THE RELATIONSHIP BETWEEN HOUSEHOLD-GENERATED FOOD WASTE IN RURAL AND URBAN LESOTHO: AN INVESTIGATION

Lisemelo Mateboho Lucia Chenene

Dissertation submitted in accordance with the requirements for the degree

Master of Science in Consumer Science

Faculty of Natural and Agricultural Sciences
Department of Consumer Science

University of the Free State
Bloemfontein

Supervisor: Dr N Cronjé

Co-Supervisor: Dr I van der Merwe

January 2020

Few things are impossible to diligence and skill. Great works are performed, not by strength, but perseverance.

Samuel Johnson

DECLARATION

I declare that this thesis, titled **THE RELATIONSHIP BETWEEN HOUSEHOLD-GENERATED FOOD WASTE IN RURAL AND URBAN LESOTHO: AN INVESTIGATION**, hereby submitted for the qualification of Master of Science in Consumer Science at the University of the Free State, is my own independent work and that I have not previously submitted the same work for a qualification at/in another university/faculty.

I hereby cede copyright to the University of the Free State.

Lisemelo Mateboho Ntlopo Chenene	31 January 2020
Name	Date

ACKNOWLEDGEMENTS

My sincere gratitude goes to my supervisor, Dr Natasha Cronjé, for her advice and making this study a success, who restlessly supervised and assisted me despite her other obligations. Without her constant support, I believe it would have been difficult to accomplish this work. I would also like to express my sincere thanks to my co-supervisor, Dr Ismari van der Merwe, who assisted in this study despite her other obligations. My sincere thanks goes to Statistical Consultation Unit UFS Dr Sean van der Merwe who helped me with data analysis despite his other obligations.

I am also grateful to my husband, my mother, and my two beautiful girls for having supported and motivated me during my student days.

ABSTRACT

Food waste has received substantial attention from industry and research communities in the previous decade. To develop sustainable food systems, and possibly ensure food security for the world population, food waste should be minimised. Food waste is related to economic, environmental, and social challenges. There are many culprits in the food supply chain that add to the food waste dilemma, as food is wasted and lost during different stages. These stages include production, processing, transport, retail, and consumption; of which consumption is of importance in this research. Consumers are significant contributors to food waste, and it is therefore essential to have a clear understanding of the factors that influence household food waste related to consumer perceptions and behaviour.

Food waste is particularly important from a developing country's point of view, especially as a potential mitigating factor for food insecurity. Sub-Saharan Africa is considered vulnerable and continues to experience challenges related to inadequate infrastructure, lack of support from government, and very little intervention. One such country, Lesotho, is a small country surrounded by the Republic of South Africa. To the knowledge of the researcher, there is a considerable void in data regarding household food waste research in Lesotho. This is especially true when considering the types of food waste generated by households, the household practices that could be driving food waste, and how it differs between urban and rural settings. It was therefore the aim of this study to compare the household food waste in rural and urban areas of Lesotho. This study further sought to explore reasons for household food waste with specific attention to households' behaviour, purchasing habits, attitudes, and lifestyle in both the rural and urban areas of Lesotho.

A quantitative approach with an exploratory and descriptive design was adopted. Data were collected from February 2019 to May 2019 from both urban (Maseru and Botha Bothe) and rural (Mokhotlong) areas of Lesotho. Randomised probability sampling was employed, and the unit of analysis in this study was households. Consumers who participated in the survey were chosen on the premise that they were older than 18 years, they were also responsible for food purchase and food preparation in households, and they were regarded as being aware of all the food that is consumed and not consumed within the household, regardless

of gender (male, female, or other). The number of households sampled in Botha Bothe was 150, Maseru 250, and Mokhotlong 150. A total of 550 consumers therefore participated in the study, representing 550 households.

The data were collected by utilising structured questionnaires. The questionnaire was designed in English and translated to the local language, Sesotho, to ensure that the consumers have a clear understanding of the questions asked, as it is the language understood by the majority of citizens in Lesotho. The questionnaire took approximately 30 minutes to complete. No incentive was provided to the participating consumers. The data were analysed using the Statistical Package for the Social Sciences (SPSS).

The results indicate that education is a significant indicator ($p=0.019$) of food waste. Regarding the relationship between food waste generation and income, it seems that income is a significant indicator of food waste. Consumers who reside in both rural and urban areas are fully aware of the negative consequences of food waste. Consumers apply a great deal of effort to minimise the amount of discarded food in their households, which was also statistically significant ($p=0.022$). Approximately three-quarters (76%) of the consumers in urban areas undertake their main shopping from a supermarket, while it is the case with just more than half (52%) of consumers in rural areas.

In rural areas, consumers do not discard the food if the “best before” date has expired, regardless of its appearance or smell, whereas most of the consumers in urban areas discard the food if the “best before” date has expired. Lesotho, being a low-income country with scarce resources, could benefit from food waste reduction and intervention programmes to assist in alleviating food insecurity. It is therefore recommended that the Lesotho government supports educational campaigns aimed at reducing food wastage and to enhance household planning skills and routines regarding food preparation.

Keywords: household food waste, food security, Lesotho, consumers.

TABLE OF CONTENTS

DECLARATION i

ACKNOWLEDGEMENTS ii

ABSTRACT iii

LIST OF FIGURES ix

LIST OF TABLES ix

LIST OF ABBREVIATIONS x

CHAPTER 1: INTRODUCTION

1.1 GENERAL INTRODUCTION 1

1.2 RESEARCH PROBLEM 3

1.3 RESEARCH OBJECTIVES 3

1.4 RATIONALISATION OF THE STUDY 4

1.5 DEFINITION OF TERMS 4

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION 6

2.2 DEFINING FOOD WASTE 8

2.2.1 Food loss 8

2.2.2 Food waste 8

2.3 THE IMPACT OF FOOD WASTE 9

2.3.1 Environmental impact 9

2.3.1.1 Carbon footprint 9

2.3.1.2 Water footprint 10

2.3.1.3 Ecological footprint 10

2.3.2 Economic impact 10

2.3.3 Social impact 11

2.4 FOOD WASTE AND CULTURE 12
2.5 REASONS FOR HOUSEHOLD FOOD WASTE 14
2.5.1 Storage 15
2.5.2 Packaging 16
2.5.3 Confusion over dates on labels 17
2.5.4 Inadequate planning 18
2.5.5 Purchasing behaviour 19
2.5.6 Excess preparation 20
2.5.7 Health concerns 21
2.5.8 Children 21
2.5.9 Food spoilage 22
2.6 FACTORS THAT AFFECT HOUSEHOLD FOOD WASTE 22
2.6.1 Consumption behaviour and food patterns 22
2.6.2 Values and the perceived value of food 23
2.6.3 Awareness 24
2.6.4 Attitudes towards food waste 25
2.6.5 Social and moral norms 26
2.6.6 Knowledge and skills 27
2.6.7 Demographic factors 27
2.6.7.1 Household size and composition 28
2.6.7.2 Age 28
2.6.7.3 Education and income 29
2.6.7.4 Gender 30
2.7 PREVENTATIVE MEASURES TO REDUCE FOOD WASTE 30
2.7.1 Planning 30
2.7.2 Provisioning 31
2.7.3 Storage 31

2.7.4 Preparation 32

2.7.5 Consumption 33

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION 34

3.2 RESEARCH DESIGN 34

3.3 TARGET POPULATION AND SAMPLING 35

3.3.1 Population 35

3.3.2 Sampling procedure 36

3.3.3 The size of the sample 37

3.4 DATA COLLECTION 37

3.4.1 Instrument 37

3.4.2 Procedure 38

3.5 DATA ANALYSIS 39

3.6 RELIABILITY AND VALIDITY 40

3.7 LIMITATIONS OF THE STUDY 41

3.8 ETHICAL CONSIDERATIONS 42

CHAPTER 4: RESULTS AND DISCUSSION

4.1 INTRODUCTION 44

4.2 THE DEMOGRAPHIC PROFILE OF CONSUMERS 44

4.3 KNOWLEDGE AND AWARENESS RELATING TO HOUSEHOLD FOOD WASTE 47

4.3.1 Awareness and concern 47

4.3.2 Estimation of the amount of food discarded and efforts to minimise it 49

4.3.3 Knowledge and correct storage 50

4.4 BEHAVIOUR RELATED TO FOOD WASTE 52

4.4.1 Purchasing behaviour 52

4.4.2 Storage 55
4.4.3 Handling leftover food 55
4.4.4 Food waste management 58
4.5 FOOD CONSUMPTION 61
4.6 INDICATORS OF FOOD WASTE GENERATION 63
4.6.1 Education and income 63
4.6.2 Household size 64

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION 66
5.2 RECOMMENDATIONS 68
5.2.1 Recommendation for awareness campaigns and educating consumers 63
5.2.2 Recommendation for food producers and retailers 64
5.2.3 Recommendation for further research 63

REFERENCES 70

APPENDICES

APPENDIX A: ETHICAL CLEARANCE 78
APPENDIX B: QUESTIONNAIRE 79
APPENDIX C: TURNITIN REPORT 89
APPENDIX D: EDITING CERTIFICATE 90

LIST OF FIGURES

Figure 3.1: Map of Lesotho with ten administrative districts 36

Figure 4.1: Gender composition of the population (n=550) 44

Figure 4.2: Monthly income of households by area (n=550) 46

Figure 4.3: The negative consequences of food waste (n=550) 47

Figure 4.4: Level of concern when discarding food (n=550) 48

Figure 4.5: Consumers' qualitative estimation of food discarded (n=550) 49

Figure 4.6: Consumers' efforts to minimise the amount of food wasted (n=550) 50

Figure 4.7: Storage of fruit and vegetables (n=550) 51

Figure 4.8: Summary of consumers' frequency of shopping behaviour (n=550) 52

Figure 4.9: Summary of the respondents' type of stores that are used (n=550) 53

Figure 4.10: Ways to handle an item that is coming close to its "best before" date (n=550) 56

Figure 4.11: Summary of what is done when too much food is prepared (n=550) 57

Figure 4.12: Summary of the origin of household food waste (n=550) 59

Figure 4.13: Category of food consumers tend to over-purchase and then discard (n=550) 60

Figure 4.14: Fruits that are consumed the most (n=550) 62

Figure 4.15: Vegetables that are consumed the most (n=550) 63

LIST OF TABLES

Table 3.1: Summary of risks and precautions during the survey 43

Table 4.1: Socio-demographic characteristics of consumers by area (n=550) 45

Table 4.2: Consumers' priority ranking of the necessity to store items in a refrigerator 51

Table 4.3: Indication of consumers' actions regarding food shopping (n=550) 54

Table 4.4: Indication of consumers' actions regarding food waste (n=550) 55

Table 4.5: Indication of consumers' actions regarding leftovers (n=550) 58

Table 4.6: Reasons for discarding food (n=550) 59

Table 4.7: Summary of the category of fruits and vegetables that are bought and discarded 61

LIST OF ABBREVIATIONS

°C	Degrees Celsius
BoS	Lesotho Bureau of Statistics
CH_4	Methane
CO_2	Carbon dioxide
FAO	Food and Agriculture Organization
FSC	Food supply chain
GHG	Greenhouse gas
Kg	Kilogram
LDHS	Lesotho Demographic and Health Survey
LNVR	Lesotho Voluntary National Review on the implementation of the Agenda 2030
LSL	Lesotho loti
MAFS	Lesotho Ministry of Agriculture
N_2O	Nitrous oxide
SDG	Sustainable Development Goal
SPSS	Statistical Package for the Social Sciences
UFS	University of the Free State
UNDP	United Nations Development Programme
USD	United States dollar
WFP	World Food Programme
WRAP	Waste and Resource Action Programme

CHAPTER 1

INTRODUCTION

1.1 GENERAL INTRODUCTION

The Food and Agriculture Organization (FAO, 2011) estimates that the world loses or wastes nearly 33% of the food produced for human consumption, which amounts to approximately 1.3 billion tonnes of wasted food per year. This occurs even though almost two billion people go hungry and approximately one in seven people is undernourished. Moreover, this implies that 24% of the caloric value of food intended for human consumption (Lipinski *et al*., 2013), and four times the amount of food needed to eradicate world hunger, is wasted (Chakona & Shackleton, 2017).

Food waste has an unfavourable impact on the environment and creates negative economic consequences (Pärn, 2016). It results in approximately USD1 trillion lost per year, as well as environmental costs estimated at USD700 billion per annum. These environmental costs include wasted water, soil erosion, increase of greenhouse gas (GHG) emissions, and delays in rural development (FAO, 2015). In addition, food waste has a social impact and leads to an increase in food prices, which makes food less accessible for the poorest, and therefore increases the number of malnourished people (Chakona & Shackleton, 2017; Boom, 2012).

Food waste and losses can occur during the process of food production, manufacturing, distribution, retail, and consumption. Consumption is an essential aspect that relates to the hospitality industry, food service industry, and consumer households. More specifically, food waste in households can occur before, during, and after meal preparation (Oelofse & Nahman, 2013). The importance thereof is further reiterated by Sustainable Development Goal (SDG) target 12.3, which calls for halving food waste by 2030 (United Nations Development Programme [UNDP], 2019).

According to the Waste and Resource Action Programme (WRAP, 2013), approximately 60% of household food waste results from products that were not used in time. These products alone account for a loss of around USD8.8 billion. The majority of household food waste is made up of perishable or short-shelf-life products and includes more fresh produce, which is

most often considered avoidable food waste. Globally, consumers are the most significant contributors to wasted food that occurs in homes (Marangon *et al*., 2015). Approximately 95 to 115 kilograms (kg) of food per person per year is wasted in households, of which much is still perfectly edible (Hudson & Messa, 2014).

Consumers can save time and money and help the environment if food waste is minimised (Aschemann-Witzel *et al*., 2017). Food waste can also possibly play an essential role in efforts to fight hunger and improve food security in lower-income countries (Oelofse & Nahman, 2013). The challenge of global food security centres around the fact that roughly 868 million people are undernourished and approximately two billion people suffer from the negative health consequences of micronutrient deficiencies due to nutritionally imbalanced meals (Chakona & Shackleton, 2017; Phil *et al*., 2015).

One such an example is Lesotho, a small landlocked nation with slightly more than two million citizens, which is surrounded by the Republic of South Africa (Furin *et al.*, 2007). Lesotho has suffered severe food insecurity, and it continues to be a chronic problem and a key obstacle to the country's development agenda (Chakona & Shackleton, 2017; Leduka *et al*., 2015). More than 30%, or 709 394, of Lesotho citizens are food insecure. As a result of the severe food insecurity, 33.2% of children under five years are malnourished. Consequently, the matter of food waste is increasingly being recognised as a possible way of addressing the food security situation (Phil *et al*., 2015). Unified strategies are necessary to address issues of development that affect Lesotho, including the promotion of effective food management and primary food processing to reduce food waste (George, 2014).

To the knowledge of the researcher, no study has been conducted on the composition or quantity of food waste generated by households in Lesotho. Furthermore, there is a void in knowledge regarding consumers' behaviour, knowledge, and attitude towards food waste, and how these differ between urban and rural locations. This study therefore focused on determining and comparing the type of food wasted in urban and rural households of Lesotho, as well as attempting to identify necessary conditions for food waste prevention and reduction for the future generation. In addition, reasons for household food waste with particular attention to households' behaviour, purchasing habits, attitudes, and lifestyle in both rural and urban areas of Lesotho were explored.

1.2 RESEARCH PROBLEM

Lesotho's national poverty figures indicate that 57.1% of the Basotho population lives below the poverty line and 34% of adults live below the food poverty line of LSL138 (USD10.30), which is one out of every three people (UNDP, 2015). The rate of poverty is unequally spread across Lesotho. It is the highest in the central mountains, followed by the more remote areas of the Foothills and Lowlands (Lesotho Voluntary National Review on the Implementation of the Agenda 2030 [LVNR], 2019), and roughly 75% of the rural population depends on subsistence agriculture for their livelihood. Poverty is lower in the urban areas, although it seems that this pattern is changing, in line with the urbanisation of the population (UNDP, 2015).

Food waste relates to food security and nutrition security (Phil *et al.*, 2015). When food is wasted, it increases food prices, therefore worsening food insecurity for many people (Segrè *et al.*, 2014). Consequently, 709 394 people in Lesotho are food insecure. As a result of severe food insecurity, 33.2% of children under five years are stunted, with a low height for their age. Addressing the matter of food waste could be of great value in the food security situation of the nation (Phil *et al.*, 2015).

Lesotho, being a developing and low-income country with scarce resources, could benefit from food waste reduction and intervention programmes to assist in alleviating poverty and food insecurity (LVNR, 2019). Many consumers are not aware of the amount of food waste that is occurring in their homes and the role they could play in reducing it (FAO, 2019).

To attain a greater understanding of food waste practices and knowledge among Basotho consumers, the researcher compared the difference between food waste behaviour in rural and urban Lesotho, and identified perceptions, attitudes, and practices that could hinder or promote the reduction of food waste.

1.3 RESEARCH OBJECTIVES

The general aim of the study is to compare the type of food waste in rural and urban areas of Lesotho. In addition, the reasons for household food waste with particular attention to households' behaviour, purchasing habits, attitudes, and demographic and socio-economic characteristics of households in both rural and urban areas of Lesotho are explored.

The specific objectives of the study are as follows:

- To determine whether education, demographic and socio-economic are important indicators regarding knowledge of food waste.
- To explore rural and urban Lesotho consumers' attitudes and knowledge towards food waste.
- To identify consumers' behaviour that contributes to household food waste in the rural and urban areas of Lesotho.
- To make comparison of consumers' food waste behaviour and identifying the most prominent food items wasted in rural and urban areas Lesotho.

1.4 RATIONALISATION OF THE STUDY

This study is motivated by the lack of empirical information and evidence concerning household food waste in Lesotho. This study will contribute to information concerning the types of food wasted in the rural and urban areas of Lesotho. Moreover, clarification of the attitude and knowledge of Lesotho citizens towards household food waste will be attained. The results of the study will support the identification of measures and instruments to reduce food waste and to increase consumers' awareness of the negative impact of food waste. This research will also contribute to identifying necessary and sufficient conditions for food waste reduction in Lesotho. Furthermore, the data can be used to inform the development of possible policies or intervention strategies to reduce household food waste.

1.5 DEFINITION OF TERMS

The following terms are frequently used in this thesis:

Avoidable food waste: Refers to food which could have been eaten if it had not been allowed to go off or had not passed its "best before" date (Anding, 2016).

Consumer: Refers to a person who buys goods or services for their own use (Silvennoinen *et al.*, 2014).

Food loss: Food loss refers to the reduction in food quality/quantity in the primary stages of the food supply chain (FSC), which decreases the amount of food suitable for human consumption (FAO, 2011).

Food security: Exists when all people, at all times, have adequate physical, social, or

	economic access to sufficient, safe, and nutritious food for their dietary needs and food preferences for an active and healthy life (FAO, 2011).
Food waste:	Refers to food appropriate for human consumption being discarded, whether or not kept beyond the expiry date, or left to spoil (Borma, 2017).
Greenhouse gases:	Greenhouse gases are gases that absorb and emit radiant energy within the thermal infrared range. The three leading greenhouse gases of importance are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) (Hudson & Messa, 2014).
Household:	Refers to a group of people who usually live together and take their meals from a communal kitchen unless the crisis of work or other incidences prevent any of them from doing so (Glanz, 2008).
Possibly avoidable food waste:	Possibly avoidable food waste refers to food that could have been eaten but which some individuals chose not to eat because it seemed inedible, although it is still usable (Ventour, 2008).
Unavoidable food waste:	Unavoidable or (inedible) food waste mainly involves preparation residues. This food cannot be eaten by people but should be used to feed animals, for compost, or in anaerobic digestion (Glanz, 2008).

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Approximately one-third of food produced in the world goes to waste, which placed a spotlight on food production and consumption and led to a call for action by world leaders and civil society groups (Segrè *et al.*, 2014). What many people recklessly allow to rot in fields, landfills, and refrigerators could be instrumental in aiding to end world hunger quickly, simply, and possibly even permanently (Chrobog, 2014). In contrast, roughly 842 million people around the world suffer from chronic hunger (Chrobog, 2014; Hudson & Messa, 2014). It is estimated that 2 100 kilocalories per person per day of food supply is wasted, which could be enough to feed roughly 1.9 billion people (Phil *et al.*, 2015).

Segrè *et al.* (2014) indicate that in developing countries, the most substantial amount of food waste occurs at the final stages of the Food supply chain (FSC), particularly household consumption, restaurants, and food service establishments. Koivupuro (2011) believes that substantial food losses and waste occur early in the FSC because of spoilage or damage to food products. Approximately 95 to 115 kg of food per person per year is wasted in households. Many of the wasted food items are still perfectly edible and can be consumed (Hudson & Messa, 2014). In an effort to fight hunger and improve food security in developing countries, the focus should shift to a potentially critical factor such as food waste. It is also an ethical problem because food loss and waste impact negatively on the availability of food to others, which creates hunger among millions of people (Boom, 2012).

Food waste also relates to food security (Phil *et al.*, 2015). When food is wasted, it increases food prices, therefore worsening food insecurity for many people (Segrè *et al.*, 2014). According to the 2010 state of food insecurity in the world report (FAO, 2010), a total of 925 million people around the world are estimated to be undernourished, of which developing countries account for 98% (FAO, 2010).

Food that is produced yet not consumed, while fit for human consumption, results in wasted resources at the production stage, which further contributes to food insecurity.

Food security is centred on the notion that people have adequate physical, social, or economic access to sufficient, safe, and nutritious food (Shafiee-Jood & Cai, 2016). The food security definition often encompasses food availability, food access, and food utilisation (Ministry of Agriculture and Food Security [MAFS], 2008).

Food availability is concerned with sufficient quantities of food being available to all people within a country. Such food can be provided through household production, other domestic outputs, commercial imports, or food assistance. Food access is guaranteed if households and all individuals within the household have enough resources to acquire the right type of food for a nutritious diet. Access depends on the income of the household, the distribution of income within the household, and the price of food. Food utilisation is the appropriate biological usage of food, which provides a diet that has sufficient energy and all the essential nutrients, drinkable water, and adequate sanitation and healthcare. Effective food utilisation is based on household knowledge regarding the storage of food and processing techniques, basic principles of nutrition, and proper childcare (FAO, 2013a).

From an environmental viewpoint, food production requires valuable resources and energy that are essentially wasted if the produced food is not consumed. It is therefore crucial to reduce food waste in order to attain global food security, clearing up scarce resources for other uses, decreasing environmental risks, and avoiding financial losses (Thompson & Prendergast, 2015). In addition, natural disasters, the weather, climate conditions, and negative economic trends might play a role (Shafiee-Jood & Cai, 2016).

Lesotho has suffered severe food insecurity, and it continues to be a chronic problem and a key obstacle to the country's development agenda (Leduka *et al.*, 2015). There is relationship between poverty and food insecurity, according to the World Food Programme report of 2017 indicated that the overall population of Lesotho was approximately 2.1 million, of which 57.1% lived below the poverty line. Consequently, 709 394 people in Lesotho are food insecure. As a result of severe food insecurity, 33.2% of children under five years are stunted, with a low height for their age. Addressing the matter of food waste could be of great value in the food security situation of the nation (Phil *et al.*, 2015).

