waste prevent you from serving better?

8. What recommendations do you have for addressing each of these challenges?
9. What interventions are in place to minimize food loss and waste in Wakulima Market?

10. What further recommendations would you suggest to reduce food loss and waste in Wakulima market?

Thank you for your cooperation

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