2.2 DEFINING FOOD WASTE

Food wastage takes place during different stages of the FSC. The stages in the FSC involve agricultural production, post-harvest handling, storage, processing, packaging, distribution, and consumption (FAO, 2011). Food wastage can be divided into two main categories, namely food loss and food waste. Food loss and waste are happening at a time when food prices are increasing and food insecurity is getting worse in many countries. It also negatively impacts the environment since energy resources are wasted, and it contributes to GHG emissions (Segrè *et al.*, 2014).

2.2.1 Food loss

Food loss refers to the reduction in food quality/quantity in the primary stages of the FSC, which decreases the amount of food suitable for human consumption (FAO, 2011). Food loss is primarily the result of wastefulness in the usage and resource allocations along the FSC. These include inadequate infrastructure and logistics; lack of technology; insufficient skills, knowledge, and management capacity among supply chain actors; and poor access to markets (Segré *et al*., 2014). Food loss therefore happens in the initial phases of the FSC, while food waste takes place during the consumer phase and is affected by a different set of variables (Phil *et al.*, 2015).

2.2.2 Food waste

Food waste refers to the discarding of food products that are fit for consumption or fit to proceed in the FSC (FAO, 2011; Segrè *et al.*, 2014; Phil *et al.*, 2015). Food waste most often takes place at the final stages of the FSC, such as in retail and consumer households.

Three types of food waste can be distinguished, namely avoidable waste, possibly avoidable waste, and unavoidable or inedible waste. Avoidable waste refers to food that could have been eaten if it had not been allowed to go off or had not passed its “best before” date. There are many reasons for this occurrence, of which the possible reasons are discussed later in this chapter. Understanding the cause of this type of waste is of primary importance in order to avoid food waste (Anding, 2016; Ventour, 2008).

Possibly avoidable waste refers to food that could have been eaten but which some individuals chose not to eat because it seemed inedible, although it was still usable. Examples of the latter include fruit skins and beet tops that could be cooked similarly to collard greens or spinach, as an alternative to being discarded (Anding, 2016; Ventour, 2008).

Unavoidable or (inedible) waste mainly involves preparation residues. This food cannot be eaten by people but could be used to feed animals, used as compost, or in anaerobic digestion. These items include teabags, bones, and fruit and vegetable peels and pips (Anding, 2016; Ventour, 2008).

Glanz (2008) adds the following to the above categories of food waste from households. Unopened food in original packaging refers to food in its original packaging, discarded after or before the expiry date. Opened, partially used food refers to food that was partially used but discarded; for example, half a package of sausages.

2.3 THE IMPACT OF FOOD WASTE

2.3.1 Environmental impact

Food waste impacts the environment on both the micro and macro level (Phil *et al.*, 2015). Firstly, at the micro level, the amount of garbage and waste results in infections and uncleanliness of individuals in both rural and urban areas at the household level. Secondly, at a macro level, food that is produced and that will not be consumed pointlessly utilises natural resources, produces GHGs, and creates waste. Higher levels of GHGs in the atmosphere are well known to influence and hasten climate change, which is causing severe problems in our biosphere (Phil *et al.*, 2015). The environmental impact of food waste is evaluated using three indicators, namely carbon footprint, ecological footprint, and water footprint (Buchner *et al.*, 2012).

2.3.1.1 Carbon footprint

The carbon footprint of food waste is estimated to be 3.3 gigatonnes of CO_2 (Hudson & Messa, 2014). The carbon footprint mainly indicates GHGs emitted during production, which primarily consist of CO_2 created by the usage of fossil fuels, CH_4 derivatives from livestock

enteric fermentation, and N_2O emissions caused by the use of nitrogen-based fertilisers (Buchner *et al*., 2012). Animal products such as dairy, meat, and cheese have the highest carbon footprint; for example, the carbon footprint of discarded beef and pork is one of the largest for food, even though they contribute to only 4% of food waste (FAO, 2013b).

2.3.1.2 Water footprint

Agricultural production accounts for over 90% of the total water footprint and is the largest consumer of water resources (Phil *et al.*, 2015). The water footprint refers to a specific indicator of the use of freshwater and is developed to deliver both the definite amounts of water resources used and how the water is used (Buchner *et al.*, 2012). The FAO (2013a) assumes that the water footprint of food waste consists of water usage in the agricultural phase only. Gibson (2016) reasons that the water footprint also includes virtual water, which is water used in processing, production, and consumption. All forms of water, whether direct or indirect, are therefore accounted for.

2.3.1.3 Ecological footprint

The ecological footprint is an indicator used to measure the impact of a specific population's consumption on the environment. It measures the total area of land and water ecosystems needed to sustainably make available all the resources used and to absorb all the emissions produced sustainably (Buchner *et al*., 2012). Produced but uneaten food uses up almost 1.4 billion hectares of land, which signifies almost 30% of global agricultural land area (Hudson & Messa, 2014).

2.3.2 Economic impact

Food waste also represents a relative financial loss, not only on a country or food industry scale but a household scale as well. Wasting food is related to wasting time, labour, and money, at the global and local scale (Phil *et al.*, 2015).

Economic losses are different for each phase of the FSC. Producers who have unharvested produce or discard perfectly edible products that do not adhere to market size and aesthetic standards imply wasted food. Retailers, who discard products due to mechanical or

biological spoilage, also have monetary losses. The spoilage is often due to transport because of long distances between the place of production and the store, or because of long journeys to slaughterhouses. Retailers also dispose of products left unsold before their expiry date, discard edible products close to their “best before” dates, or throw away edible products that are below the required aesthetic standards; all of which contributes to financial loss (Phil *et al*., 2015).

The global market is ruled by demand and supply, which involve price variations of a given product. As a result, increases in prices, in turn, lead to food conflicts in lower-income regions. In the case of a decrease in prices, wasting by producers can be expected, since selling food items at a lower price than the harvesting cost is not a lucrative option (Phil *et al*., 2015). The increasing demand for food in developed countries has contributed to an increase in food prices, which in turn causes the food to be expensive for poor people (Enos, 2019). Sharing the same sentiment, Phil *et al.* (2015) indicate that the economy has an influence on households and affects the most impoverished households rather than the richest.

Food waste also influences the purchasing capacity of households. It occurs directly in the sense that discarding a product is equal to money lost (Segré *et al*., 2014). It also occurs indirectly, as food waste suffered by stores is paid for indirectly by the consumer through the increase of prices, which enables the supermarket to stay profitable even if it throws away many products (Phil *et al.*, 2015; Hudson & Messa, 2014). Raw commodity food prices also influence the price of the food we buy in stores and supermarkets (Britain *et al.*, 2015).

Furthermore, with a more conscious attitude towards food waste by consumers, the quantity of food bought per shopping trip decreases. Nevertheless, the amount of food eaten does not change, nor does the overall budget for food. Consumers spend the same amount of money on food, as they buy smaller amounts but repeatedly – hence contributing to minimising food waste (Britain *et al*., 2015).

2.3.3 Social impact

The social impact of food waste is considered from the angle of food security and food access (Segrè *et al*., 2014). According to the FAO (2013b), food security is a situation where

all individuals always have physical, social, and economic access to enough food that is safe and nutritious to fulfil their nutritional needs and food choices for a healthy and active life.

The idea of food security also relates to whether or not food is available country-wide in such quantities that it will meet the energy requirements of the reference population. In conjunction with energy requirements, a diet should also ensure adequate nutrient content. The minimum daily energy requirement set by the World Health Organization is 2 100 kilocalories per person (Segrè *et al*., 2014).

While millions of tonnes of food end up in landfills, the number of people who have no access to suitable food and healthy diets is increasing not only in low-income countries but also in higher-income countries (Hudson & Messa, 2014). The World Food Programme further indicated in 2017 that 709 394 people in Lesotho are food insecure and that 57.1% of people live below the poverty line. According to Leduka *et al.* (2015), Lesotho has suffered severe food insecurity, and it continues to be a chronic problem and a key obstacle to the country's development agenda.

Moreover, Hudson and Messa (2014) explain that overproduction and food wastage persevere at the cost of the right to food, and the right to have consistent, permanent, and unlimited access to food, both directly and by way of buying. Adequate and sufficient food should be linked to the cultural traditions of the group of people with whom the consumer fits in, in order to ensure a physical and mental, individual and collective, and fulfilling and dignified life free of fear.

Malnutrition is increasing in many parts of the world due to poor accessibility of food. The challenge of malnutrition is also influenced by increased levels of poverty or the presence of war in a particular country or region, with resulting reduced access to food. This implies that poverty may hinder people from being both able to produce or buy sufficient food. On the other hand, in societies where food is plentifully available, and access to food is guaranteed, food waste increases due to overeating (Segrè *et al*., 2014).

2.4 FOOD WASTE AND CULTURE

Food is inextricably linked and related to one's culture, to one's individual and collective histories, and to one's identity (Segrè *et al*., 2014). The individual's decisions concerning

what is suitable or not suitable to discard are thus influenced by culture and personal choices. The quality and type of food and food waste differ substantially from one country to another, which are usually dependent on how economically developed a country or specific area is (Enos, 2019).

Furthermore, food waste generation, nutrition, eating, and food are primarily determined by the culture and self-awareness of people. The production and consumption of food have profound cultural roots (Enos, 2019). People produce and eat food in order to stay alive, but also to celebrate essential events, to define their identity, and for pleasure and enjoyment (Hudson & Messa, 2014).

Cultural capacity aspects refer to tradition and traditional food-related skills and knowledge. For example, some consumers from different cultures experience problems with consuming and combining specific food items if they are not familiar with the item or lack knowledge of how to use it, which results in discarding the item (Segrè *et al.*, 2014). At the same time, traditional cultural heritage and habits might result in differences in the management of food (Segrè *et al.*, 2014).

Cultures vary concerning the edibility of different foods and food parts. Some consume food wholly, while others discard different parts of food (Enos, 2019). Furthermore, people regard some food items as edible or inedible in certain cultures, but not in others. Culture therefore determines which food is consumed by members of that culture, which significantly influences households' attitudes toward food and what to eat (Chrobog, 2014).

The personal relationship an individual has with food directly influences the amount of food waste that person generates and profoundly affects consumers' values regarding food. Moreover, dwindling religious practices have led to the degradation of the value of food (Phil *et al*., 2015). In addition, weddings and religious and traditional holidays might influence food loss and waste, since they present additional difficulties in predicting the demand for food products. These could also possibly lead to excess production that necessitates management at the processing, retail, or consumption levels, and therefore potentially becoming a source of food waste (Segrè *et al.*, 2014).

Consumers' lifestyle also influences food waste generation. As many consumers have moved to urban areas, dietary and consumption patterns have also changed. Urban consumers generally stay far away from the place of production and become dissociated with seasonal food items (Aschemann-Witzel *et al*., 2015). As a result, the value of labour that a farmer provides to a product tends to vanish in urban areas. Consumers' lifestyles and conveniences are entangled in food waste for a variety of reasons, such as the consumption and the need for fast food, both in a restaurant and in a household, as well as the use of a microwave for prepared meals. This contributes to food that needs to be gobbled up, and basic knowledge about cooking fresh products efficiently and how to manage a good meal with what is available disintegrating. This leads to food items being discarded more easily (Phil *et al.*, 2015).

African society is a society of abundance that has a throwaway mentality, which means that consumers can buy what they want and where they want. This mentality is further exacerbated by the market enterprise and advertisements. This desire for variety, both in the refrigerator and in the stores, has a direct influence on food waste (Phil *et al*., 2015).

2.5 REASONS FOR HOUSEHOLD FOOD WASTE

Food waste generation in households is a result of consumers' behaviour and their lifestyles. This relates to different features of food purchasing, preparation, consumption, and post-meal behaviour, each of which is influenced by several factors (Qi & Roe, 2016). The types of food consumed and the way food is packaged influence the purchasing of food, and, consequently, the extent to which food is wasted (Marangon *et al.*, 2015). It is therefore essential to educate people in order to help them change their habits (Pärn, 2016).

According to Van Geffen *et al.* (2016), there are two types of situations in which consumer food waste occurs, namely in-home and out-of-home eating. In-home consumer food waste refers to food waste from food products such as drinks or meals that are prepared and partly consumed in the household. This is inclusive of situations in which food is wasted from meals prepared in the home but eaten elsewhere (i.e. picnics and packed lunches), as well as food prepared elsewhere but consumed in-home, such as ready-made convenience meals and take-aways.

Out-of-home consumer food waste refers to food waste that occurs when consumers eat food prepared by food services outside of the home. This includes restaurants, snack bars, kiosks at train stations, canteens, as well as institutions such as homes for the elderly and prisons (Van Geffen *et al.*, 2016).

Food waste produced in households mostly consist of perishable food items such as unused or spoiled cooked food, excess cooked food, vegetable and fruit peelings, beverages that have gone off, undesirable raw food, meat scraps, fresh fruits and vegetables, and salad (Žitnik & Vidic, 2016; Ramukhwatho *et al.*, 2016). Food spoilage may occur because of improper storage, partially used ingredients, and overestimated food needs (Gustavsson *et al.*, 2013). Moreover, incorrect food storing and paying too little attention to the instructions indicated on the labels are also considered factors that add to household food waste (Segrè *et al.*, 2014; Aschemann-Witzel *et al.*, 2015).

Avoidable household food waste accounts for approximately one-quarter of all avoidable food wastage and is equal to roughly 0.8 portions being thrown away per person per day (Hoover, 2017). It is therefore imperative to reduce the quantity of food wasted (Gustavsson *et al.*, 2013). The following sections discuss the main reasons for household food waste.

2.5.1 Storage

Food products that are not appropriately stored reduce the shelf life of these products and add to the amount of food wasted in households (Aschemann-Witzel *et al.*, 2015). Freezing or refrigeration is considered the best measure to combat food waste (Van Dooren & Mensink, 2014), and is also the preferred method for preserving food. Refrigeration is used to reduce bacterial action in order to keep food safe for a longer time (Aschemann-Witzel *et al.*, 2015).

Food products such as dairy, meat, and vegetables need to be refrigerated to avoid spoilage. Food is generally stored between temperatures of 3 and 7 degrees Celsius (°C), which is somewhat higher than the sub-zero temperatures of a freezer (Amini *et al*., 2012). Nevertheless, many consumers set their refrigerators to temperatures higher than 7 °C, as they do not know which is the best temperature for a refrigerator to prevent food spoilage

(Van Dooren & Mensink, 2014). However, some advice that a temperature of 8 °C is acceptable (Glanz, 2008).

Freezing solidifies water in the food, unlike refrigeration. This causes frozen foods to be kept fresh for up to six months, compared to refrigeration, which keeps it useful for at most seven days. The main reason is that in frozen foods, the free water is unavailable for bacterial growth and chemical and biochemical reactions. Freezing inactivates and prevents bacterial growth without changing the taste or texture of most food products, except for fruits, which become mushy (Amini *et al*., 2012).

Food storage is also an essential aspect of post-purchase behaviour (Borisova, 2013). Evidence indicates that there is a positive correlation between storage space capacity and food waste (Borisova, 2013). In general, consumers with larger cupboard/refrigerator capacity are likely to waste more in comparison with those who have less storage capacity. Improper storage contributes to food waste, as most consumers are incapable of accurately measuring whether food is safe to eat or not (Shafiee-Jood & Cai, 2016; Glanz, 2008).

Fresh products such as fruits, vegetables, meat, and fish obtained directly from the farm or after the catch can spoil in hot climates, especially if there is a lack of infrastructure for transportation, storage, cooling, and markets (FAO, 2010).

2.5.2 Packaging

As much as 20% to 25% of food is wasted due to packaging factors, such as packages being too large and packages not being easy to empty. Consumers generally do not make optimum use of packaging functions such as that of packaging prolonging the product's lifetime at home (Gustavsson *et al*., 2013). Food products packaged in considerably larger portions have a significant influence on household food waste such as not being able to portion bulk fresh foods for timely consumption. In most instances, the larger quantities are comparatively cheaper to purchase (Aschemann-Witzel *et al.*, 2015).

In addition, many consumers think products should be unpacked from their packaging before storage, although that is not always the case (Van Dooren & Mensink, 2014). Packaging helps to keep a product fresher for a more extended period, both at home and on the retailers' shelves.

2.5.3 Confusion over dates on labels

According to Van Dooren and Mensink (2014) “use by” dates indicate when food product may no longer be safe to eat. Consumer’s should not consume, cook or freeze it after the date displayed. “Use by” dates are linked to the safety of the product. It can be consumed until that day but not later than the indicated date. A product with an expired “use by” date should be discarded as consumers may contract foodborne diseases if they consume the product (Van Dooren & Mensink, 2014). Storage instructions should be carefully followed. “Use by” dates are frequently found on chilled products such as cooked meats, soft cheeses, and dairy-based desserts (WRAP, 2013).Whereas, “best before” dates food product is still safe to consume after the indicated best before date but its flavour and texture is not as good as before date. Food products that have an expired “best before” date can be consumed without causing illness to consumers (Van Dooren & Mensink, 2014). According to WRAP (2011), “best before” dates are generally put on longer-shelf-life foods such as frozen, tinned, or dried goods, and indicate quality rather than safety.

Confusion over food expiry dates such as “use by” and “best before” dates has been specified as one of the main reasons of food waste in households (Segrè *et al.*, 2014; Van Dooren & Mensink, 2014; Borisova, 2013). This might be due to too little attention paid to the information reported on the labels, confusion, or a lack of knowledge about the actual meaning of “best before” dates (Falasconi *et al.*, 2016; Radzymińska *et al*., 2016; Van Dooren & Mensink, 2014).

The proper use of these terms is not adequately understood by consumers, who interpret this information differently depending on the food category (Aschemann-Witzel *et al*., 2015; Borisova, 2013). A study conducted by WRAP in 2013 indicated that 36% of consumers interpret a “best before” date as a “use by” date, and only 55% correctly interpret “use by” dates.

Consumers are attentive to the expiry dates of products in which a decrease in quality or risk is involved, or for products with which consumers have experience of usage. If consumers’ focus on the “best before” date is increased, it could save up to 14 kg of food waste per person per year (Van Dooren & Mensink, 2014).

The ability to restore a perishable product declines throughout its shelf life (Aschemann-Witzel *et al*., 2015). This occurs particularly rapidly when the process influences the quality of the product. In most cases, consumers see dates of foods as an indicator of freshness and not as healthiness or a safety indicator; as a result, consumers are prepared to pay more for the food item. Products that are close to their expiry dates are often rejected by consumers (Göbel *et al.*, 2015).

2.5.4 Inadequate planning

Planning meals in advance or spot-checking inventories can assist in reducing food waste (Enos, 2019). Improper planning, such as purchasing too many products, is another factor that results in food wastage (Van Geffen *et al.*, 2016; Schneider, 2008). This increases the probability that not all products will be eaten before spoiling. Consequently, a lack of planning increases the chances of spoilage (Pärn, 2016; Van Geffen *et al.*, 2016; Aschemann-Witzel *et al.*, 2015).

Employing planning strategies, such as writing a shopping list, compiling meal plans beforehand, or checking inventories prior to shopping, minimises food waste (Enos, 2019; Jörissen *et al*., 2015; Van Dooren & Mensink, 2014). It is important to note that there is not yet clarity on the correlation between adequate planning and reduced food waste levels (Enos, 2019). Consumers who do not plan their meals and shop without shopping lists usually make incorrect estimates of how many ingredients they will use during the week. This influences consumers to overestimate and purchase unnecessary food items that are eventually not consumed (Aschemann-Witzel *et al.*, 2015).

Furthermore, having unplanned restaurant meals or food delivery can result in food at home going off before it can be used (Van Dooren & Mensink, 2014; Borisova, 2013). The household's particular lifestyle influences the meal preparation frequency, as well as the time for planning or preparing dishes. Unexpected invitations for dinner or eating out may be reasons for some households not using the bought food as planned (Glanz, 2008).

2.5.5 Purchasing behaviour

Over the past decade, there has been a marked change in the way consumers purchase food. The new tendency is not to plan meals but rather to be more impulsive (Pärn, 2016; Gjerris & Gaiani, 2013). In Nordic stores, up to 75% of purchases were found to be impulse purchases (Gjerris & Gaiani, 2013). Numerous grocery stores tempt consumers to purchase fewer products and visit the store more often, which encourages impulsive purchasing behaviour (Pärn, 2016). If shopping-trip plans are utilised and adhered to, food waste can be reduced (Evans, 2012).

A higher frequency of visiting stores results in more food being discarded (Jörissen *et al*., 2015). However, consumers who purchase only once a week have been found to be more wasteful than consumers who visit stores more often (Borisova, 2013). If all the food items for the week are bought during one purchasing trip, the proper estimation of the correct quantity of food is often not exact because of some uncertainties involved in planning. Furthermore, consumers tend to purchase large amounts of food or more than needed in order to reduce inconvenience and to avoid additional trips to the store (Aschemann-Witzel *et al*., 2015). More substantial amounts of food, if not consumed timely, can spoil and increase food waste (Pärn, 2016).

In this sense, online shopping could prove to be very advantageous because it saves time and consumers are not dependent on stores' operating hours. Moreover, purchasing items already present in the household is reduced. However, consumers cannot see if a product is of good quality or not and how fresh it is (Glanz, 2008). Interestingly, consumers who shop only at supermarkets have the highest food waste indices of households. Food waste declines when purchases take place at small stores and local markets and is at the minimum when people grow their own food (Jörissen *et al*., 2015).

Purchasing habits, such as overbuying of food or purchasing unintended products, or being attracted by promotions, negatively affect household food waste (Evans, 2012). Reasons for this occurrence include no planning before shopping, lack of knowledge regarding what is in storage or the refrigerator, impulsive purchasing caused by promotions and marketing influences in the store, the presence of other persons or children during shopping (Glanz, 2008), changed plans, cooking for more people than will be present at the meal,

experimenting with new products or recipes, and meal preparation for special occasions (FAO, 2010).

Special offers, to some extent, affect food waste. The consumers' way of planning their food shopping is influenced by special offers (Segrè *et al.*, 2014). Special offers, promotions, and large portion sizes cause consumers to purchase more than they need (Aschemann-Witzel *et al*., 2015; Schneider, 2008). Also, higher occurrences of unplanned purchases relate to higher levels of waste. Sales and promotions motivate consumers to be impulsive and purchase large amounts of food. Retail stores frequently influence consumers to buy items that do not form part of their regular meal plans and these items often spoil before they can be consumed (Van Dooren & Mensink, 2014). In addition, items bought at discount prices or impulsively tend to be discarded (Glanz, 2008).

2.5.6 Excess preparation

Another major reason why food is thrown away is the preparation of too much food. Consumers find it difficult to estimate correct amounts, and in many instances follow their instincts when cooking. As a result, households that do not accurately calculate how much they need to cook, discard more food (Van Dooren & Mensink, 2014). Furthermore, consumers tend to buy more than they would during regular shopping when preparing meals for bigger groups, which also results in more food waste (Oelofse & Nahman, 2013).

Leftover food is the result of excess preparation and the most significant contributor to food waste because of the way it is dealt with (Cronjé *et al*., 2018; Pärn, 2016). In most cases, small quantities of leftover food are thrown away because there was too little worth saving for another meal (Evans, 2012). The majority of consumers are unable or not willing to try to prepare meals using leftovers in the refrigerator, mainly due to a lack of cooking confidence and skills (Van Geffen *et al.*, 2016; Van Dooren & Mensink, 2014). Consumers rather store leftovers to consume it later, and only discard it if it was not eaten within what they view as a suitable time (Van Dooren & Mensink, 2014; Evans, 2012). Furthermore, some consumers are not comfortable with or dislike eating the same leftovers multiple times in a row, as it can cause "leftover fatigue" and loss of interest in eating still-edible foods (Evans, 2012). If

there is plenty of leftovers, it could be frozen, which is an alternative to forcing the idea that leftovers need to be eaten right away or over multiple consecutive days (Evans, 2012).

Providing recipes and ideas for using leftovers could minimise food that is wasted. Cooking education can provide consumers with a sense of responsibility and control over the ingredients, cooking style, and portion size of food to avoid food waste. Consumers should be provided with the correct information concerning quantities and measuring out quantities with a measuring cup or scale in order to minimise food waste (Condrasky *et al*., 2015).

Furthermore, cooking skills affect consumption since the degree of confidence in cooking also has an impact on the shopping behaviour of consumers (Van Geffen *et al.*, 2016). Consumers who lack adequate cooking skills are less willing to try different cooking methods and styles than consumers with better cooking skills. Trying out new or unfamiliar food can also result in an increased amount of food waste (Aschemann-Witzel *et al.*, 2015).

2.5.7 Health concerns

It is worth mentioning that households that adopt a health-conscious style of living are also culprits in the household food waste context. The assumption that health-conscious consumers are also conscious of the environment is not always correct. A variety of different foods in their meals is necessary, predominantly more fresh and perishable products such as fruits or vegetables. Due to the perishable nature of the food items, food waste can be relatively high in these households, although very little literature exists on this topic (Glanz, 2008).

2.5.8 Children

During shopping trips, parents are sometimes significantly influenced by what their children like and enjoy as they are picky eaters and do not always like the food prepared for them. It is also true that households that include children tend to have higher rates of food waste (Aschemann-Witzel *et al*., 2015). Furthermore, reheated foods are not given to children by some caregivers due to health concerns, which results in food that is discarded (Glanz, 2008).

2.5.9 Food spoilage

Food safety and hygiene play a part in food waste. Thirty-four percent (34%) of consumers discard food in the bin straight away when the expiry date is reached, 21% do not consume products that are near the expiry date, and 30% of consumers do not eat food that does not appear pleasing in terms of colour, taste, or smell (Borisova, 2013).

Food poisoning constitutes a serious societal threat, and consumers who express a deep concern for food safety will, in all likelihood, generate more waste (Borisova, 2013). However, food spoilage is closely linked to the summer season when temperatures are higher and food spoils faster (Radzymińska *et al*., 2016).

2.6 FACTORS THAT AFFECT HOUSEHOLD FOOD WASTE

Several factors affect household food waste, such as consumerism in terms of excessive consumption, increased accessibility of inexpensive food, and modern lifestyles. In combination with these factors, the devaluation of food by consumers also has a definite impact on food waste. Food is perceived as something that is palpable and not useful, and consumers are no longer acquainted with the cultural background of the food they eat. There has also been an alteration in social and emotional links with food. Households are no longer eating together as part of a family tradition, and consequently, traditional family recipes are vanishing (Gjerris & Gaiani, 2013).

Wasting food has become habitual behaviour in some households. It is therefore vital to consider moral, normative, emotional, and social influences in the food waste context, and it is just as critical to understand the way consumers make choices and selections regarding food (Boto & Biasca, 2012). Motivation to stop food waste connects to the willingness of an individual consumer to perform actions that avoid increasing food waste. In this sense, awareness, attitude, and social norms are the most powerful motivational constructs (Van Geffen *et al.*, 2016).

2.6.1 Consumption behaviour and food patterns

Consumer behaviour is determined by ethical factors that play a part in their decision-making processes. When consumers decide to discard a food item, they are also influenced

and necessitated by a multitude of factors and decisions (Boto & Biasca, 2012). Food waste is often determined by social practices and food and eating habits (Aschemann-Witzel *et al.*, 2015).

Most of the decisions consumers make daily happen without thinking about it in depth (Albisu, 2016). At times, decisions are made due to traditional habits, lack of knowledge, poor appreciation, or many other reasons. One of the primary reasons for household food waste is that some people can afford to waste food due to its abundant availability (Boto & Biasca, 2012).

Food consumption patterns and food habits are significantly influenced by international trends such as fast food, ethnic cuisine, and the gourmet restaurant culture (Gjerris & Gaiani, 2013). In addition, socio-demographic and psychological factors influence consumption, food habits, and thus food waste, although they are often overlooked (Aschemann-Witzel *et al.*, 2015).

2.6.2 Values and the perceived value of food

Food waste in households occurs because of incompatible values some consumers attempt to live by, as well as how food is valued (Enos, 2019). The abundance of available food at lower costs affects how food is valued and how much food is wasted in high-income countries; however, a shortage of food and increasing food prices would not necessarily decrease food waste in households (Aschemann-Witzel *et al*., 2015).

Values have an effect on detected behavioural control and play a significant role in the clarification of individual groups, and societal behaviour and values are a significant preliminary step in the process of connection that influences specific behaviour. Values play a central role in forming negative or positive attitudes. In addition, values play a part in constructing social and moral norms, and impact beliefs that are crucial to perception and describe the connections between different components (Borisova, 2013).

As a consequence, beliefs around food and different values and norms among various cultures have a direct influence on food waste; more specifically, how certain foods must be dealt with in particular situations (Borisova, 2013).

2.6.3 Awareness

Consumer awareness is one of the critical features of understanding food waste behaviour (Borisova, 2013). Glanz (2008) explains that households have different considerations when referring to food waste. In the majority of households, food waste is something they have control over. Leftovers or spoilt food, thus rendered inedible, is generally not considered "waste" in the judgement of some consumers. However, most agree that food waste is avoidable; every person throws away at least some quantities of food that could have been eaten (Marangon *et al*., 2015). Consumers are keen to pay less for foods with visual faultiness compared to higher-quality foods, and this understanding is also applicable to organic foods in comparison with conventional foods (Oelofse & Nahman, 2013).

When purchasing products that are on promotion, consumers are aware that not every item will be consumed, which ultimately leads to discarded products extended beyond their expiry date (Radzymińska *et al*., 2016). Consumers are not always aware of how much food they throw away because, in most circumstances, only small quantities of food are discarded (Evans, 2012). As a consequence, consumers tend to underestimate the amount of food waste they generate (Aschemann-Witzel *et al*., 2015; Glanz, 2008). This lack of awareness promotes wasteful behaviour, and, on the contrary, when consumers are aware of the consequences of food waste behaviour, they are more vigilant and better organised (Borisova, 2013).

Most consumers agree that food waste is not acceptable, and a few are even willing to admit that their household is creating too much food waste (Van Geffen *et al.*, 2016; Neff *et al.*, 2015). In all likelihood, it is concluded that due to a lack of awareness, food waste occurs due to complex behaviours, rather than being intentional behaviour (Van Geffen *et al.*, 2016). Food waste often occurs unintentionally (Pärn, 2016). At some stage, every consumer discards, even if minutely, some quantity of food that could have been consumed (Glanz, 2008). However, in some instances, a household that discards 5 kg of food waste per week would be producing 260 kg (equivalent to 13 filled garbage bags) of food waste per year (Evans, 2012).

Understanding consumers' behaviour and creating awareness are therefore critical components to understanding and minimising food waste (Glanz, 2008). The lack of

awareness contributes to wasteful behaviour, and, consequently, when consumers are conscious of the inferences of food waste behaviour, it is believed that it could be reduced (Borisova, 2013).

2.6.4 Attitudes towards food waste

Attitude refers to a person's judgment when discarding food. It incorporates the emotional state and related thoughts, beliefs, and ideas that are carried to the surface when disposing of food (Russell *et al.*, 2017; Van Geffen *et al.*, 2016). Attitudes act as an essential role player in creating one's intentions (Borisova, 2013). The attitudes and behaviour of the consumer also play a vital function in determining the amount of food that is discarded in households (Lipinski *et al.*, 2013). Attitudes towards food waste and food quality therefore have a substantial effect on wasteful behaviour (Van Dooren & Mensink, 2014).

The attitudes of consumers concerning food waste symbolise favourable or unfavourable judgement behaviour towards the minimisation of food waste (Boom, 2012). Radzymińska *et al.* (2016) further explain that attitudes toward food waste rely on the extent to which consumers are aware of the information included on the product and product packaging (i.e. "best before" date). Favourable attitudes towards decreasing food waste are anticipated to result in stronger intentions to decrease food waste, as indicated by the theory of planned behaviour (Boom, 2012).

In general, most consumers have negative attitudes towards wasting food and feel culpable when discarding food (Borisova, 2013). Consumers feel guilty and concerned when they discard food and want to decrease food waste in their households (Borisova, 2013; Pärn, 2016). Consumers who regard food waste as a considerable problem play an essential role in reducing waste. On the other hand, food waste problems are primarily because of the structural characteristics of households linked to modern lifestyles, such as planning and shopping routines (Marangon *et al*., 2015). The absence of planning and prioritising is the reason consumer's waste food in contrast to their attitude and intention because they prioritise time saving or convenience, health goals or safety concerns, and flexibility or enjoyment over wasting food (Aschemann-Witzel *et al.*, 2015).

In addition, many consumers deem food waste as an unnecessary loss of money that affects them negatively (Van Geffen *et al*., 2016). Consequently, consumers have the possibility of saving money by reducing food waste; however, ethical issues related to fairness, such as values or religious beliefs, seem to influence food waste behaviour to a greater extent than financial factors (Boom, 2012).

Many consumers have indicated that the common reason for discarding food is their concern for foodborne illness and they merely want to consume the freshest food (Neff *et al.*, 2015). In this regard, some consumers believe that reducing food waste implies that they must consume products that are past their "use by" date or which are already spoilt (Van Geffen *et al.*, 2016). Nevertheless, other consumers have admitted to discarding food because of personal preferences such as a dislike for the taste or disliking eating leftovers (Aschemann-Witzel *et al.*, 2015).

2.6.5 Social and moral norms

There are mainly two different types of social norms, namely injunctive and descriptive norms. Injunctive social norms refer to the extent to which consumers observe and consider wasting food as approved or disapproved behaviour by others who are significant to them; hence a correct type of behaviour is recommended depending on the situation. Descriptive social norms happen when an individual accepts what is reasonable ("normal") to do by others (Borisova, 2013).

Consumers adopt food wasting as accepted behaviour because of the perception that it is unavoidable; however, other consumers discern food waste as unacceptable behaviour (Van Geffen *et al*., 2016). According to Aschemann-Witzel *et al.* (2015), the difference between food and eating is the complexity of habits and rituals. The food waste that occurs in households is mostly unnoticeable and, thus, much less influenced by social norms or social signalling (Marangon *et al.*, 2015; Van Dooren and Mensink, 2014). Furthermore, Aschemann-Witzel *et al.* (2015) indicate that social norms are transferred between personal networks of friends, family, or neighbours, and create personal norms.

Other social norms have been indicated to be relevant to food waste in households, and it is indicative of being a good provider for the household as there is surplus food (Van Geffen

et al., 2016). Being a good provider denotes ensuring that wide varieties of healthy and delicious foods are obtainable for household members and guests (Aschemann-Witzel *et al.*, 2015). Consequently, the desire to express that one is a good provider may lead to food that becomes spoiled. Consumers describe that living up to this norm is crucial to them, even if it may lead to food waste (Van Geffen *et al.*, 2016).

2.6.6 Knowledge and skills

Consumers often do not have adequate knowledge or confidence to make meals from leftovers, which raises the possibility of wasting food (Aschemann-Witzel *et al*., 2015). For this reason, consumers should be provided with appropriate knowledge and skills for proper management of leftovers in order to create tasty meals out of leftovers and thus to help reduce household food waste (Van Geffen *et al.*, 2016).

Moreover, consumers tend to estimate the edibility of food items inaccurately. Household practices such as keeping the temperature of refrigerators too high and incorrect storage of food products further exacerbate the situation (Aschemann-Witzel *et al*., 2015). The lack of knowledge concerning the advantages of product packaging and the guidelines for using it are often misunderstood by consumers (Van Geffen *et al.*, 2016).

When knowledge is transferred to consumers, it is noteworthy to consider that they often lack the insight to incorporate the knowledge into their daily life and food management behaviour. Solutions must therefore be practical and time efficient. Skills allow consumers to waste less food because they will be able to deal with food correctly at home. Practical solutions empower consumers not to waste food when their day-to-day life practices are integrated, such as making shopping lists, planning meals in advance, using foods that are about to spoil to create tasty meals, making new dishes from leftovers, and lengthening the shelf life of food products that otherwise will not be eaten in time (Van Geffen *et al.*, 2016).

2.6.7 Demographic factors

Demographic factors – primarily income levels, the presence of children in the household, household size, and age – have a notable effect on households' behaviour regarding food waste (Borisova, 2013). It is impossible to separate any specific socio-demographic factor(s)

as an explanatory variable(s) for food waste; the collection of various socio-demographic factors that relate to the amount of food wasted in households is therefore necessary (Schanes *et al*., 2018).

Demographic factors have an indirect influence on food waste behaviour, but most probably a more significant impact on the motivation, ability, or opportunity to not waste food. In other words, demographic factors have an effect on food waste through the concepts of the consumers' food managing process (Van Geffen *et al.*, 2016). Enos (2019), however, is of the opinion that socio-demographic factors are directly linked to food waste.

2.6.7.1 Household size and composition

Household composition, particularly the presence of children, tends to affect the amount of food waste. In this sense, more food waste is generated because small children often dislike prepared food (Borisova, 2013). Children can be choosy eaters who influence their parents to dispose of food (Borisova, 2013; Van Geffen *et al.*, 2016). Adults still generate more food waste than children, even though the highest amount of food waste is found in households with children younger than 16 years (Glanz, 2008).

According to Enos (2019), larger households have been found to waste more food in comparison with smaller households. Consumers in large households generate more food waste (Van Geffen *et al.*, 2016; Borisova, 2013). Segrè *et al.* (2014) disagree with the previous authors, explaining that larger families are likely to be more disciplined, while smaller households are likely to have higher waste per person. Larger families have experience, evidence, and information to estimate what their weekly needs are. It is therefore easy to buy only what is needed. Moreover, packaging and the size of portions are generally geared towards larger quantities that cater for large households. As a consequence, food waste is the highest in single-person households (Borisova, 2013).

2.6.7.2 Age

Age is negatively correlated with the amount of food waste generated (Borisova, 2013). Children and teenagers are considered significant contributors to waste compared to older adults. Young working people (16 to 34 years) are also considered a focus group as they

generate vast amounts of food waste (Glanz, 2008). There is consensus that consumers over 50 years of age dispose of minimal food due to varied attitudes toward food and prudence in avoiding waste. This is most likely because they are very conscious about saving and reusing, use more of their time being at home, and they are financially constrained (Pärn, 2016; Borisova, 2013; Wassermann & Schneider, 2005).

Aschemann-Witzel *et al.* (2015) furthermore elucidate and indicate that this might be associated with the social and cultural background of young and elderly consumers. Elderly consumers have lived during periods of food shortages, while young consumers have not. Acculturation has been connected to the perceptions and habits of the consumer concerning food management. Moreover, elderly people may waste a smaller amount of food because they regularly have more time and a better understanding of the impacts of food waste compared to younger people (Van Geffen *et al.*, 2016).

2.6.7.3 Education and income

Households with varied income levels differ in their attitudes concerning which type and how much food is wasted (Schanes *et al*., 2018). Consumers with lower incomes produce a large amount of food waste, mainly because they do not plan their shopping and have a "live for today" attitude (Pärn, 2016, Van Geffen *et al*., 2016; Glanz, 2008). On the other hand, the evidence that Borisova (2013) gathered indicated that higher-income households tend to waste a more considerable amount of food in comparison with lower-income households, most likely because a smaller salary and increased food prices are associated with less food waste (Van Geffen *et al*., 2016).

Although there does not appear to be a strong correlation between education level and food waste, Schanes *et al*. (2018) in their review of household food waste did find that people who are employed are likely to generate more food waste in comparison to people who are not employed (Schanes *et al*., 2018). In addition, individuals who are working full-time usually feel that they have less time to concern themselves about food waste issues (Schanes *et al*., 2018; Wassermann & Schneider, 2005).

2.6.7.4 Gender

There are somewhat mixed opinions about gender and food waste generation. Some studies have indicated that women generate less food waste, while others assume that women waste more because they are responsible for the grocery purchases of the household (Schanes *et al*., 2018). Women are, however, also more likely to take the initiative in reducing food waste than men (Pärn, 2016; Van Geffen *et al*., 2016; Aschemann-Witzel *et al*., 2015; Koivupuro *et al*., 2012). As a result of this debate, it is proposed that gender does not have a substantial influence on food waste (Schanes *et al*., 2018). Since food waste originates from households, which consist of joint individuals who often share food management responsibilities, it is difficult to recognise who is accountable for food waste (Van Geffen *et al*., 2016).

2.7 PREVENTATIVE MEASURES TO REDUCE FOOD WASTE

Prevention is the preferred strategy to decrease food waste (Florkowski *et al*., 2018). Food waste prevention is an ongoing process that necessitates households, producers, and other participants in the economy to adjust their behaviour (Glanz, 2008). Food waste is usually the consequence of many different individual behavioural aspects, at different times that increase the possibility of waste (Van Geffen *et al*., 2016). However, if consumers and other role players are willing to adapt or change their behaviour in these stages, it will culminate in a decrease of the amount of food waste (Hoover, 2017). The following is a discussion of household behaviours that can reduce food waste:

2.7.1 Planning

Planning refers both to the planning before food enters the household and when the food is in stock. Consumers should be realistic when making meal plans whereby they choose meals that will be eaten during specific periods such as a day or week, and the number of people who will eat these meals (Van Geffen *et al.*, 2016). Consumers who are without meal plans and shopping lists habitually make incorrect estimations of what and how many ingredients they will use during the week, which may result in inventory underestimation and purchases of unnecessary food items that are eventually not consumed (Aschemann-Witzel *et al.*, 2015).

Moreover, strategies such as preparing for shopping trips by making lists of food products that are needed and their quantities, checking what is available at home, and only buying items on the shopping list can help consumers to decrease food waste (Enos, 2019; Hoover, 2017; Anding 2016; Van Geffen *et al.*, 2016). Planning practices like checking storage space are essential for consumers when making plans to be updated and informed so that they are knowledgeable of which food items they already have, as well as their shelf life. Consumers need a concrete action plan in order to decrease their food waste (Van Geffen *et al*., 2016).

2.7.2 Provisioning

Provisioning refers to all the ways in which food products enter the household. Most food products are purchased at supermarkets, greengrocers, butchers, or farmers' markets. Online and home-delivered purchases are other methods to order food products used in households. Moreover, food can be grown at home, foraged, received as gifts, or purchased as sit-down meals or takeaways from restaurants. Another form of provisioning is the leftover food brought into the household from out-of-home consumption (Van Geffen *et al.*, 2016).

It is suggested that more frequent trips to grocery stores should be undertaken, adhering to a prepared shopping list, and avoiding bulk purchases, discounted food items, and/or special offers if the items are not necessary. Furthermore, consumers should be vigilant of supermarkets with promotional offers (Van Geffen *et al.*, 2016; Aschemann-Witzel *et al.*, 2015; Jörissen *et al.*, 2015; Segrè *et al.*, 2014; Borisova, 2013; Glanz, 2008).

2.7.3 Storage

Storage refers to the storing of food, either as single items or as a combination of foods. Food storage is also an essential aspect of post-purchasing behaviour (Borisova, 2013) as the correct storage extends the shelf life of the products. Food can be stored in a refrigerator, freezer, cupboards, or other forms of storage (Van Geffen *et al*., 2016).

Organised storage helps to prevent food waste; however, messy or disorganised storage spaces result in the risk of forgetting about products (Van Dooren & Mensink, 2014). Furthermore, thorough and extensive cleaning of storage spaces, refrigerators, and freezers

has been shown to lead to less food waste (Van Geffen *et al.*, 2016). The capacity of storage space also correlates positively with food waste (Borisova, 2013). In general, consumers with a bigger cupboard/refrigerator capacity are likely to be more significant wasters compared to those with less storage capacity. Improper storage contributes to food waste, as most consumers are not able to accurately measure whether food is safe to eat or not (Shafiee-Jood & Cai, 2016; Glanz, 2008).

The edibility of food products is determined by using different methods. Older people habitually use their senses, whereas young people are likely to make use of date labels or the number of days it has been in storage. The usage of senses has been linked to a reduction of food waste, while the misunderstanding and lack of knowledge concerning "use by" and "best before" dates are primary reasons for food waste (Van Geffen *et al*., 2016).

Food storage can increase the chances of food waste due to specific behaviour. Such behaviours include buying frozen and chilled products with or without a cool bag, which affects the shelf life of the products after purchasing (Van Geffen *et al.*, 2016). Moreover, the shelf life can be affected by how products are stored. For instance, it is common for consumers to store products incorrectly, which means that the shelf life is not extended to its full extent (Aschemann-Witzel *et al.*, 2015; Van Geffen *et al.*, 2016). Aschemann-Witzel *et al.* (2015) state that such behaviour is intentional among some consumers, such as using a fruit bowl to motivate children to eat healthy instead of placing the fruits in the refrigerator due to a lack of knowledge on how to lengthen the shelf life of the products.

2.7.4 Preparation

Preparation refers to the handling, cooking, or preparing of food products to improve edibility. The majority of food products are handled before being eaten by household members; for example, the preparation of main meals such as breakfast, lunch, and dinner. The peeling of food products such as fruit or the baking of cookies for these meals falls into this category (Van Geffen *et al.*, 2016).

Products that are used only partially are found to increase the chances of food waste behaviour because consumers within households do not make proper use of partially left

products and must find a recipe and the time to use such products. Also, behaviour that increases the likelihood of food waste is the amount of food prepared (Van Geffen *et al.*, 2016). Consumers waste food after having prepared too much and tend to misestimate portion sizes, which result in leftover portions that might not be considered enough for storage, or they do not have the skills and knowledge to reuse leftovers or partially used products (Van Geffen *et al.*, 2016; Van Dooren & Mensink, 2014).

In some instances, this happens intentionally; for example, when consumers want to ensure that their household members eat meals that conform to their wishes, but it also occurs accidentally (Van Geffen *et al.*, 2016). Food is also thrown away when it does not taste good, which in particular cases is the result of suboptimal cooking skills such as when the food is burned during preparation (Van Geffen *et al.*, 2016).

2.7.5 Consumption

The consumption of food refers to the moments when the food products or meals are being eaten, and leftovers are being handled (Van Geffen *et al.*, 2016). In most cases, food is discarded because consumers do not store leftovers for future use, or they do keep the leftovers to consume it later but then end up not eating it (Van Geffen *et al.*, 2016; Van Dooren & Mensink, 2014).

Consumers are generally reluctant to eat leftovers when they feel that food can no longer be consumed safely or enjoyably, but more frequently they do not know what to do with their leftovers and in other cases fail to recall that the leftovers are kept in storage (Van Dooren & Mensink, 2014). Such behaviour occurs because consumers find it problematic to estimate edibility and want to prevent foodborne diseases, and therefore decide to throw away leftovers (Van Geffen *et al.*, 2016).

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter delineates the processes and methods used in collecting and analysing data concerning the main objective, which was to compare the type of food waste in the urban and rural areas of Lesotho. In addition, reasons for household food waste with particular attention to households' behaviour, purchasing habits, attitudes, and lifestyle in both the urban and rural areas of Lesotho were explored.

This chapter provides information regarding the method that was used in this research, as well as a justification for the use thereof. Quantitative information, such as the type and frequency of wasted food, as well as causes for wasting food, based on self-reported behaviour of consumers, was summarised. In addition, information about interrelated conditions such as level of employment, age of household members, and behaviour in terms of purchasing, cooking, and food storage habits was gathered. Finally, procedural issues of the research, including the timing, weighting, and integration decisions of the study, along with considerations for ethical issues, are discussed in this chapter.

3.2 RESEARCH DESIGN

The research design is the theoretical structure within which research is conducted and creates the plan for the collection, measurement, and analysis of data (Pandey, 2015). It sets the procedure for the required data, the methods to be applied to collect and analyse such data, and how all of it will culminate to answer the research question (Kothari, 2004).

Quantitative research consists of mathematical tools that make use of statistical or computational techniques for analysis, and which provide numerical results from a selected subgroup that are measured more objectively in order to generalise the findings to the population that is being studied (Moore, 2016). Moreover, the data are collected in a logical and detailed manner using a predesigned data-collection tool (*Dictionary of Epidemiology*, 2014).

An exploratory design is research conducted concerning a challenge that has not been studied intensively. It is the most appropriate research design for research projects that address a subject about which there are high levels of uncertainty and/or ignorance (Pandey, 2015). Exploratory research is often characterised by its flexibility and adaptability to change. It does not intend to offer final and conclusive solutions to existing problems, but only explores the research questions. Furthermore, it aims to articulate challenges more precisely, clarify concepts, gather explanations, gain insight, and form hypotheses (Moore, 2016).

Descriptive research design refers to the type of research questions, design, and data analysis that are applied to a given topic. The function of a descriptive study is to portray a picture of a situation, person, or event or to show how variables are related to one another (Kothari, 2004). Descriptive research defines research aspects such as “who”, “what”, “where”, “when”, and sometimes the “how” of the research. Descriptive research design often uses visual aids such as graphs and charts to help the reader to understand the data distribution by reducing the data to a manageable form (Moore, 2016).

Consequently, a quantitative research design with an exploratory and descriptive approach was considered most suitable for this research in order to compare food waste in the rural and urban areas of Lesotho. The demographic characteristics of consumers and the behaviour that contributes to household food waste were also explored and described.

3.3 TARGET POPULATION AND SAMPLING

3.3.1 Population

Data were collected from two urban districts of Lesotho, namely Maseru, which is also the capital city of Lesotho, and Butha Buthe. Mokhotlong was selected to represent the rural areas of Lesotho because it has the highest rate of malnutrition (49.9%) in comparison to other rural districts. Butha Buthe has the highest malnutrition rate (40.3%) among the urban districts, and Maseru has the densest population and is the largest district in Lesotho [Lesotho Demographic and Health Survey (LDHS)] (2014). The Butha Buthe and Mokhotlong districts are situated in the north-eastern part of Lesotho, and Maseru is located in central-western Lesotho.

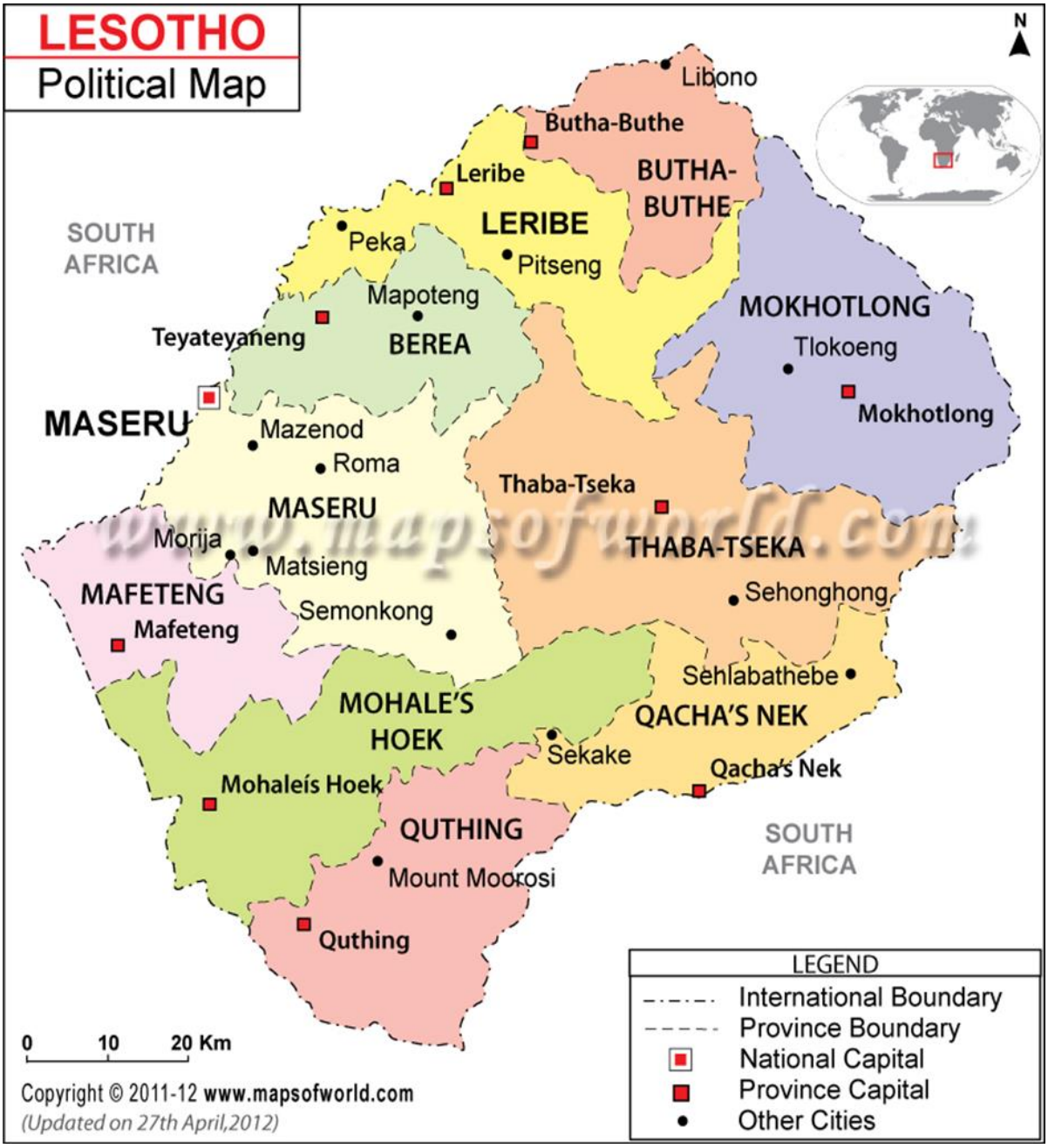


Figure 3.1: Map of Lesotho with ten administrative districts

Mappery (2009)

3.3.2 Sampling procedure

Randomised probability sampling was employed, and the unit of analysis in this study was households. In this particular case, consumers under the age of 18 were excluded. Although some actively participate in food preparation and waste, they were excluded from the data-collection process due to they cannot be given informed consent since they are minors. Consumers were chosen on the premise that they were above 18 years and also responsible

for food purchase and food preparation in households, and they were regarded as having the knowledge of all the food that is consumed and not consumed within the household, regardless of gender status (male, female, or other). Furthermore, the consumer had to be a permanent resident in one of the three study locations. Fieldworker administered the questionnaires to participating households.

The fieldworker had Diploma in Home Economics obtained from Lesotho Agricultural College. The fieldworker was chosen from the list of 2 applicants because she was good speaker of both English and Sesotho language. In addition, she had good interviewing skills, listening skills and was skilful in personal interaction. The fieldworker was trained for four hours before undertaking quantitative data collection. The training was on how to use questionnaire and individual interview to gather data from consumers.

The fieldworker did not in any way interfere with the process of completing the questionnaire but did clarify if the consumer asked a question. It took an average of 30 minutes to complete the questionnaire. No incentives were provided, and participation was entirely voluntary.

3.3.3 The size of the sample

According to the Lesotho Bureau of Statistics (2016), the total number of households in Butha Buthe is 30 097, and 158 012 in Maseru, while the total number of households in Mokhotlong is 24 362. The minimum sample size selected for the three districts was 550 consumers, based on a 95% level of significance, 80% power, 50% defects (which gives the maximum sample size), and a 0.05 margin of error (Wessa, 2019). The number of households sampled in Butha Buthe was 150, 250 in Maseru, and 150 in Mokhotlong.

3.4 DATA COLLECTION

3.4.1 Instrument

A questionnaire was chosen as the measuring instrument for this study. The questionnaire was written in English and translated into the local language, Sesotho, to ensure that the consumers have a clear understanding of the questions asked, as it is the language

understood by the majority of citizens in Lesotho. The self-developed questionnaire is attached as Appendix B.

The questionnaire consisted of nominal, ordinal, binary, and open-ended questions. Likert scaling was applied as possible answers to some of the closed-ended questions. For measuring the items, consumers were requested to mark their level of agreement on a five-point Likert scale (from “Strongly Disagree” to “Strongly Agree”).

The questionnaire consisted of the following sections: Section 1 contained all the demographic questions. Section 2 was related to shopping behaviour, such as how often consumers buy fruits, vegetables, and other food products for consumption in the home. Section 3 ascertained information regarding food storage and categorised food products according to the frequency of use. Questions to determine where consumers store fruits and vegetables in the home, as well as which fruits and vegetables are consumed most in the home, were asked.

Section 4 investigated consumers’ management of leftovers. It included questions on behaviour such as what is done with excess food, and what consumers do if they notice that an item of food is coming close to its “best before” date. Consumers’ concerns about reheating leftovers that have been kept in the refrigerator for one or two days were reported.

Section 5 related to food waste in general. The most common reasons for discarding food, the extent to which consumers were aware of the negative consequences of food waste, and self-reporting of the amount of food discarded were explored. The amount of effort consumers were willing to expend in order to minimise the amount of food thrown away was also estimated.

3.4.2 Procedure

The data were collected from February 2019 to May 2019. The questionnaire took approximately 30 minutes to complete. The sample was divided into two groups; the fieldworker interviewed the consumers that were illiterate and the literate consumers were given the questionnaire to complete. The concepts that were difficult to translate in Sesotho were explained. After completion, the fieldworker placed the questionnaire in a

tamperproof box, to which only the researcher had access. Consumers who requested to receive the results of the research after completion were instructed to complete a feedback form that contained details of where the results could be sent.

Completed questionnaires, signed informed consent forms, and feedback forms were handed in separately to keep questionnaire anonymous and were taken to the researcher's office on a daily basis and locked in a cabinet to which only the researcher had access. Every week the researcher captured data from completed questionnaires, on a password-secured computer, using Microsoft Excel 2013. Data were captured using a double-entry method, and in order to warrant the completeness of data, consistency and range checks were used.

Communication between the fieldworker and consumers were in English or Sesotho, depending on the consumer's preference. No identifying information was written on the questionnaire to ensure that data were anonymised. The created electronic database was stored on the researcher's personal computer, which is password protected. In addition, a backup of the data was made on the researcher's external hard drive, which is also password protected. The external hard drive was always kept in the researcher's office in a locked cabinet. According to the University of the Free State's (UFS) policy, at the end of the data-collection period, all forms that contain details to contact consumers for participation were destroyed by the researcher.

3.5 DATA ANALYSIS

Data gathered through questionnaires were analysed using the Statistical Package for the Social Sciences (SPSS) version 25. This was done in consultation with statisticians from the UFS, using the appropriate data-analysis methods. Basic descriptive and frequency statistics were conducted on the data. Moreover, Pearson's correlations and chi-square tests were conducted to determine the significance and relationships between variables. The assumption that the expected number of responses in every category would be the same for a single question was made. The probability of seeing differences in the categories as large as or larger than what was observed under the assumption was calculated. If this probability is small, it is concluded that there is evidence of grouping or consensus. The significance level chosen was 0.05, which means that only the results where the p-value was less than 0.05 were considered significant.

3.6 RELIABILITY AND VALIDITY

Measuring instruments in quantitative research are determined by the reliability and validity of the measurements provided by the measuring tool to determine accuracy and consistency (Kimberlin & Winterstein, 2008). Reliability refers to the stability of findings, while validity is represented by the truthfulness of findings (Mohajan, 2017). The subsequent paragraphs describe how the reliability and validity of data-collection tools are evaluated.

According to Drost (2011), reliability refers to the consistency of measurement or the stability of measurement over the variability of conditions in which, ultimately, the same results should be attained. A test used by several different people or at different times under stable conditions and that produces consistent results that are not changing is considered reliable. The reliability of a tool is ensured if it is free from measurement errors, since the more measurement errors occur, the less reliable the tool is (Pietersen & Maree, 2016).

The reliability of the questionnaire was ascertained by executing a pilot test. The measuring instrument was tested on a group of 20 consumers who completed it without the assistance of a fieldworker. The pre-test was conducted at Marakabei village in the Butha Buthe district. The questionnaire was left with each household that accepted the preliminary inquiry to participate in the survey. The pilot test revealed that the questions were understood and answered without any difficulties.

Internal consistency demonstrates the degree of the reliability of the collected responses. The most common internal consistency measure is Cronbach's alpha, which is typically interpreted as the mean of all possible split-half coefficients (Mohajan, 2017). Cronbach's alpha is mostly used to determine the internal consistency coefficient of questionnaires. It is statistically calculated based on the pairwise correlations between different variables.

According to Mohajan (2017), Cronbach's alpha coefficient is measured on a scale from 0 to 1, with perfect reliability equalling 1, and no reliability equalling 0. Alpha values above 0.7 are typically considered acceptable and satisfactory, above 0.8 are generally considered quite good, and above 0.9 are considered to reflect exceptional internal consistency. Very high results (0.95 or higher) show that the items are unnecessary. Values under 0.7 indicate

weakness in achieving internal consistency. As a result, in social science, the acceptable range of alpha value estimates from 0.7 to 0.8 is measured to be the most desirable from a methodological point of view. The Cronbach's alpha for this questionnaire was 0.82, which indicates good internal consistency. This is also a sign that each included variable contributes to unique information in the data-collection process.

Validity is the degree to which any measuring instrument measures what it is intended to measure (Mohajan, 2017). Content validity is the degree to which the questions on the instrument (questionnaire) and the scores from these questions symbolise all possible questions that could be asked about the content or skill (Mohajan, 2017). The questionnaire was given to experts at the UFS and the Department of Nutrition and Home Economics at the Ministry of Agriculture and Food Security, Lesotho. All comments and amendments to the questionnaire were included.

The content validity of the questionnaire was tested to find questions that could be unclear or poorly understood by the consumers and the questions were amended to ensure that the questionnaire obtained the required information from consumers. As a result, the questionnaire items for readability, clarity, and comprehensiveness were included in the final questionnaire. In addition, the translated version was compared with the original version to ensure the validity of the questionnaire.

Face validity is defined as the degree to which a test appears to measure what it intends to measure. It is a subjective judgment on the operationalisation of a construct (Mohajan, 2017). A field test was conducted whereby 20 households from various socio-demographic and education backgrounds completed the questionnaire. The feedback was positive, and the questionnaire layout was reported to be clear, and both the font size and the questionnaire's length to be acceptable. The questionnaire instructions were considered easy to understand.

3.7 LIMITATIONS OF THE STUDY

Different household members are expected to share similar food waste behaviour. However, in reality, it does vary. In most cases, only the household member who is responsible for the food purchase and preparation was asked to complete the

questionnaire. Hence, interviewing each household member could prove to add additional information and significance to the study results.

Lack of previous research on the behaviour of Lesotho consumers relating to food waste presented a significant difficulty in analysing the results. Evidence discussion therefore focused on the present situation, instead of elaborating on a dynamic approach that clarifies the prevailing trend in consumers' behaviour over time.

3.8 ETHICAL CONSIDERATIONS

Ethical matters need to be taken into consideration before, during, and after any research project, such as permission and informed consent, anonymity, confidentiality, risks and benefits analysis, compensation of consumers, data management, and the dissemination of results. The data collection only commenced after ethical clearance from the Ethical Committee of the UFS was obtained (see Appendix A).

The privacy of consumers was guaranteed through the process of obtaining informed consent, and the interviews were conducted in private. Fieldwork was conducted using hard copies of predesigned structured questionnaires. The researcher did not record the names of consumers on the questionnaire.

Anonymity and confidentiality were ensured; during the completion of the questionnaire, the researcher did not use the consumers' names in order to keep their identity confidential. The researcher, participants, and the supervisor signed a confidentiality agreement form. The information was kept safe and was not shared with any unauthorised person throughout the study.

All data collected, from the process of obtaining signed informed consent forms to the interviews, were protected and kept confidential throughout the study. The researcher respected the consumers' time and the questionnaires were completed at a time convenient for the consumers. The time for the interview was scheduled beforehand by the researcher. Before and during the process, the consumers were reminded of their right to withdraw at any time.

The consumers were also encouraged to ask questions for clarification purposes if they did not understand something. The consumers who participated in the study were not

compensated in any way. All the processes in the study, including the consent form and interviews, were conducted in the villages where the consumers live. Table 3.1 describes the possible risks involved in the study and the preliminary precautions taken to mitigate these risks.

Table 3.1: Summary of risks and precautions during the survey

Risks	Precautions
Fieldworker administering the questionnaire face to face might cause consumers to be uncomfortable.	To be done in private with only the consumer and the fieldworker present. Consumers were reminded that their participation is confidential. Consumers were given the freedom to withdraw at any time should they feel distressed.
Consumers might be concerned about their anonymity as individuals and the confidentiality of the information they would share.	The informed consent form was not linked back to any specific participating consumer. The researcher did not use any identifying information.
Consumers might be worried about the consequences should they decide to withdraw from the study.	Consumers were reminded that their participation in the study is strictly voluntary and confidential, and that withdrawing from the study would have no negative consequences.
Consumers might experience some time lost and might also experience some degree of boredom.	The appointment for completion of the questionnaire was scheduled beforehand. The fieldworker kept the process as short as possible to reduce time lost and to prevent boredom.
Consumers might experience psychological harm expressed through anxiety or embarrassment if they are not able to answer specific questions.	Consumers were given the freedom to pass questions that they were uncomfortable answering. However, consumers were allowed to respond to such questions at a later stage if they decide otherwise.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The primary objective of this study was to compare the food waste in both the rural and urban areas of Lesotho. This chapter summarises the primary data collected. The collected quantitative data are presented in the form of tables, figures, and graphs, and discussions thereof. The relevant relationships were tested for significance between variables to provide answers to the research questions, with the assistance of statistical software and techniques. This chapter starts with a discussion of the demographics, continues on to discuss food waste behaviour, and makes a comparison between the rural and urban areas.

4.2 THE DEMOGRAPHIC PROFILE OF CONSUMERS

The data were collected from two urban districts, namely Maseru and Butha Buthe, and a rural district, Mokhotlong. The trend was the same in all the districts, where female consumers represented a large proportion (>77%) of the sample (see Figure 4.1). It is generally assumed that females are mostly in charge of the household food supply (UNDP, 2015), which was a prerequisite for participation in the study.

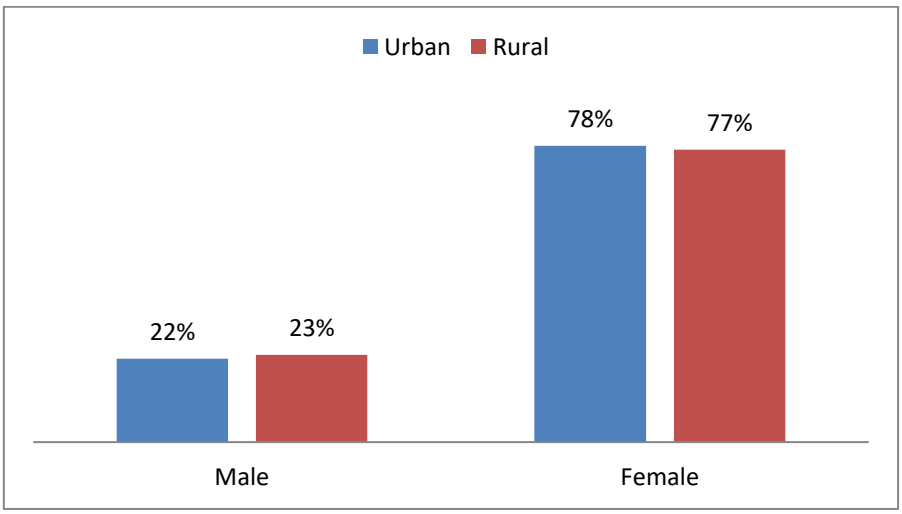


Figure 4.1: Gender composition of the population (n=550)

The participating consumers' ages varied from 18 years to older than 70 years. The socio-demographic characteristics of the responding households showed some differences between the urban and rural areas. In urban areas, 35% of the consumers were between 30 and 39 years old, whereas in rural areas 24% of the participating consumers were between 40 and 49 years old, and 22% were between 30 and 39 years old (see Table 4.1).

Table 4.1: Socio-demographic characteristics of consumers by area (N=550)

Characteristics	Urban	Rural
AGE		
<19	4%	0%
20-29	17%	8 %
30-39	35%	22%
40-49	27%	24%
50-59	12%	21%
60-69	4%	19%
>70	1%	6%
LEVEL OF EDUCATION		
Did not attend school	4%	5%
Completed primary school	11%	58%
Completed high school	45%	17%
University degree	27%	17%
Postgraduate degree	13%	3%
FAMILY STRUCTURE		
One-person household	8%	2%
Two adults without children	6%	1%
Two adults with children	62%	63%
One adult with children	21%	32%
Other combination	3%	2%
HOUSEHOLD SIZE		
1	6%	2%
2	8%	2%
3	15%	14%
4	36%	37%
5-8	30%	31%
9-10	5%	13%
>10	0%	1%

Regarding educational background, in urban areas, 72% of the participating consumers completed high school or obtained a university degree. In rural areas, most (75%) of the consumers only completed primary and high school. It is reassuring that low percentages of the consumers in urban (4%) and rural (5%) areas did not attend school. However, it is

essential to point out that more than half (58%) of the consumers in the rural areas indicated their highest level of education as primary school, as opposed to the urban areas where 45% listed high school as their highest level of education.

From Table 4.1, it can be seen that the number of households that consist of two adults with children is the highest in both the urban (62%) and rural (63%) areas. The patterns regarding the number of members in the households varied among the two areas. Most importantly, in both urban (36%) and rural (37%) areas, the number of four-member households was similar, as well as the highest. Only 1% of households consisted of more than ten family members, regardless of the area.

More than half (56%) of the consumers in urban areas and the majority (81%) of the consumers in rural areas earn less than LSL4 000 (LSL1 = USD0.069) per month (see Figure 4.2). According to a UNDP (2015) report, 57.1% of the Basotho population live below the poverty line (LSL138; USD9.59). Furthermore, 34% of adults in Lesotho live below the food poverty line every month; interpreted as one out of every three people. High unemployment (33%) has resulted in the prevalence of poverty, predominantly among youths, who constitute almost half of the population.

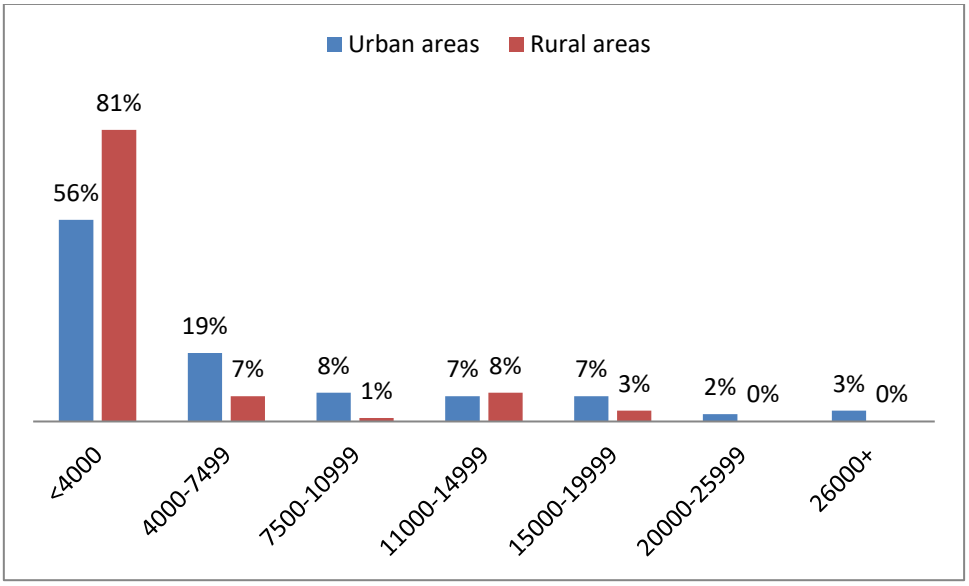


Figure 4.2: Monthly income of households by area (N=550)

4.3 KNOWLEDGE AND AWARENESS RELATING TO HOUSEHOLD FOOD WASTE

Household food waste often goes unnoticed, and most consumers are not always aware of the food that they are wasting. Many consider food waste as unavoidable and thus also acceptable (Hebrok & Boks, 2017). Increasing the awareness of consumers about their own food waste levels and the consequences of food waste is therefore an important factor to alter food-wasting behaviour. This might lead to a sense of responsibility and guilt, which can positively influence practices and reduce food waste (Hebrok & Boks, 2017; Van Geffen *et al.*, 2016). This research found that most consumers from rural areas (87%), as well as urban areas (72%), are not aware of the "Stop food waste programme".

4.3.1 Awareness and concern

Discarding food is considered improper behaviour by most consumers, as well as the negative consequences associated with it (Schanes *et al.*, 2018), which is confirmed by the results of this research, which indicate that the majority of consumers in both urban (92%) and rural (84%) areas were fully or somewhat aware of the negative consequences of food waste (see Figure 4.3).

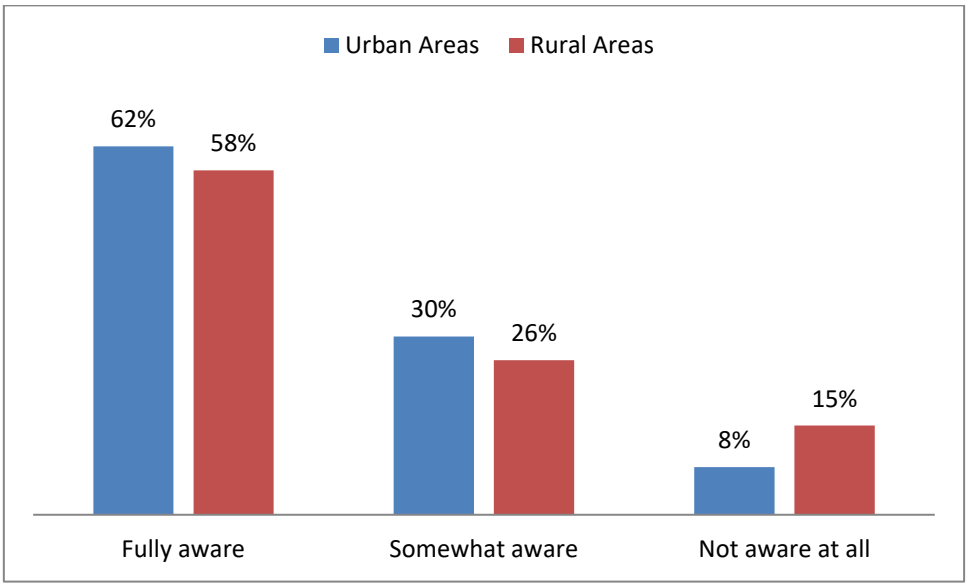


Figure 4.3: The negative consequences of food waste (N=550)

This is interpreted as very positive, considering that in other studies, the majority of consumers were not aware of the consequences of food waste (Hebrok & Boks, 2017). Financial concerns related to the money that is lost when throwing away food is commonly mentioned as the primary motivation for minimising food waste (Schanes *et al.*, 2018). The reduction of food waste is therefore seen as an essential factor to achieving global food and nutrition security, freeing up limited resources for other uses, diminishing environmental risks, and avoiding financial losses (Thompson & Prendergast, 2015). Consumers who consider food wastage as a problem are likely to decrease their waste (Marangon *et al*., 2015).

Consumers were also asked how much it concerns them to discard food because it was not eaten. Many consumers in both rural (50%) and urban (66%) areas reported that it bothered them a great deal (see Figure 4.4). It was also indicated that they did not feel comfortable wasting considerable amounts of food, especially when they discarded food without using it. However, a minority of the consumers indicated that discarding food was not their choice, and consequently there was nothing to be bothered about, and, as a result, they did not think wasting food was a problem. Approximately one out of ten consumers in rural areas are not concerned at all when they discard food. This is slightly less (4%) in urban areas (see Figure 4.4).

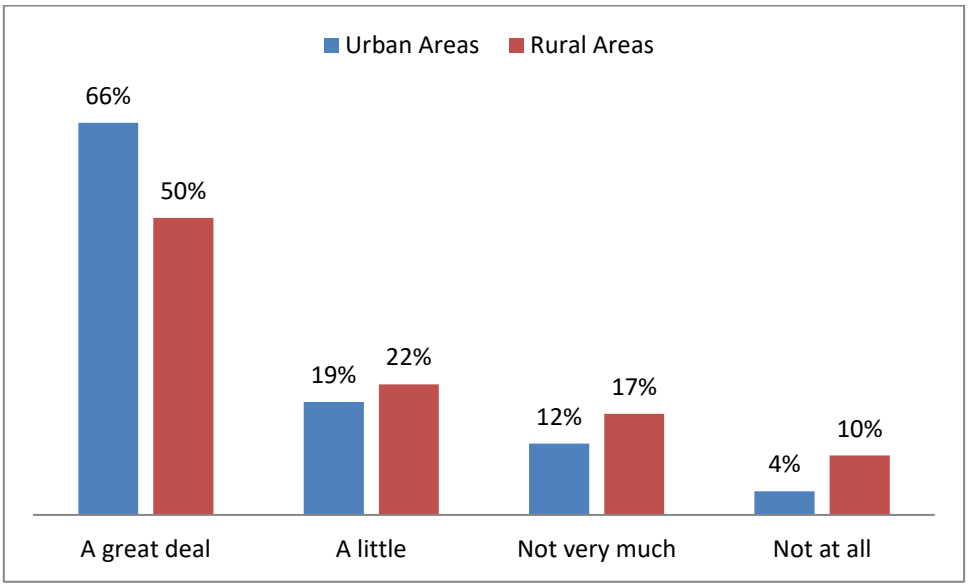


Figure 4.4: Level of concern when discarding food (N=550)

Concerns about discarding food are a significant predictor of food waste reduction and play an essential role in the intention to reduce food waste. The majority of households are concerned that when food is thrown away, a loss of money is also inevitable, which is the main motivation to reduce food waste. Furthermore, throwing away food is considered a waste of time put into the provision and preparation of the food (Schanes *et al*., 2018).

4.3.2 Estimation of the amount of food discarded and efforts to minimise it

Consumers qualitatively estimated the avoidable amount of food that their households discard. According to the consumers in urban (40%) and rural (45%) areas, they discard only a small amount of food or less (see Figure 4.5), although they expressed a sense of guilt about throwing away food. In contrast, 38% of consumers in rural areas discarded quite a lot of food, which was reasonably lower in urban areas (23%). Consumers tend to underestimate the amount of food they waste. In addition, consumers give the "correct" answer instead of the truthful one to display acceptable behaviour, which is known as social desirability bias (Jörissen *et al.*, 2015).

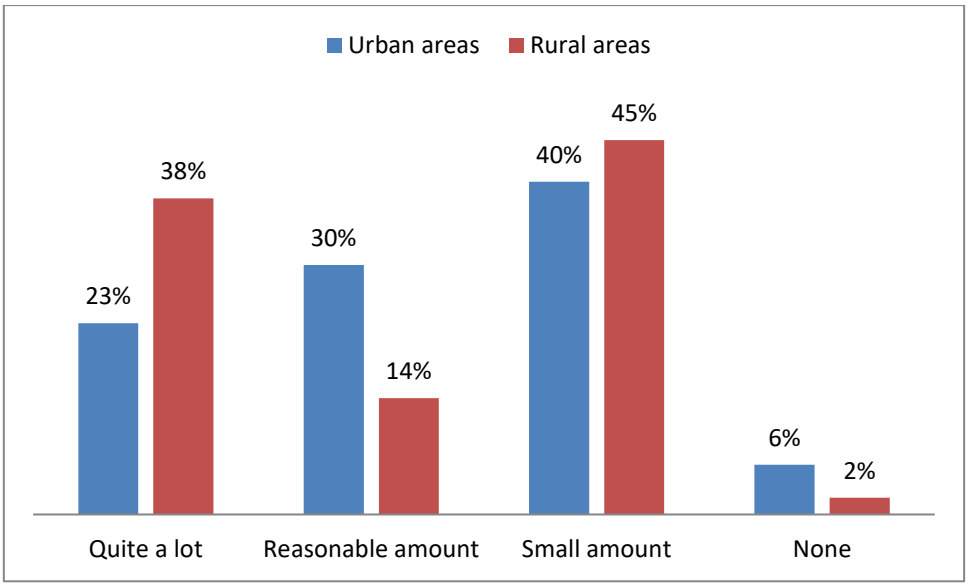


Figure 4.5: Consumers' qualitative estimation of food discarded (N=550)

The consumers in both the urban (67%) and rural (62%) areas did, however, apply a great deal of effort to minimise the amount of discarded food in their households, which was also statistically significant (p=0.022). Most indicated that a fair amount of waste was avoidable if they acted on it. The consumers' effort to minimise food waste is illustrated in Figure 4.6.

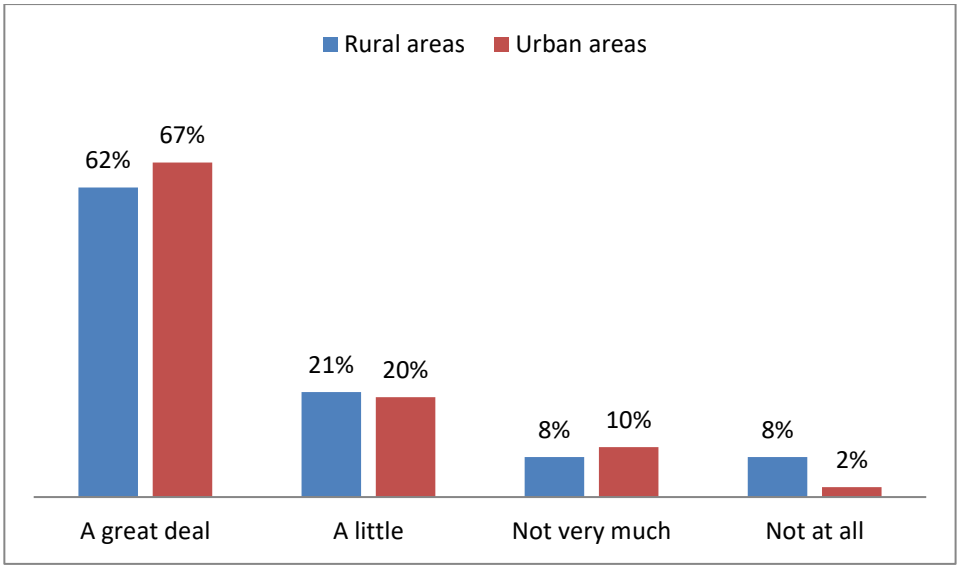


Figure 4.6: Consumers' efforts to minimise the amount of food wasted (N=550)

4.3.3 Knowledge and correct storage

The correct knowledge of food management is necessary in order to decrease the levels of household food waste. Lack of knowledge to accurately estimating food quantities for cooking also contributes to food waste (Van Geffen *et al.*, 2016). Consumers frequently find it a challenge to make meals from leftover foods, which increases food waste. In addition, consumers lack knowledge of proper storage of food and they often store products incorrectly, which decreases the shelf life of products (Van Geffen *et al.*, 2016).

Correct storage helps to prolong the shelf life of products, which can include stocking food in a refrigerator, freezer, or cupboard (Van Geffen *et al.*, 2016). From Figure 4.7, it can be seen that higher percentages in the urban areas (54%) stored fruits and vegetables in the refrigerator compared to the rural areas (18%). Thirty-eight percent (38%) of rural consumers stored their fruits and vegetables in a cupboard, and 28% used a fruit bowl as their primary storage. The consumers in both urban and rural areas were aware that fruits and vegetables should be stored in a cool place to extend their shelf life, as well as to protect against contamination and heat.

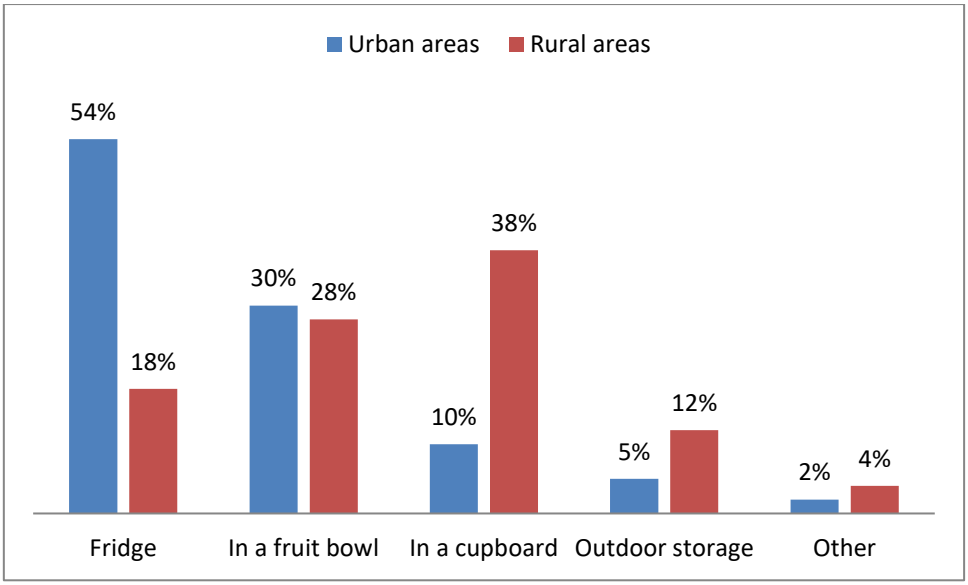


Figure 4.7: Storage of fruit and vegetables (N=550)

Moreover, the consumers ranked the food items according to priority concerning refrigerator storage (see Table 4.2). A significant number of consumers indicated that it is very important to store meat (56%) and milk (57%) in the refrigerator, regardless of the area. Yet, the same consumers indicated that it is not important at all to store fruits and vegetables (65%) and bread (81%) in a refrigerator. Less than half of the consumers regarded it as important to store cheese (44%), margarine (32%), and leftovers (39%) in the refrigerator, which are all items that should be stored in a refrigerator. It is especially important to store leftovers in a refrigerator as food-borne illnesses and bacterial growth can cause severe challenges for a household (Hebrok & Boks, 2017).

Table 4.2: Consumers' priority ranking of the necessity to store items in a refrigerator

Food item	Not important	Somewhat important	Very important
Meat	8%	36%	56%*
Milk	15%	28%	57%*
Cheese	21%	34%	44%
Margarine	34%	33%	32%
Leftovers	22%	38%	39%
Fruits and vegetables	65%*	17%	16%
Bread	81%*	13%	4%

*Significant as p-value is less than 0.05

Twenty two percent (22%) of the consumers indicated that it is not important to store leftovers in a refrigerator. Considering responses to the handling of leftover food (see Section 4.4.2), many of the consumers in rural areas indicated that they gave their leftover food to neighbours. It could be a plausible explanation of the fact that so many did not regard it as important. The responses to this question are indicative of the necessity to inform and educate consumers about the importance of correct storage in particular.

4.4 BEHAVIOUR RELATED TO FOOD WASTE

Consumers who are aware and concerned about food waste as a social challenge generally produce less waste and express a high degree of ethical concern related to food waste. In addition, household routines such as planning, shopping, storing, cooking, eating, and managing leftovers play a crucial role in food waste generation and management, and in some contexts become drivers of food waste (Schanes *et al*., 2018).

4.4.1 Purchasing behaviour

The frequency of purchasing food might contribute to buying more food than is needed and is also one of the most noticeable reasons that leads to wasted food (Schanes *et al.*, 2018). It was found that buying fruits, vegetables, and other food products for both urban (53%) and rural (72%) households most often occurred once a week (see Figure 4.8).

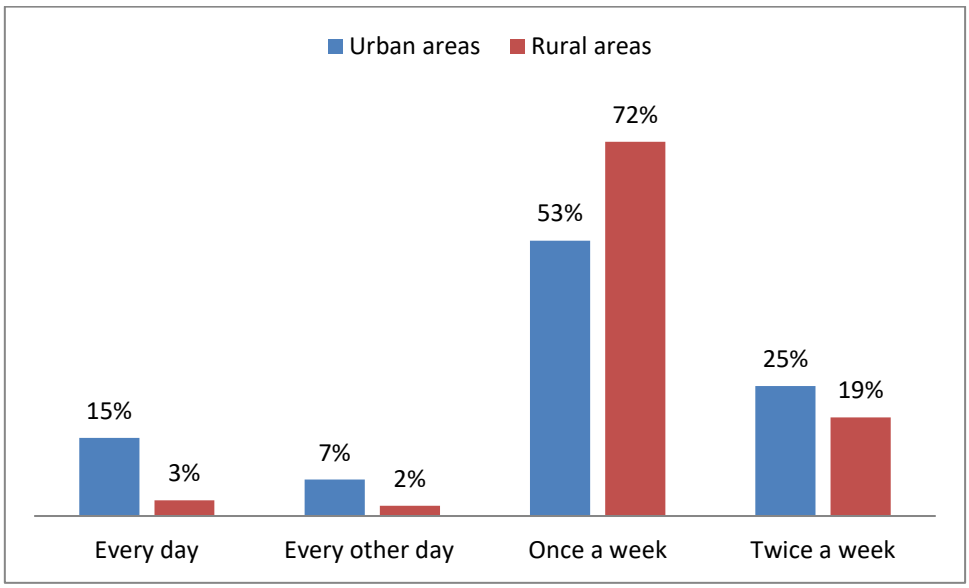


Figure 4.8: Summary of consumers' frequency of shopping behaviour (N=550)

On assumption, this could be because there are more stores in urban areas as opposed to rural areas. The purchasing frequency also affects the amount of food waste. The result for rural areas relates to Jörissen *et al.*'s (2015) results, who found that the purchase of larger quantities for the whole week increased the probability of spoilage, especially of perishable products such as vegetables, milk, and meat. The habit of some people to purchase foodstuff in bulk or more than is necessary is related to reducing inconveniences and avoiding multiple trips to stores (Jörissen *et al.*, 2015). Furthermore, due to the scarcity of adequate food-processing facilities, perishable products in Lesotho are not processed for prolonged shelf life, which includes storage in households. As a result, food spoils easier and this necessitates more frequent visits to stores (George, 2014).

Consumers were also asked to identify their first and second choice of stores that they used for their main grocery purchases (see Figure 4.9). Approximately three-quarters of the consumers in urban areas (76%) undertake their main purchases from a supermarket, while it is the case with just more than half of the consumers in rural areas (53%). Seventeen percent (17%) of urban consumers do their shopping at a local convenience store, while 38% of rural consumers buy at local convenience stores due to access. A negligible number of households produce their own food.

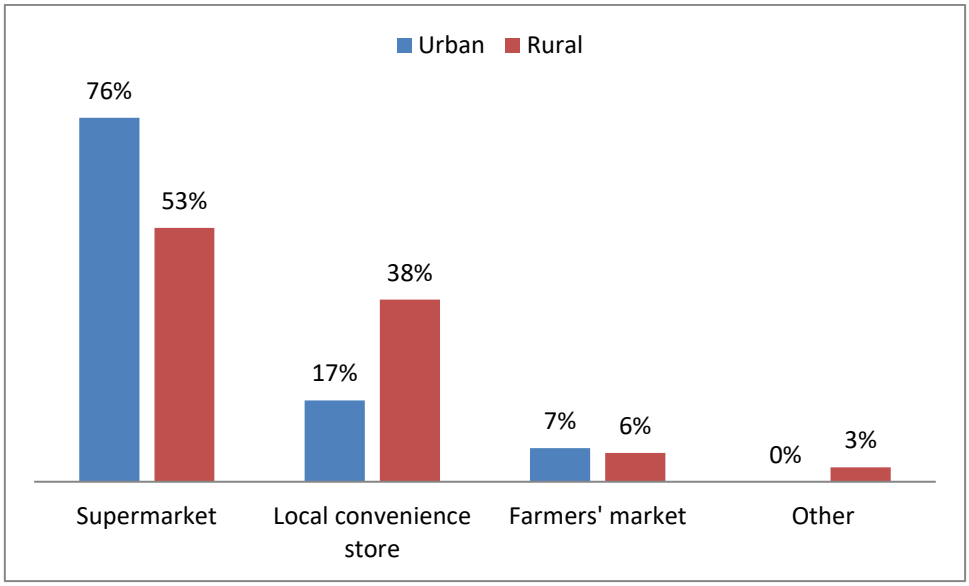


Figure 4.9: Summary of the respondents' type of stores that are used (N=550)

Schanes *et al.* (2018) explain that food waste is the highest when people exclusively shop at large supermarkets and decreases when purchasing takes place at different facilities, such

as small stores and local markets, and is the lowest when people grow their own food. It could be that consumers who spend a great deal of time doing their purchases at smaller stores or local markets attribute a higher value to foods than people who prefer quick and convenient large supermarkets.

Majority (79%) of rural consumers and (70%) of urban consumers make use of these special offers, such as "buy one, get one free". Special offers such as "buy one, get one free" or the offer of discounted products motivate consumers to purchase more than they actually need, which contributes to the food waste generated (Aschemann-Witzel *et al.*, 2015; Schneider, 2008). Less than one-third of rural (21%) and urban (30%) consumers were not interested in special offers. Purchasing these special offers might imply that consumers are tempted by the perceived low price, and are less concerned about the risk of wastage and the subsequent steps to act in a way that avoids food waste (Borisova, 2013).

Table 4.3: Indication of consumers' actions regarding food shopping (N=550)

Indication of people's actions	Responses	Rural	Urban
Use of 2-for-1 offers on food products when food shopping	No	21%	30%
	Yes	79%	70%*
Often consume the "free" product before the "use by" date	No	32%	47%
	Yes	68%	53%*
Often buy more than needed when food shopping	No	64%	68%
	Yes	36%	32%
Buy fruits and vegetables that are available loose rather than pre-packed so that I can buy the amount I need	N/A	2%	6%
	No	23%	22%
	Yes	75%	72%

*Significant as p-value is less than 0.05

Most consumers (68%) in the rural areas and more than half of the urban consumers (53%) consumed free products before the "use by" date. Food expiry dates such as "use by" and "best before" dates have been indicated as one of the major causes of household food waste (Van Dooren & Mensink, 2014; Segrè *et al.*, 2014; Borisova, 2013). Consumers (urban=68%; rural=64%) indicated that they did not buy more than needed when purchasing food. However, the results indicate that 36% of rural consumers and 32% of urban consumers often buy more than needed. According to Schneider (2008), items bought on offer or impulsively are more likely to be discarded. It is better to buy what you need so that you know it will stay fresh and that money will be saved.

Furthermore, 75% of rural and 72% of urban consumers try to buy items that are available loose, rather than pre-packed. In this manner, the quantity is more manageable, as consumers only buy the amount that they need and no more than necessary. The majority (64%) of consumers in rural areas did not discard the food if the "best before" date has expired, regardless of its appearance or smell, whereas most (65%) of the consumers in urban areas discarded the food if the "best before" date has expired, despite what it might look or smell like.

4.4.2 Storage

Packaging helps to keep products fresh for a longer period, both at home and on the retailers' shelves (Aschemann-Witzel *et al.*, 2015). According to Table 4.4, many of the consumers, both in the rural (74%) and urban areas (74%), followed the recommended storage information of packaged goods. Moreover, more than half of the urban (56%) and rural (63%) consumers stored fruit, vegetables, and salads in their original packaging. Other studies had found that consumers do not make the best use of packaging functions or the information provided on the packaging, and they are not aware of how packaging might prolong a product's lifetime at home (Schanes *et al.*, 2018; Hebrok & Boks, 2017). These results are encouraging as they imply that the consumers who participated in this study were responsive and attentive to the instructions of the packaging of produce. However, it is necessary to note that many of the consumers indicated that they preferred to buy loose food items (see Section 4.4.1).

Table 4.4: Indication of consumers' actions regarding food waste (N=550)

Indication of people's actions	Responses	Rural	Urban
Follow the recommended storage information on packaged goods	No	26%	26%
	Yes	74%*	74%*
Store fresh fruit, vegetables, and salads in the manufacturer's wrapping that they came in	N/A	2%	2%
	No	35%	42%
	Yes	63%	56%

*Significant as p-value is less than 0.05

4.4.3 Handling leftover food

Reusing leftovers is one of the most effective action plans to combat food waste at the household level. Consumers who often eat leftovers create less food waste. Households

have difficulties in assessing the durability of leftovers and therefore tend to be concerned about safety issues when considering them for reuse (Schanes *et al.*, 2018).

The majority of the consumers in the rural areas (91%), as well as the urban areas (89%), used an item or product as soon as possible if they realised that it was coming close to its "best before" date (see Figure 4.10). Reassuringly, it is the minority of consumers in both rural (6%) and urban areas (3%) who discarded such items without bother. This indicates that consumers do not discard food unnecessarily, probably because food is expensive, and most of the consumers do not have a high monthly income. Some even rely on social grants and therefore work economically with their food products. Moreover, Van Dooren and Mensink (2014) indicate that if consumers focused more on the "best before" dates, it could save up to 14 kg of food waste per person per year.

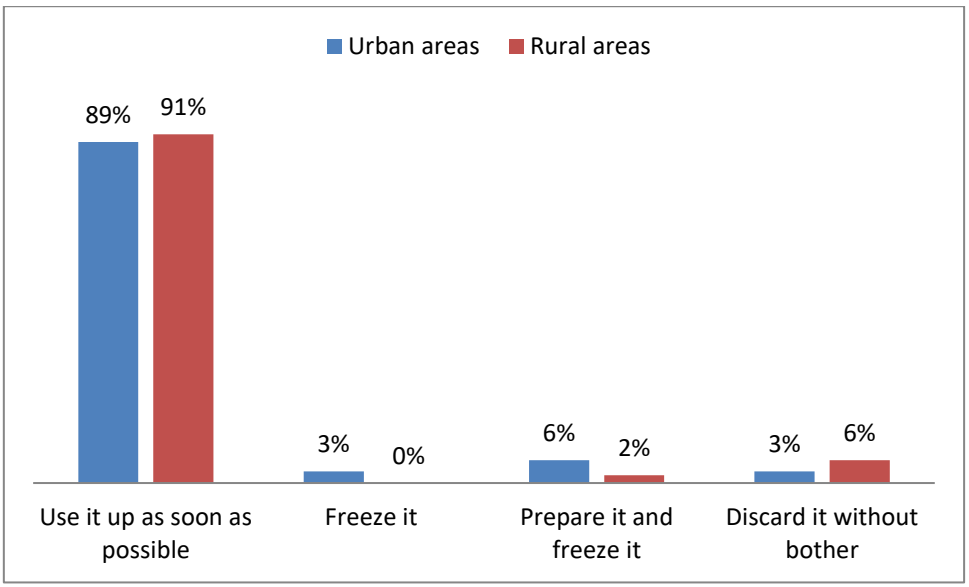


Figure 4.10: Ways to handle an item that is coming close to its "best before" date (N=550)

Another major reason that food is thrown away is because too much is prepared (Van Dooren & Mensink, 2014). In this study, the majority (80%) of the consumers in urban areas indicated that they stored food in the refrigerator (see Figure 4.11), whereas in rural areas only 29% of consumers have access to store food in refrigerators. More than half (52%) of the consumers in rural areas did not discard food, but rather gave it to their neighbours, and put the food in a cooler place so that it could be reused the following day. However, 10% of urban and 18% of rural consumers discarded leftover foods. It could be because some consumers found it tedious to eat the same meal repetitively, others disliked

reheating leftovers, and some perceived it to have less quality and freshness (Schanes *et al.*, 2018).

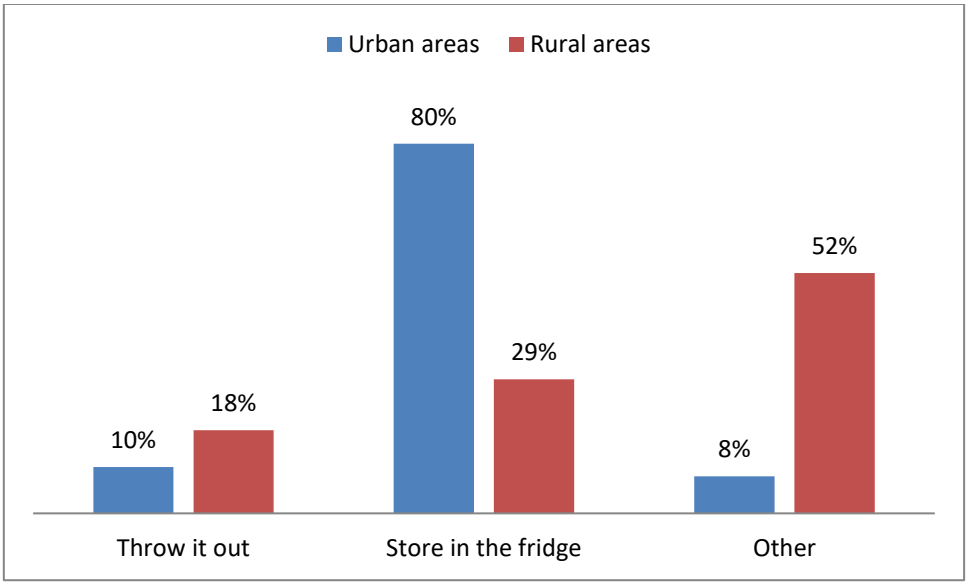


Figure 4.11: Summary of what is done when too much food is prepared (N=550)

Leftover food is the result of excess preparation and the most significant contributor to household food waste because of the way it is dealt with (Pärn, 2016). However, many consumers find it challenging to prepare meals using leftovers in the refrigerator. This could be due to a lack of cooking confidence and skills (Van Geffen *et al*., 2016). A relatively low percentage of consumers in rural (18%) and urban areas (10%) indicated that they discarded food if too much was prepared. This is positive as one can assume that consumers are aware of the negative consequences of discarding food and, as a result, they attempt to save food and indirectly, money.

Schanes *et al.* (2018) explain that reusing leftovers is considered one of the best as well as most efficient strategies to reduce food waste in households. Reusing leftovers saves time, effort, and money. In addition, the consumption of leftovers is regularly related to feelings of sacrifice and thrift for the good of the family. The findings of this research indicate that more than half of the consumers in the rural (59%) and urban areas (54%) considered additional meals that could be made from leftover ingredients (see Table 4.5). Furthermore, at the point of purchase and when planning meals, they considered what could be made from leftovers.

Table 4.5: Indication of consumers' actions regarding leftovers (N=550)

Indication of people's actions	Responses	Rural	Urban
When planning meals, do you ever think what could be made from leftover food?	No	44%	46%
	Yes	56%	54%
Do you consider additional meals that can be made from leftover ingredients at the point of purchase?	No	40%	45%
	Yes	60%	55%
Do you buy perishable food items, and check the date on the pack first?	N/A	2%	2%
	No	20%	8%
	Yes	78%	90%*
Do you throw away food like bread, cakes, and eggs, no matter what it looks or smells like if the "best before" date has expired?	N/A	2%	5%
	No	64%	28%
	Yes	34%	67%
Do you worry about reheating leftovers that have been kept in the freezer?	N/A	62%	8%
	No	22%	53%
	Yes	16%	39%
Do you worry about reheating leftovers that have been kept in the refrigerator for one or two days?	N/A	64%	9%
	No	25%	47%
	Yes	11%	44%

*Significant as p-value is less than 0.05

Consumers were also asked if they were concerned about reheating leftovers that have been kept in the freezer. Sixty-one percent (62%) of the rural consumers indicated that they did not have refrigerators, but they kept leftover foods in cool places. Consequently, they did not worry about reheating leftovers that have been kept in the refrigerator. Slightly fewer consumers (53%) in the urban areas shared the same sentiment, although they did have refrigerators. In contrast, 44% of the urban consumers and 11% of the rural consumers did worry about reheating leftovers that have been kept in the refrigerator for one or two days. When put in storage, leftovers are often misplaced, forgotten, and/or stored for too long, and therefore spoil more frequently (Schanes *et al.*, 2018).

4.4.4 Food waste management

Consumers judge whether food is still fit for consumption in different ways, which include date labels, sense of smell, and visual judgements. Some research indicates that consumers who use a variety of strategies to define edibility tend to waste more food than those who depend on only one or two strategies, such as look and smell (Hebrok & Boks, 2017). According to the results of this study, regarding reasons why food is wasted, many of the consumers in urban areas discarded food when it was found to be mouldy (76%) or had an off smell (67%) (see Table 4.6).

Table 4.6: Reasons for discarding food (N=550)

Reasons for household food waste	Urban	Rural
Mouldy	76%	43%
Off smell	67%	57%
Leftover food (plate)	36%	57%
Off appearance/texture	38%	10%
Prepared too much	15%	20%
Did not like it	15%	3%
Bought more than needed	9%	9%
Needed space	2%	8%

More than half (57%) of the consumers in rural areas threw away food when it had an off smell, and when there were leftovers on the plate. As indicated in Table 4.6, the minority of consumers who resided in urban areas discarded food when they had prepared too much (15%), did not like it (15%), bought more than needed (9%), or needed the space to store other food (2%); compared to rural consumers who discarded food when it had an off appearance (10%), prepared too much (20%), did not like it (3%), bought more than needed (9%), and additional needed space (8%).

The consumers had to indicate where they thought most of the household food wastage came from (see Figure 4.12). Approximately half (51%) of rural consumers stated that it came from plate waste and over-purchasing of ingredients. Most of the consumers (64%) in the urban areas indicated that it came from food spoilage, and more than half (51%) stated that food wastage came from plate waste. Furthermore, less food waste in rural areas (11%) originated from food preparation and cooking, which was also the case in urban areas (14%).

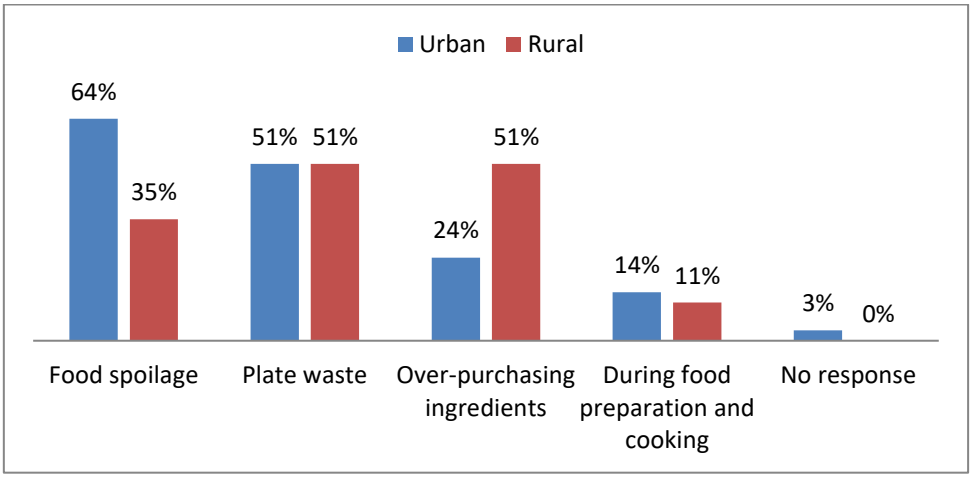


Figure 4.12: Summary of the origin of household food waste (N=550)

The results in Figure 4.13 illustrate the category of food consumers tend to buy too much of, which is ultimately discarded. It seems that the consumers in both the rural (50%) and urban (48%) areas tended to purchase too many fruits and vegetables, which end being discarded. It can be assumed that this is due to rural consumers who do not have refrigerators in which to store fruits and vegetables. It can also be assumed that it might be due to consumers from both the urban and rural areas buying in bulk.

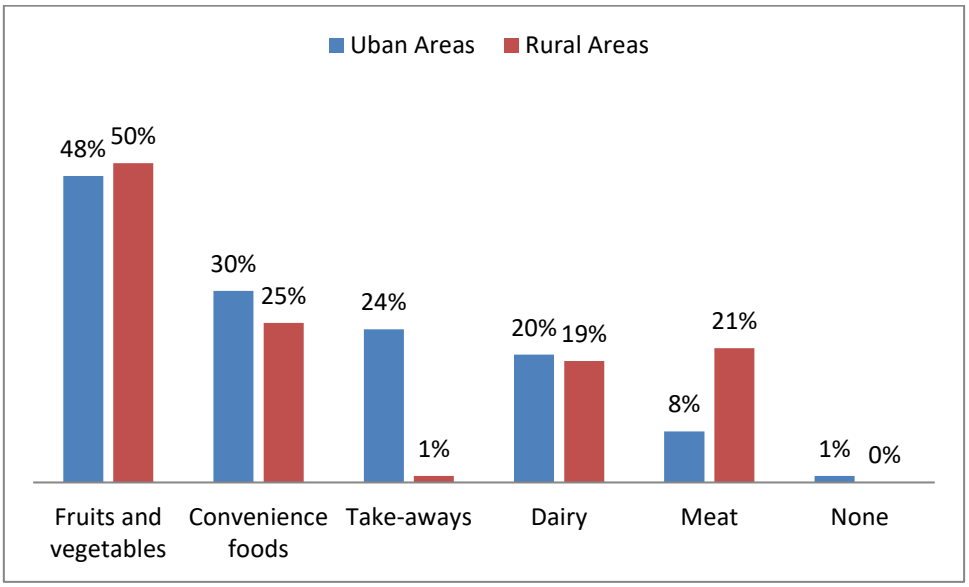


Figure 4.13: Category of food consumers tend to over-purchase and then discard (N=550)

The researcher sought to identify whether there were any relationships between different food items consumed and discarded. If so, an assumption can be made that if there is a strong relationship, the propensity for discarding certain food items might also indicate that other food items will be discarded. Consequently, the researcher can start to compile an estimate of the consumption of certain foods in households. All the correlations and their values are summarised in Table 4.7. The top pane from left to right represents the consumed food items (indicated with ^{B}), and the left pane from top to bottom represents the discarded food items (indicated with ^{D}).

It is important to note that it is expected that perfect relationships exist between food consumed and food discarded. If a particular food item is purchased, it is consumed, but some of it might be discarded. One cannot consume a food item if it has not been bought. There were no strong relationships between different food items, as confirmed by quite a few indications of no relationships existing between particular food items.

There were moderate positive relationships between apples, grapes, and oranges, or bananas, grapes, and oranges, which implies that the two groups of three different fruits are often consumed in combination within households. Interestingly, there is a weak relationship between apples and bananas, which could indicate that in most instances, bananas and apples are not consumed at the same time, but rather in combination with grapes and oranges.

Table 4.7: Summary of the category of fruits and vegetables that are bought and discarded

	Apples[B]	Bananas[B]	Grapes[B]	Oranges[B]	Seasonal fruits[B]	Cabbage[B]	Spinach[B]	Swiss chard[B]	Radish[B]	Potatoes[B]	Carrots[B]	Beetroot[B]
Apples[D]	1.0	0.3*	0.5**	0.4**	0.2*	0.2*	0.4**	0.1*	0.2*	0.4**	0.3*	0.3*
Bananas[D]	0.3*	1.0	0.5**	0.5**	0.1*	0.2*	0.4**	0.2*	0.3*	0.4**	0.3*	0.3*
Grapes[D]	0.4**	0.5**	1.0	0.4**	0.0	0.1*	0.3*	0.0	0.1*	0.4**	0.2*	0.1*
Oranges[D]	0.4**	0.5**	0.5**	1.0	0.1*	0.2*	0.1*	0.1*	0.2*	0.2*	0.2*	0.2*
Seasonal fruits[D]	0.2*	0.1*	0.0	0.2*	1.0	0.1*	0.1*	0.1*	0.1*	0.1*	0.1*	0.1*
Cabbage[D]	0.2*	0.2*	0.1*	0.3*	0.2*	1.0	0.4**	0.1*	0.2*	0.3*	0.2*	0.2*
Spinach[D]	0.3*	0.3*	0.2*	0.2*	0.2*	0.4**	1.0	0.4**	0.2*	0.3*	0.2*	0.3*
Swiss chard[D]	0.1*	0.2*	0.0	0.0	0.0	0.0	0.4**	1.0	0.5**	0.0	0.0	0.2*
Radish[D]	0.2*	0.3*	0.1*	0.3*	0.0	0.2*	0.3*	0.5**	1.0	0.1*	0.0	0.2*
Potatoes[D]	0.4**	0.4**	0.4**	0.2*	0.2*	0.3*	0.4**	0.0	0.1*	1.0	0.4	0.2*
Carrots[D]	0.3*	0.3*	0.2*	0.2*	0.1*	0.1*	0.3*	0.0	0.0	0.4**	1.0	0.5**
Beetroot[D]	0.3*	0.3*	0.1*	0.2*	0.0	0.1*	0.4**	0.2*	0.2*	0.2*	0.5**	1.0

***Strong correlation (0.7≤r<1); **Moderate correlation (0.4≤r<0.7); * Weak correlation (0.1≤r<0.4); 0 = no correlation; 1 = perfect correlation

There is a moderate relationship between spinach and cabbage, swiss chard, potatoes, and beetroot, but not necessarily between cabbage, swiss chard, potatoes, and beetroot. This suggests that there is a possibility that spinach is consumed in combination with either cabbage, swiss chard, potatoes, or beetroot. Moreover, swiss chard is often consumed with radishes. It is also likely that carrots are consumed with either beetroot or potatoes.

4.5 FOOD CONSUMPTION

The adequacy of food refers to food that is available and accessible in a quantity that is satisfactory or acceptable and sufficient in quality for someone to enjoy a healthy and active life (FAO, 2018), which involves consumer or cultural acceptance. The standard by which it is

measured exceeds dietary needs and includes non-nutrient-based values for food, such as expiry dates that determine consumers' behaviour towards food acceptance and their perception of adequate food (FAO, 2018). Food consumption is related to food waste when food is not consumed in time, when food is discarded because it exceeded the expiration date stated on the package, when it spoiled, or no longer seems edible (Segrè *et al.*, 2014). It is essential to obtain information from consumers regarding the types of food they consume. This assists in designing interventions or food waste campaigns. The fruit and vegetables mostly consumed in the rural and urban areas of Lesotho are illustrated in Figures 4.14 and 4.15 respectively.

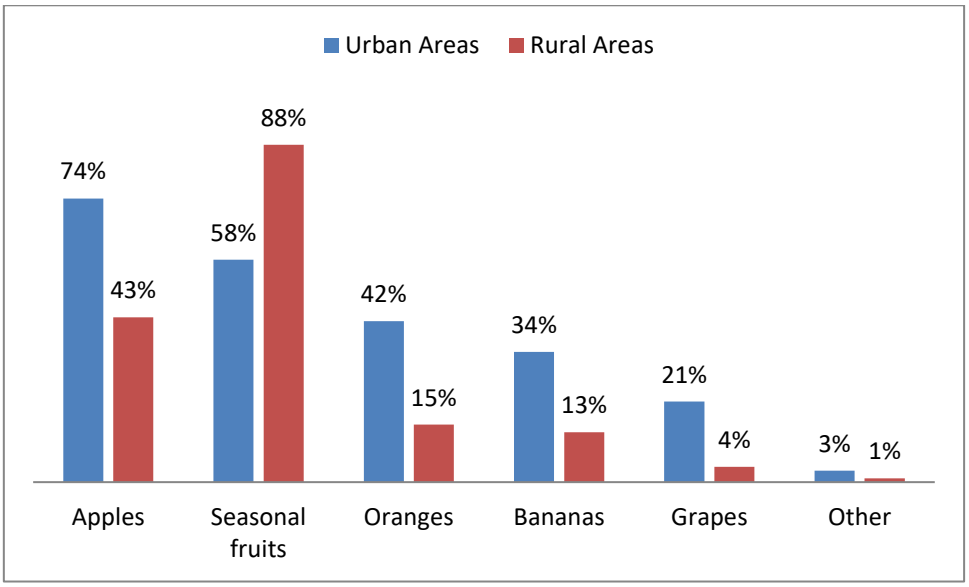


Figure 4.14: Fruits that are consumed the most (N=550)

The most commonly consumed and locally produced fruits are peaches and apricots (FAO, 2013a), as confirmed by the majority of the consumers. In rural areas, consumers consume seasonal fruits (88%), as opposed to urban consumers who mostly consume apples (74%), as illustrated in Figure 4.14. Other fruits such as mangos, kiwis, and papayas are consumed, although much less in the urban (3%) and rural areas (1%). When a type of fruit is in season, it is at its peak in terms of flavour and harvest during that time of the year. Seasonal fruits during summertime in Lesotho are peaches, apricots, and prunes. It is assumed that the majority of rural consumers consume seasonal fruits because they are readily available during the summer season and less expensive as well. In urban areas, apples are mostly consumed because they are more readily available.

Cabbage is the most consumed vegetable by both the urban (73%) and rural (88%) consumers (see Figure 4.15). In rural areas, many consumers (68%) consume spinach and more than half (57%) of the consumers in urban areas consume spinach. More than half of the consumers in urban areas consume potatoes (56%) and carrots (55%). Traditionally, the most commonly consumed vegetables in rural areas are cabbage and spinach. It is assumed that cabbage and spinach are consumed mainly because they are grown in most family gardens, and they can withstand the cold climate in rural areas.

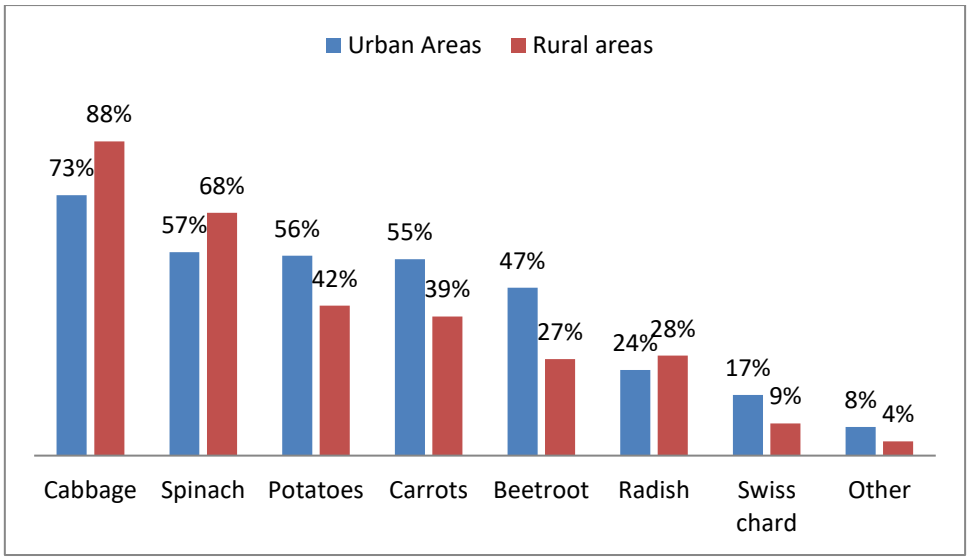


Figure 4.15: Vegetables that are consumed the most (N=550)

4.6 INDICATORS OF FOOD WASTE GENERATION

A variety of factors influence the amount of food waste generated. Consequently, certain factors are more important than others in their prediction of or contribution to food waste. Demographic factors have an indirect influence on food waste behaviour, but most likely influence motivation, ability, or opportunity. By these means, these constructs affect food waste, as well as the consumer food management process (Van Geffen *et al.*, 2016).

4.6.1 Education and income

According to the results of this study, education is a significant indicator (p=0.019) of food waste, and there is a strong negative correlation (r=-0.8) between education and food waste generation. The majority of consumers who have a higher level of education are aware of

the negative consequences of food waste. Some scholars indicate that there is not a strong correlation between education level and food waste. Furthermore, employment status can also potentially be linked with food waste generation, most likely because income is related to employment status (Schanes *et al*., 2018).

Regarding the strong negative correlation (r=-0.78) between food waste generation and income, income is a significant indicator of food waste generation (p=0.0027). It seems that people in lower-income households waste more food. The main reason given is a lack of planning, possibly due to a lack of sufficient knowledge concerning planning. Households with different income levels differ in particular with regard to their attitudes towards food waste reduction, as well as with regard to which type of food is wasted (Schanes *et al.*, 2018).

In addition, other studies have indicated that more educated people tend to discard more food due to a higher income and eating out more often, which may influence storage management (Jörissen *et al*., 2015; Glanz, 2008). The level of education correlates positively with food waste, whereby a full-time employed person may have less time to plan and use their food stock (Schneider, 2008).

4.6.2 Household size

Household size is not a significant indicator (p=0.131) of the amount of food wasted in this research. The literature indicates that larger families tend to throw away less food. The majority of the available studies have shown a strong correlation between the amount of food waste and household size. The more people living in a household, the more food is wasted. Smaller households typically produce less waste than larger households, although the amount of food waste generated per capita decreases with increasing household size (Jörissen *et al*., 2015).

Segrè *et al*. (2014), however, disagree, and explain that larger families tend to be more disciplined due to less waste per person, while smaller households tend to have more waste per person. According to Schanes *et al*. (2018), the presence of children in households tends to significantly affect the quantities of food waste. This is possibly due to the selective eating habits of children and the fact that their parents pay more attention to food safety

and food quality; they are therefore more likely to throw away food and to be less knowledgeable about how to avoid food waste (Schanes *et al*., 2018).

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

This study compared food waste in Lesotho and explored reasons for possible household behaviours, purchasing habits, attitudes, and demographic and socio-economic characteristics of households in both the rural and urban areas that could contribute toward food waste. This study has provided useful information about drivers that influence households' behaviour concerning food waste, food storage, and managing leftovers. It highlighted in detail specific factors that may motivate household food waste.

When comparing food waste in the rural and urban areas of Lesotho, the study identified that consumers in urban areas wasted more food than consumers in rural areas. It is assumed that consumers in urban areas have more access to food. Moreover, regardless of a rural or urban setting, the majority of discarded food consisted of fresh produce such as fruits and vegetables. The majority of the consumers in rural areas consumed seasonal fruits such as peaches, apricots, and prunes during summer, as opposed to urban consumers who mostly consumed apples. Consequently, seasonal fruits were primarily wasted in rural areas, and apples were mostly wasted in urban areas.

The most commonly wasted vegetables in both the rural and urban areas were cabbage and spinach, with the addition of potatoes in rural regions and carrots in urban areas. There is a relationship between the fruits and vegetables consumers purchase and that which is ultimately discarded. The prepared foods that were commonly wasted in rural and urban areas were staples, such as porridge and rice.

Another objective was to determine the attitudes and knowledge of citizens towards food waste in rural and urban Lesotho. The results indicated that consumers from rural and urban areas were not aware of the "stop food waste programme", which was confirmed by the majority of consumers from rural and urban areas, who clearly underestimated the amount of food waste their households generated. However, many consumers in both the

rural and urban areas were fully aware of the negative consequences of food waste and mentioned that it concerned them a great deal when they threw away food.

The majority of consumers in the rural areas and more than half of consumers in the urban areas buy fruits, vegetables, and other food products for consumption in the home once per week. The increased quantities bought once a week might imply that the fresh produce spoils more often. Moreover, the findings indicated that approximately three-quarters of the consumers in urban areas undertook their main shopping from a supermarket, while it was the case with just more than half of the consumers in the rural areas.

Majority of consumers in the rural and urban areas buy items that are available loose, rather than pre-packed. In this manner, the quality is more manageable as consumers only buy the amount that they need and not more than necessary. Consumers of rural areas majority of them purchase large quantities for the whole week, on assumption this could be because there are more stores in urban areas as opposed to areas in order to avoid multiple trips to stores.

In the case of purchasing behaviour, the study found that consumers in both the rural and urban areas were attracted to special offers that persuade them to buy more than they need. Furthermore, the majority of consumers in the rural areas did not discard the food if the “best before” date had expired, regardless of appearance or smell, whereas most of the consumers in the urban areas discarded the food if the “best before” date had expired, despite what it might look or smell like.

The majority of rural and urban consumers followed the recommended storage information of packaged goods. In addition, the majority of consumers in urban areas had refrigerators in which to store food, while the majority of rural consumers did not have refrigerators for proper storage of perishable foods. Consumers in both the rural and urban areas were concerned when discarding food, and it bothered them a great deal.

Furthermore, the majority of urban consumers stored leftover foods in refrigerators when too much was prepared, whereas the consumers in the rural areas gave it to neighbours because there was no space to store the leftovers, or put the food in a cooler place so that it could be reheated the following day. In some instances, in both the rural and urban areas,

leftovers were thrown away because consumers did not know what to do with their leftovers.

Reasons for discarding food in urban areas included mould and an off smell, whereas more than half of the consumers in the rural areas threw away food when it had an off smell, and threw away leftovers from plates.

Lastly, it was found that education and income are significant predictors of food waste in Lesotho, whereas household size was not.

5.2 RECOMMENDATIONS

5.2.1 Recommendation for awareness campaigns and educating consumers.

It is recommended that knowledge and skills to increase the awareness of consumers about their household food waste, as well as the consequences of food waste, should be provided by consumer scientists, as this is an essential factor to alter food waste behaviour. The reduction of food waste is seen as a critical factor for achieving food and nutrition security.

Awareness raising campaigns (such as the “stop waste food programme”) should be implemented by consumer scientists to stimulate food waste reduction at home. Consumers should be encouraged to plan meals, proper food preparation, do shopping list that contain the products needed to reduce food waste. Consumers should be encouraged to save leftovers and be provided with the skills and knowledge on how to re-use and transform leftovers into a new a meal by consumer scientists.

It is recommended that these empirical data and findings are used to develop communication campaigns that can be conducted to assist in influencing consumer behaviour at the household level. There should also be increased awareness and educational campaigns that focus on consumers’ food purchasing skills; using leftovers to create new meals; interpreting “sell by”, “use by”, and “best before” dates; as well as food management and storage for household food waste reduction.

In addition, the appropriate way of storing foods should be communicated in rural areas to save food. Integrated approaches are therefore required to address this developmental

issue in Lesotho, which includes encouraging proper food management in order to decrease household food waste.

5.2.2 Recommendations for food producers and retailers and their role in preventing and reducing food waste and educating of consumers.

Ministry of Agriculture and Food Security should coordinate retailers and farmers to work together on demand planning, management of tighter grading and quality control decisions in order to reduce food waste. In this case food retailers will be able to share their forecast data for specific food items to help farmers with their production plan and avoid overproduction. As a result, agricultural food waste can be significantly reduced. In addition, the Ministry of Agriculture and Food Security should make a policy that will bind farmers to sell directly to retailers to reduce an easy access of farm produce to everybody. Lesotho should make food waste reduction a priority in their national food and agriculture policies, programs and incentives.

Retailers can help to reduce food waste by improving freshness and quality by increasing the speed through supply chain and ensuring that food is properly handled at each stage. Based on the findings of my research, I suggest retailers should also help consumers avoid buying too much food by giving more tailored assortment and smaller pack sizes and cutting back buy promotions on perishable food items.

5.2.3 Recommendations for further research

This study has covered most of the consumers' behaviour about household food waste in rural and urban areas of Lesotho using quantitative approach. Further research should focus on a qualitative component such as focus group discussion or extending the research to other locations. In addition it should include impact of food waste on food and nutrition security.

REFERENCES

Albisu, L.M. (2016). Consumer behaviour with respect to food losses and waste. *Mediterra: Zero Waste in the Mediterranean,* 2016:303-317.

Amini, H.R., Reinhart, D.R. & Mackie, K.R. (2012). Determination of first-order landfill gas modeling parameters and uncertainties. *Waste Management,* 32(2):305-316.

Anding, J. (2016). *Reducing Food Waste at Home*. [Online]. Available: https://agrilifecdn.tamu.edu/earthkindliving/files/2016/04/Earth-Kind-Reducing-Food-Waste.pdf [2019, December 15].

Aschemann-Witzel, J., Rohm, H., Oostindjer, M., Symmank, C., Almli, V., De Hooge, I., Normann, A. & Karantininis, K. (2017). Consumers in a sustainable food supply chain (COSUS): Understanding consumer behaviour to encourage food waste reduction. *Foods* 6(12):E104. [Online]. Available: https://www.ncbi.nlm.nih.gov/pubmed/29186883 [2019, November 15].

Aschemann-Witzel. J., De Hooge I., Pegah, A., Tino, B. & Oostindjer, M. (2015). Consumer-related food waste: Causes and potential for action. *Sustainability* 7(6):6457-6477.

Boom, I.F.A. (2012). Interaction between Consumers and Supermarkets to Reduce Household Food Waste. M.Sc dissertation. Wageningen University.

Borisova, A. (2013). Food Waste in Denmark: Investigating the Antecedents of Food Waste Avoidance among Danish Households. M.Sc dissertation. University of Aarhus.

Borma, A. (2017). Food waste: Global problem. *SEA Practical Application of Science* 15(3):353-362.

Boto, I. & Biasca, R. (2012). *Small Island Economies: From Vulnerabilities to Opportunities*. [Online]. Available: http://www.cta.int/joomlatools-files/docmanfiles/policy_papers/8_Building_resilience_in_small_island_economies.pdf [2019, December 15].

Britain, E., Brigden, A., Smith, L.D. & Mitchell, M. (2015). *The Economics of Food Waste*. Warwickshire: WRAP.

Buchner, B., Fischler, C., Gustafson, E., Reilly, J., Riccardi, G. & Ricordi, C. (2012). *Food Waste: Causes, Impacts and Proposals*. [Online]. Available: https://www.barillacfn.com/m/publications/food-waste-causes-impact-proposals.pdf [2019, December 15].

Chakona, G. & Shackleton, C.M. (2017). Local setting influences the quantity of household food waste in mid-sized South African towns. *PLoS ONE* 12(12):e0189407. [Online]. Available: https://doi.org/10.1371/journal [2019, November 15].

Chrobog, C.K. (2014). *Wasted: Understanding the Economic and Social Impact of Food Waste. M. dissertation. Academic Training and Research Center*. [Online]. Available: http://bibliotecadigital.fgv.br/dspace/themes/Mirage2/pages/pdfjs/web/viewer.html?file=http://bibliotecadigital.fgv.br/dspace/bitstream/handle/10438/13325/CHROBOG.pdf?sequence=1&isAllowed=y [2019, November 17].

Condrasky, M.D., Hegler, M., Sharp, J.L., Carter, C. & Komar, G.R. (2015). Opinions, knowledge, and current practices of culinary arts instructors and professionals in regards to healthy food techniques. *Journal of Culinary Science & Technology* 13(4):287-302.

Cronjé, N., Van der Merwe, I., Muller, I., (2018). Household food waste: A case study in Kimberley, South Africa. *Journal of Consumer Science* 46:1-9.

Dictionary of Epidemiology. (2014). 6th Edition. Oxford: Oxford University Press.

Drost, E.A. (2011). Validity and reliability in social science research. *Education Research and Perspectives* 38:105-123.

Enos, A. (2019). Assessing the Socio-Economic Impact of Food Waste Among International Students. Dissertation. Szent István University.

Evans, D. (2012). Binning, gifting and recovery: The conduits of disposal in household food consumption. *Environment and Planning D: Society and Space* 30(6):1123-1137.

Falasconi, L., Franco, S., Segré, A., Setti, M., Vittuari, M. & Cusano, I. (2016). Consumer approach to food waste: Evidences from a large-scale survey in Italy. *Italian Review of Agricultural Economics* 71(S1):266-277.

Florkowski, W.J., Us, A. & Klepacka, A.M. (2018). Food waste in rural households support for local biogas production in Lubelskie Voivodship (Poland). *Resources, Conservation and Recycling* 136:46-52.

Food and Agriculture Organization (FAO). (2010). *The State of Insecurity in the World: Addressing Food Insecurity in Prostrated Crises.* Rome: FAO.

Food and Agriculture Organization (FAO). (2011). *Global Food Losses and Food Waste: Extent, Causes and Prevention*. Rome: FAO.

Food and Agriculture Organization (FAO). (2013a). *Food Wastage Footprint: Full Costs Accounting*. Rome: FAO.

Food and Agriculture Organization. (FAO). (2013b). *Food Wastage Footprint: Impacts on Natural Resources: Summary Report of the Food and Agricultural Organization of the United Nations.* Rome: FAO.

Food and Agriculture Organization (FAO). (2015). *Regional Strategic Framework: Reducing Food Losses and Waste in the Near East & North Africa Region*. [Online]. Available: http://www.fao.org/3/a-i4545e.pdf [2019, December 20].

Food and Agriculture Organization (FAO). (2018). *Food Loss and Waste and the Right to Adequate Food: Making the Connection*. Rome: FAO.

Food and Agriculture Organization (FAO). (2019). *The State of Food and Agriculture: Moving Forward on Food Loss and Waste Education*. Rome: FAO.

Furin, J., Rigodon, J., Cancedda, C., Keshavjee, S., Seung, K., Letsie, M., Kim, J. & Joseph, J. (2007). Improved case detection of active tuberculosis associated with an antiretroviral treatment program in Lesotho. *The International Journal of Tuberculosis and Lung Disease* 11(10):1154-1156.

George, M.J. (2014). The status of food industry and associated socio-economic implications in Lesotho: Challenges and opportunities. *Journal of Science Policy & Governance* September:1-14.

Gibson, M. (2016). *The Feeding of Nations: Redefining Food Security for the 21st Century*. Boca Raton: CRC Press.

Gjerris, M. & Gaiani, S. (2013). Household food waste in Nordic countries: Estimations and ethical implications. *Etikk i Praksis: Nordic Journal of Applied Ethics* 1:62-68.

Glanz, R. (2008). Causes of Food Waste Generation in Households: An Empirical Analysis. M.Sc dissertation. University of Natural Resources and Applied Life Sciences.

Göbel, C., Langen, N., Blumenthal, A., Teitscheid, P. & Ritter, G. (2015). Cutting food waste through cooperation along the food supply chain. *Sustainability* 7:1429-1445.

Gustavsson, J., Cederberg, C., Sonesson, U. & Emanuelsson, A. (2013). *Global Food Losses and Food Waste – Extent, Causes and Prevention*. SIK Report No. 857. Sweden: The Swedish Institute for Food and Biotechnology.

Hebrok, M. & Boks, C. (2017). Household food waste: Drivers and potential intervention points for design – an extensive review. *Journal of Cleaner Production* 151:380-392.

Hoover, D. (2017). *Estimating Quantities and Types of Food Waste at the City Level*. New York: Natural Resources Defence Council.

Hudson, U. & Messa, M. (2014). *Position Paper on Food Losses and Waste*. [Online]. Available: http:// www.helsinki.fi/henvi/yvv/esitykset/Koivupuro.pdf [2019, June 5].

Jörissen, J., Priefer, C. & Braeutigam K.R. (2015). Food waste generation at household level: Results of a survey among employees of two European research centers in Italy and Germany. *Sustainability* 7:2695-2715.

Kimberlin, C.L. & Winterstein, A.G. (2008). Validity and reliability of measurement instruments used in research. *American Journal of Health-System Pharmacy* 65(23):2276-2284.

Koivupuro, H.K. (2011). *Foodspill – Food Wastage and Environmental Impacts*. [Online]. Available: http:// www.helsinki.fi/henvi/yvv/esitykset/Koivupuro.pdf [2019, March 15].

Koivupuro, H.K., Hartikainen, H., Silvennoinen, K., Katajajuuri, J.M., Heikintalo, N., Reinikainen, A. & Jalkanen, L. (2012). Influence of socio-demographical, behavioural and attitudinal factors on the amount of avoidable food waste generated in Finnish households. *International Journal of Consumer Studies* 36(2):183-191.

Kothari, C.R. (2004). *Research Methodology: Methods and Techniques*. 2nd Edition. Jaipur: University of Rajasthan.

Leduka, R., Crush, J., Frayne, B., McCordic, C., Matobo, T., Makoa, T., Mphale, M., Phaila, M. & Letsie, M. (2015). *The State of Poverty and Food Insecurity in Maseru, Lesotho*. Kingston and Cape Town: African Food Security Urban Network.

Lesotho Bureau of Statistics (BoS). (2016). *National Statistical System of Lesotho Statistical Reports*, *No. 42*. Maseru: BoS.

Lesotho Demographic Health and Survey (LDHS). (2014). Ministry of Health, Maseru, Lesotho. Available: https://www.dhsprogram.com/pub

Lesotho Voluntary National Review (LVNR). (2019). *United Nations Lesotho, Voluntary National Review*. [Online]. Available: https://www.undp.org/content/dam/unct/lesotho/docs/Speeches/UN%20RC%20Remarks%20on%20Lesotho%20Voluntary%20Review%20June%202019%20.pdf [2019, August 25].

Lipinski, B., Hanson, C., Lomax, J., Kitinoja, L., Waite, R. & Searchinger, T. (2013). *Reducing Food Loss and Waste. Working Paper: Instalment 2 of Creating a Sustainable Food Future.* Washington, D.C.: World Resources Institute. [Online]. Available: http://www.workresourcereport.org [2019, March 15].

Mappery. (2009). *Lesotho Map*. [Online]. Available: http://www.mappery.com/Lesotho-Map-2 [2019, January 13].

Marangon, F., Tempesta, T., Troiano, S. & Vecchiato, D. (2015). Food waste, consumer attitudes and behaviour: A study in the north-eastern part of Italy. *Italian Review of Agricultural Economics* 69(2-3):201-209.

Ministry of Agriculture and Food Security (MAFS). (2008). *Food Security Report*. Maseru: MAFS.

Mohajan, H.K. (2017). Two criteria for good measurements in research: Validity and reliability. *Annals of Spiru Haret University* 17(4):56-82.

Moore, D.F. (2016). *Applied Survival Analysis Using R*. Switzerland: Springer International Publishing.

Neff, R.A., Spiker, M.L. & Truant, P.L. (2015). Wasted food: U.S. consumers' reported awareness, attitudes and behaviors. *PLoS ONE* 10:e0127881. [Online]. Available: https://www.ncbi.nlm.nih.gov/pubmed/26062025 [2019, March 12].

Oelofse, S.H.H. & Nahman, A. (2013). Estimating the magnitude of food waste generated in South Africa. *Waste Management and Research* 31(1):80-86.

Pandey, K. (2015). *Introduction to Research Methodology*. [Online]. Available: http://www.krishanpandey.com/rpapersd/research_methodology.pdf [2019, May 26].

Pärn, A. (2016). Designing a Solution for Food Waste Reduction. M.Sc dissertation. Aalborg University.

Phil, A., Li, F., Augis, F., Patama, M., Mouhdi, O., Delabruyère, R. & Parviainen, T. (2015). The food wastage phenomena: An overview of the current situation in three countries: France, Finland and Taiwan. *Taiwanese Journal of Asian Economics* 6(2):6457-6477.

Pietersen, J. & Maree, K. (2016). "Standardisation of a Questionnaire." In *First Steps in Research*. Maree, K. (ed). Pretoria: Van Schaik. 235-247.

Qi, D. & Roe, B.E. (2016). Household food waste: Multivariate regression and principal components analyses of awareness and attitudes among U.S. consumers. *PLoS ONE* 11(7):e0159250. [Online]. Available: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0159250 [2019, March 15].

Radzymińska, M., Jakubowska, D. & Staniwska, K. (2016). Consumer attitude and behaviour towards food waste. *Journal of Agribusiness and Rural Development* 1(39):175-181.

Ramukhwatho, F.R., Du Plessis, R. & Oelofse, S. (2016). "Household Food Wastage by Income Level: A Case Study of Five Areas in the City of Tshwane Metropolitan Municipality, Gauteng Province, South Africa." In *Proceedings of the 23rd WasteCon Conference*, 17-21 October 2016, Emperors Palace, Johannesburg, South Africa.

Russel, S.V., Younga, C.W., Unsworth, K.L. & Robinsona, C. (2017). Bringing habits and emotions into food waste behaviour. *Resources, Conservation & Recycling* 125:107-114.

Schanes, K., Dobernig, K. & Gözet, B. (2018). Food waste matters: A systematic review of household food waste practices and their policy implications. *Journal of Cleaner Production* 182:978-991.

Schneider, F. (2008). *Wasting Food – An Insistent Behaviour*. [Online]. Available: https://www.researchgate.net/publication/237566848 [2019, April 15].

Segrè, A., Falasconi, L., Politano, A. & Vittuari, M. (2014). *Save Food: Global Initiative on Food Loss and Waste Reduction. Background Paper on the Economics of Food Loss and Waste*. Rome: FAO.

Shafiee-Jood, M. & Cai, X. (2016). Reducing food loss and waste to enhance food security and environmental sustainability. *Environmental Science and Technology* 50:8432-8443.

Silvennoinen, K., Katajajuun, J.M., Hartikainen, H. & Heikkla, L. (2014). Food waste volume and composition in Finnish households. *British Food Journal* 116(6):1058-1068.

Thompson, E.R. & Prendergast, G.P. (2015). The influence of trait effect and the five-factor personality model on impulse buying. *Personality and Individual Differences* 76(Supplement C):216-221.

United Nations Development Programme (UNDP). (2015). *Lesotho National Human Development Report: Leveraging the Power of Youth to Promote Human Development*. [Online]. Available: http://hdr.undp.org/sites/default/files/final_lesotho_high_res_single_pages.pdf [2019, June, 24].

United Nations Development Programme (UNDP). (2019). *Sustainable Development Goals.* [Online]. Available: https://www.undp.org/content/undp/en/home/sustainable-development-goals.html [2019, December 19].

Van Dooren, C. & Mensink, F. (2014). "Consumer Food Waste" [Fact Sheet]. In *Causes & Determinants of Consumers Food Waste*. Van Geffen, L.E.J., Van Herpen, E. & Van Trijp, J.C.M. (eds.). (2016). REFRESH Deliverable 1.1. [Online]. Available: https://eu-refresh.org/causes-determinants-consumers-food-waste [2019, April 15].

Van Geffen, L.E.J., Van Herpen, E. & Van Trijp, J.C.M. (eds.). (2016). *Causes & Determinants of Consumers Food Waste*. REFRESH Deliverable 1.1. [Online]. Available: https://eu-refresh.org/causes-determinants-consumers-food-waste [2019, April 15].

Ventour, L. (2008). *Food Waste Report: The Food We Waste*. Banbury: WRAP.

Wassermann, G. & Schneider, F. (2005). "Edibles in Household Waste." In *Proceedings of the Tenth International Waste Management and Landfill Symposium*, Pula, Sardinia, Italy. Cossu, R. & Stegmann R. (eds). 913-914.

Waste and Resources Action Programme (WRAP). (2011). *Investigation into the Possible Impact of Promotions on Food Waste*. [Online]. Available: http://www.wrap.org.uk/content/investigation-possibleimpact-promotions-food-waste [2019, March 15].

Waste and Resources Action Programme (WRAP). (2013). *Consumer Attitudes to Food Waste and Food Packaging*. [Online]. Available: http://www.wrap.org.uk/sites/files/wrap/Slides%20-%20Consumer%20attitudes%20to%20food%20waste%20and%20food%20packaging.pdf [2019, January 27].

Wessa, P. (2019). *Free Statistics Software, Office for Research Development and Education, version 1.2.1*. [Online]. Available: https://www.wessa.net/ [2019, January 28].

World Food Programme (WFP). (2017). *Report of 2017 Country Programme: Lesotho (2013-2017): Standard Project Report*. Maseru: WFP.

Žitnik, M. & Vidic, T. (2016). *Food Among Waste*. [Online]. Available: http://www.stat.si/StatWeb/en/publications [2019, November 29].

APPENDIX A: ETHICAL CLEARANCE

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA

UFS UV

GENERAL/HUMAN RESEARCH ETHICS COMMITTEE (GHREC)

27-Mar-2019

Dear Ms Chenene, Mateboho ML

Application Approved

Research Project Title:
Behaviour, attitudes and perception of consumers towards household food waste in urban and rural Lesotho

Ethical Clearance number:
UFS-HSD2018/1444/2603

We are pleased to inform you that your application for ethical clearance has been approved. Your ethical clearance is valid for twelve (12) months from the date of issue. We request that any changes that may take place during the course of your study/research project be submitted to the ethics office to ensure ethical transparency. furthermore, you are requested to submit the final report of your study/research project to the ethics office. Should you require more time to complete this research, please apply for an extension. Thank you for submitting your proposal for ethical clearance; we wish you the best of luck and success with your research.

Yours sincerely

Dr. Petrus Nel
Chairperson: General/Human Research Ethics Committee

206 Nelson Mandela Drive/Ryalon
Park West/Parkweg
Bloemfontein 9301
South Africa/Suid-Afrika

P.O. Box/Posbus 339
Bloemfontein 9300
South Africa/Suid-Afrika
T+27(0)51 401 9700
F+27(0)51 401 9703
www.ufs.ac.za

APPENDIX B: QUESTIONNAIRE

Household food waste in urban and rural areas Lesotho: Maseru, Botha Bothe, and Mokhotlong

PLEASE NOTE: All questionnaires will be kept confidential.

1 BASIC INFORMATION/ TLHAHISOLESEDING EA MOTHEO

1.1 Gender of the respondent / **Tekano ea ho hlompholla**

Male / **Motho ea motona**	
Female / **Motho ea motshehali**	

1.2 How old are you? / **Lilemo?**

< 19	
20 - 29	
30 - 39	
40 - 49	
50 - 59	
60 - 69	
>70	

1.3 What is your highest level of education? / **Boemo ba hoa bo phahameng ka ho fetisisa ba thuto ke bofe?**

Did not attend school / **Ha aa ka a ea sekolong**	
Completed primary school / O **qetile sekolong sa primary e nnyane**	
Partially completed high school / **O qetile karolo e-itseng ea sekolo se phahameng?**	
Completed high school / **O qetile sekolong se phahameng**	
University degree / **Lengolo la Yunivesithi le qalang**	
Postgraduate degree / **Lengolo la Yunivesithi le phahameng**	

1.4 How is your family structured? / **Lelapa la hau le hlophisitsoe joang?**

One-person household / **Ntlo ea motho a le mong**	
Two adults without children / **Batho ba babeli ba baholo ba se na bana**	
Two adults with children / **Batho ba babeli ba baholo ba nang le bana**	
One adult with children / **Motho e moholo ea nang le bana**	
Other combination / **Ho kopana tse ling**	

1.5 Including you, how many people live in the household? / **Ho kopanyelletsa le uena, ke batho ba bakae ba lulang lapeng?**

1	
2	
3	
4	
6 – 8	
9 - 10	
>10	

1.6 Who prepares and cooks dinner? / **Ea itokisetsang le ea phehang lijo tsa mantsiboea?**

Mother / Mme	
Father / Ntate	
Other family members / Litho tse ling tsa lelapa	
Paid helper / Mothusi ea lefshoang	
Voluntary helper / **Mothusi ea ithaopelang**	
Every one cooks their own / **E mong le e mong o pheha lijo tsa hae**	
Othe r/ **Tse ling**	

If other, please specify: / **Haeba e le tse ling, ka kopo hlalosa:**

1.7 What is your marital status? / **Sebaka sa hau sa lenyalo ke eng?**

Single / **Ke masoha**	
Married / **Lenyalong**	
Living together / **Ho phela hammoho**	
Divorced / **Ho hlalane**	
Widowed / **Mohlolohali**	

1.8 What is your monthly income of the household? / **Ke chelete efe ea hau ea khoeli le khoeli ea ntlo?**

< R4 000	
R4 000 - R7 499	
R7 500 - R10 999	
R11 000 - R14 999	
R15 000 - R19 999	
R20 000 - R25 999	
R26 000 +	

1.9 Do you have a vegetable garden? / **Na u na le serapa sa meroho?**

Yes / **Ee**	
No / **Che**	

2 REQUIREMENTS / MEKOA EA HO REKA

2.1 How often do you buy fruits, vegetables and other food products for consumption in the home? / **Ke hangata hakae u rekang litholoana, meroho le lihlahisoa tse ling tsa lijo bakeng sa ho sebelisoa ka tlung?**

Every day / **Letsatsi le letsatsi**	
Every other day / **Letsatsi le leng le le leng la bobeli**	
Once a week / **Hang ka beke**	
Twice a week / **Habeli ka beke**	

2.2 Where do you regularly shop for food? / **U lula u reka lijo kae?**

Supermarket / **Supamakete**	
Local convenience store / **Lebenkele la lijo tsa sebakeng seo**	
Farmers market / **Lihoai tsa lihoai**	
Other / **Tse ling**	

If other, please specify: / **Haeba e le tse ling, ka kopo hlalosa:**

3 GUIDE / POLOKELO

3.1 Where do you store fruits and vegetables in the home? / **U boloka litholoana le meroho ho kae moo ka tlung?**

Fridge / **Friji**	
In a fruit bowl / **Ke sekotlolo sa litholoana**	
In a cupboard / **Ka lebokoseng**	
Outdoor storage / **Polokelo ea ka ntle**	
Other / **Tse ling**	

If other, please specify: / **Haeba e le tse ling, ka kopo hlalosa:**

Rank the following food items according to their priority in regard to refrigerator storage. / **Beha lintlha tse latelang tsa lijo ho latela lintho tsa bona tse tlang pele ka ho boloka sehatsetsing.**

	Not important/ **Ha se bohlokoa**	Somewhat important/ **Ho bohlokoa haholo**	Very important/ **E bohlokoa haholo**
3.2 Meat / **Nama**			
3.3 Milk / **Lebese**			
3.4 Cheese / **Chisi**			
3.5 Margarine / **Margarine**			
3.6 Leftovers / **Tse setseng**			
3.7 Fruit and vegetables / **Litholoana le meroho**			
3.8 Bread / **Bobobe**			

3.9 Are you aware that the majority of fruits and vegetables should be kept in a cool place in order to extend shelf life? / **Na u hlokomela hore boholo ba litholoana le meroho li lokela ho bolokoa sebakeng se phodileng e le hore se atolose sethala sa bophelo?**

Yes / **Ee**	
No / **Che**	

4 FOOD WASTE / HO SENYA

4.1 Which fruits are consumed most in your home? More than 1 can be selected. / **Ke life litholoana tse jeoang kaho fetisisa ka tlung ea hau? Ho feta 1 ho ka khethoa.**

Apples / **Liapole**	
Bananas / **Libanana**	
Grapes / **Morara**	
Oranges / **Li-oranges**	
Seasonal fruits (peaches, apricot, plums) / **Litholoana tsa selemo (ka mohlala diperekisi; aperekisi; plums)**	
Other / **Tse ling**	

4.2 If other, please specify: / **Haeba e le tse ling, ka kopo hlalosa:**

4.3 Which vegetables are consumed most in your home? More than one can be selected. / **Ke efe meroho e jeoang haholo ka tlung ea hau? Ho feta 1 ho ka khethoa.**

Cabbage / **Khabeche**	
Spinach / **Khabeche**	
Swiss chard / **Swiss chard**	
Radish / **Radish**	
Potatoes / **Litapole**	
Carrots / **Lihoete**	
Beetroot / **Beetroot**	
Other / **Tse ling**	

4.4 If other, please specify: / **Haeba e le tse ling, ka kopo hlalosa:**

How often do you throw away the following fruit? / **Ke ka makhetlo a makae u lahlehang litholoana tse latelang?**

	Never/ **Ha ho mohla**	Sometimes/ **Ka linako tse ling**	Often/ **Hangata**
4.5 Apples / **Liapole**			
4.6 Bananas / **Libanana**			
4.7 Grapes / **Morara**			
4.8 Oranges / **Li-oranges**			
4.9 Seasonal fruits (peaches, apricot, plums) / **Litholoana tsa selemo (ka mohlala diperekisi; aperekisi; plums)**			

How often do you throw away the following vegetables? / **Ke ka makhetlo a makae u lahlehang meroho e latelang?**

	Never/ **Ha ho mohla**	Sometimes/ **Ka linako tse ling**	Often/ **Hangata**
4.10 Cabbage / **Khabeche**			
4.11 Spinach / **Sepinichi**			
4.12 Swiss chard / **Swiss chard**			
4.13 Radish / **Radish**			
4.14 Potatoes / **Litapole**			
4.15 Carrots / **Lihoete**			
4.16 Beetroot / **Beetroot**			

4.17 Which other food products are also wasted in your home (More than one can be selected)? / **Ke lihlahisoa life tse ling tsa lijo tse senyehang ka tlung ea hau? Ho feta 1 ho ka khethoa.**

Butter and cheese / **Botoro le chisi**	
Milk / **Lebese**	
Condiments (spreads, jams, relishes, sauces) / **Li-condiments (Ea ata, jams, e tsosolosa, li-sauces)**	
Fresh meat, fish and eggs / **nama e ncha, tlapi le mahe**	
Yogurt / **Yogurt**	
Staples (rice, pasta, noodles, pap) / **Ho folotseha (raese, pasta, li-noodle, pap)**	
Bread / **Bohobe**	
Leftovers (take-always) / **Tse setseng (ho nka li-aways)**	
Other / **Tse ling**	

4.18 If other, please specify: / **Haeba e le tse ling, ka kopo hlalosa:**

4.19 To what extent are you aware of the negative consequences of food waste at home? / **U ela hloko liphello tse bohloko tsa litšila tsa lijo lapeng ha kae?**

Fully aware/ **Tseba hantle**	
Somewhat aware/ **Ba tseba hantle**	
Not aware at all/ **Ke sa tsebe letho**	

4.20 What is your most common reason for throwing out food (More than one can be selected)?? / **Lebaka le tloaelehileng ka hofetisisa la ho-qhala lijo? Ho feta 1 ho ka khethoa.**

Left-over food / **Masalla a lijo**	
Bought more than I needed / **Reka ho feta ho hlokahala**	
Mouldy / **Ho mela hlobo**	
Off appearance / texture / **Ho bonahala ponahalo/moaparo**	
Off smell / **Monko o mobe**	
Didn't like it / **Ha aa ka a rata joalo**	
Needed space / **Sebaka se hlokahalang**	
Prepared too much / **Pheha haholo**	

4.21 Where do you think food wastage comes from (more than one answer can be selected)? / **U nahana hore ho senyeha ha lijo tsa hau ~~li~~ ho tsoa kae? Ho feta 1 ho ka khethoa.**

Over-purchasing ingredients / **Ho reka haholo**	
Food spoilage / **Lijo tse senyehang**	
During food preparation and cooking / **Nakon ea ho lukisa lijo le ho pheha**	
Plate waste / **Litsila tse ngata**	

		Yes/ **Ee**	No/ **Che**
4.22	Did you follow the recommended storage information on packaged goods? / **Na u latela tlhahiso-leseling e boletsoeng e khothalletsoang ka thepa e phuthetsoeng?**		
4.23	Do you regularly discard left-over food after preparing a meal? / **Na kamehla u lahla lijo tse setseng ka mor'a hore u phehe?**		
4.24	Do you consider additional meals that can be made out of leftover ingredients at point of purchase? / **Na u nahana ka lijo tse ling tse ka etsoang ka ho setseng nakong ea theko?**		
4.25	Do you avail of 2 for 1 offers on food products when food shopping? / **Naa u e u shebe lijo tse tsoang ka bobeli bakeng sa theko ea e le ngoe ha u reka lijo?**		
4.26	Do you often consume the "free" product before the used by date? / **Na u atisa ho ja sehlahisoa sa "mahala" pele se sehlahisoa seo se felloa ke nako e lekantsoeng ya sona?**		
4.27	Do you feel that you often buy more than needed when food shopping? / **Na u ikutloa u atisa ho reka ho feta kamoo ho hlokahalang ha ho reka lijo?**		

4.28 Thinking about food waste in your household, overall how much food would you say you throw away in general? / **Ho nahana ka litšila tsa lijo malapeng a hau, ka kakaretso u ka re u ka lahleheloa ke lijo tse kae ka kakaretso.**

A lot / **E ngata**	
Some / **Tse ling**	
Very little / **Hanyane haholo**	
None / **Ha ho joalo**	

4.29 Thinking about when you throw food away, to what extent, if at all, does it bother you? / **Ho nahana ka ha u lahlela lijo, ho isa bohōleng bofe, haeba ho joalo, ho u tšoenya?**

A great deal / **E ngata haholo**	
A little / **Hanyane**	
Not very much / **Eseng haholo**	
Not at all / **Ho hang**	

4.30 How much effort do you and others in your household go to in order to minimize the amount of food thrown away? / **Ke boiteko bo bokae boo uena le ba bang ba lelapeng la hau le eang ho bona ho fokotsa lijo tse lahlehileng?**

A great deal / **E ngata haholo**	
A little / **Hanyane**	
Not very much **/ Eseng haholo**	
Not at all / **Ho hang**	

4.31 If you notice that an item of food is coming close to its best before date, do you / **Haeba u hlokomela hore nako e baletoeng ya sehlahisoa e se e le haufi haholo, u etsa eng?**

Use it up as soon as possible / **E sebelise hang ha ho khoneha**	
Freeze it / **E phunyeletse**	
Prepare it and freeze it / **E lokise le ho e qeta**	
Discard it without bother / **E lahle**	

4.32 What category of food do you tend to overbuy and end up throwing out? (You may select more than one) / **Ke mofuta ofe oa lijo tseo u atisang ho li reka haholo 'me u qetella u lahla? (U ka khetha tse fetang tse le 'ngoe)**

Meat / **Nama**	
Fruits and vegetables / **Litholoana le meroho**	
Dairy / **Lebese**	
Convenience foods / **Lijo tse bonolo**	
Take-aways / **Ho nka li-aways**	

4.33 When the food has been prepared and there is too much, what do you do? / **Ha lijo li se li lokiselitsoe mme ho na le tse ngata haholo, u etsa'ng?**

Throw it out / **E lahlele**	
Store in the fridge / **Boloko fereji**	

4.34 If other, please specify: / **Haeba e le tse ling, ka kopo hlalosa:**

Please select Yes/No for the following statements in terms of your own actions. / **Ka kopo khetha E / Che Che lipolelo tse latelang ho latela liketso tsa hau.**

		Yes/ Ee	No/ Che	N/A
4.35	When I buy fresh fruit and vegetables, I try to buy items that are available loose rather than pre-packed, so that I can buy the amount I need. / **Ha ke reka litholoana le meroho e mecha ke leka ho reka lintho tse fumanehang ka bongoe ho e-na le hore ke li reke li phuthetsoe ka bongata pele, e le hore nka reka thepa eo ke e hlokang.**			
4.36	I tend to store fresh fruit, fresh vegetables and salads in manufacturer's wrapping that they come in. / **Ke atisa ho boloka litholoana tse ncha, meroho e mecha le salate ka ho koahela ha lihlahisoa tseo ba li kentseng teng.**			
4.37	When I buy perishable food items, I check the date on the pack first. / **Ha ke reka lihlahisoa tsa lijo tse senyehang, ke sheba letsatsi la pakete ea pele.**			
4.38	I throw away food like bread, cakes and eggs no matter what it looks or smells like if the best before date has expired. / **Ke lahla lijo joaloka bohobe, mahobe le mahe ho sa tsotellehe hore na li shebahala joang kapa li nkha joaloka eka ha e le hantle pele ho letsatsi.**			
4.39	I throw away food like fresh meat no matter what it looks or smells like if the use by date has expired. / **Ke lahla lijo joaloka nama e ncha ho sa tsotellehe hore na e shebahalang kapa e nkha joaloka eka ha letsatsi le sebelisoa.**			
4.40	I worry about reheating leftovers that have been kept in the freezer. / **Ke a tsoenyeha ha ke omosa lijo tse bolokiloeng ka sehatsesing (Freezer).**			
4.41	I worry about reheating leftovers that have been kept in fridge for one or two days. / **Ke tsoenyehile ka ho tsosolosa lichelete tse bolokiloeng firiji ka matsatsi a le mong kapa a mabeli. Ke a tsoenyeha ha ke omosa lijo tse bolokiloeng ka hara friji letsatsi kapa a mabeli.**			
4.42	I prefer to buy frozen vegetables rather than fresh ones. / **Ke khetha ho reka meroho e nang le serame ho e-na le hore ke reke e mecha.**			

		Yes/ Ee	No/ Che	N/A
4.43	When planning meals do you ever think what could be made of leftover food. / **Ha u rera lijo u nahane hore na ho ka etsoa'ng ka lijo tse setseng.**			
4.44	Do you label and date items in your freezer? / **Na o hlahisa lintho le ho etsa lintho tsa letsatsi kahare ea hau?**			
4.45	Are you aware of the stop food waste programme? / **Na u tseba lenaneo la ho emisa ho lahla lijo?**			

4.36 If yes, where did you hear about it? / **Haeba e, u kile ua utloa hokae ka eona?**

Television/radio / **Thelevishene/radio**	
Social media / **Melaetsa ea sechaba**	
Internet / **Internet**	
Word of mouth / **Lentsoe la molomo**	

Thank you for your participation! / Kea le leboha ka karolo ea hau!

APPENDIX C: TURNITIN REPORT

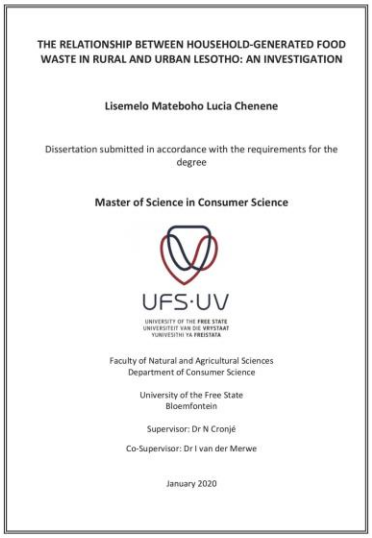
turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	Lisemelo Chenene
Assignment title:	Natasha
Submission title:	Dissertation Final
File name:	L_Chenene_Dissertation_30_Janua…
File size:	1.44M
Page count:	104
Word count:	27,717
Character count:	147,076
Submission date:	09-Apr-2020 01:29PM (UTC+0200)
Submission ID:	1293550085



THE RELATIONSHIP BETWEEN HOUSEHOLD-GENERATED FOOD WASTE IN RURAL AND URBAN LESOTHO: AN INVESTIGATION

Lisemelo Mateboho Lucia Chenene

Dissertation submitted in accordance with the requirements for the degree

Master of Science in Consumer Science

UFS·UV

Faculty of Natural and Agricultural Sciences
Department of Consumer Science

University of the Free State
Bloemfontein

Supervisor: Dr N Cronjé

Co-Supervisor: Dr I van der Merwe

January 2020

APPENDIX D: EDITING CERTIFICATE

GRAMMAR GUARDIANS

29 January 2020

To whom it may concern

Re: Proofreading and academic editing: Ms L.M.L. Ntlopo Chenene

I, J.L. van Aswegen of Grammar Guardians, hereby confirm proofreading and academic editing of the thesis entitled "The Relationship Between Household-Generated Food Waste in Rural and Urban Lesotho: An Investigation" by Ms Lisemelo M.L. Ntlopo Chenene (student number 2015105287) in January 2020.

Please contact me on 082 811 6857 or at jeanne@grammarguardians.co.za regarding any queries that may arise.

Kind regards,

J.L. van Aswegen

Grammar Guardians