

EXPLORING HOUSEHOLD BEHAVIOUR CONTRIBUTING TO FOOD WASTE IN MANGAUNG, FREE STATE

by

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UFS·UV

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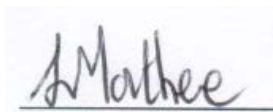
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January 2020

DECLARATION

I declare that the dissertation, **EXPLORING HOUSEHOLD BEHAVIOUR CONTRIBUTING TO FOOD WASTE IN MANGAUNG, FREE STATE**, hereby submitted for the qualification of Masters 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.

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ABSTRACT

Food waste is a challenge related to food security and the sustainability of food supply chains. It is estimated that approximately 1,3 billion tons of food, produced for human consumption, is wasted every year. In South Africa, 27 million tons of food is lost and wasted yearly, amounting to approximately ZAR505 million lost per annum. In a country where 26% of the population experience hunger regularly and 28.3% are at risk of starvation, wasting this much food seems unfortunate. Food loss and waste occur during all stages of the food supply chain, namely: production, processing, transport, retail and consumption. Minimising household food waste could potentially assist in reducing overall food waste and contribute to food security.

Reducing food waste can assist with conserving valuable resources like water and land, reduce environmental risks and avoid financial losses. To reduce food waste, it is essential to be aware of potential drivers and practices, which influence consumers to waste food. Consequently, this study aimed to determine the food purchasing practices, food storing practices, eating habits and discarding practices of consumers and identify possible drivers of household generated food waste. In addition, the researcher set out to determine the food items purchased, consumed and wasted by consumers in their households.

A quantitative, descriptive approach was adopted for the research, conducted through a survey. A structured questionnaire was distributed among 400 Mangaung households, of which a total of 376 questionnaires could be used for analysis. Consumers who completed the questionnaire were selected on the premise that he/she is above 18 years of age and is the person responsible for food purchasing and/or food preparation. Participation was entirely voluntary and none of the participating consumers received incentives.

The results indicate that Mangaung consumers are unsure about the safety of food after its use-by, sell-by or best-before date is reached, and deem it necessary to discard food items that are past this date. Many indicated that they would become sick if this food (expired use-by date) is consumed.

The majority of Mangaung consumers do not discard excess ingredients, leftovers on a plate or food still in a pot/serving dish, as it is kept to be consumed later. Leftover food is not a significant concern among Mangaung consumers and is not considered a major driver towards food waste. Many of the consumers strongly agree that leftovers are still good to eat after it is made. Also, more than half of the consumers mentioned that they do not cook more than necessary. Furthermore, they are aware of correct storage practices that may reduce food waste. Vegetable or fruit peels are also not discarded, although the reasons why they do not discard it is not clear.

A concern is that only 20,4% of Mangaung consumers separate their waste, indicating a probable lack of knowledge concerning alternative and more sustainable disposal methods. Another socially contested challenge that needs to be addressed, is the fact that leftovers are given to domestic animals, although it could still be consumed by a human.

Mangaung consumers mostly use convenience supermarkets to make grocery purchases and visit stores monthly. Time constraints are not the reason, but possibly personal transport. Moreover, few people always use a shopping list when doing grocery shopping. Consequently, food items are purchased before all food that is currently in the kitchen, is used or eaten. Assistance in planning meals is necessary, which will positively affect purchases.

The vegetables, which are mostly consumed and discarded by consumers are tomatoes, potatoes, cabbage and onions. Most purchased fruits are apples and bananas, which are the most consumed and discarded fruit items. Chicken is the most bought and consumed meat product, but not the most discarded. Milk is the most bought, consumed and discarded dairy food item. The comprehensive data obtained, will contribute to a better understanding of consumption patterns, purchasing behaviour and disposal practices of Mangaung consumers, enabling the development of suitable intervention and communication campaigns.

Keywords: food waste, household, food security, Mangaung.

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LIST OF TERMINOLOGY

Attitude:	Described as a resolved way of thinking or feeling about a particular issue (Schiffman & Kanuk, 2019).
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 (Parfitt <i>et al.</i> , 2010).
Consumer behaviour:	The behaviour that consumers display in searching for, purchasing, using, evaluating and disposing of products and services that they expect will satisfy their needs (Schiffman & Kanuk, 2019).
Everyday practices:	Everyday life is performed through habitual, socially shared practices (Hebrok & Heidenström, 2019).
Food loss:	Food loss refers to food that spills, spoils, incurs an abnormal reduction in quality, such as bruising or wilting or otherwise gets lost before it reaches the consumer. It is the unintended result of an agricultural process or technical limitation in storage, infrastructure, packaging or marketing (Lipinski <i>et al.</i> , 2013).
Food security:	Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO 1996).
Food waste:	Food waste refers to food that is of good quality and fit for human consumption, but is not consumed, and instead discarded - either before or after it spoils (Lipinski <i>et al.</i> , 2013).
Greenhouse gasses:	Decomposition of food waste emits the greenhouse gasses, which includes nitrous oxide, methane and carbon dioxide and also leachate that pollutes water resources. These gasses

contribute to global warming and climate change (Ramukhwatho *et al.*, 2014).

Perception: It is the process by which an individual selects, organises, and interprets stimuli into a meaningful and coherent picture of the world (Schiffman & Kanuk, 2019).

Possibly avoidable food waste: Possibly, avoidable waste refers to food that could have been eaten, but which some individuals chose not to eat, because it seemed inedible, although still usable (Parfitt *et al.*, 2010).

Spaza Shops: Spaza shops are retail shops in South Africa that are considered to be small and owner-managed (Chipunza & Phalatsi, 2019).

Unavoidable food waste: Unavoidable or (inedible) waste mainly involves preparation residues. This food cannot be eaten by people, but should be used to feed animals, like compost, or anaerobic digestion (Principato *et al.*, 2015).

Vermicomposting: Vermicomposting is a process that is used to reduce food waste. This process uses earthworms and microorganisms to create a product that is known as vermicompost. This method is eco-friendly and low on costs (Bhat *et al.*, 2019).

LIST OF ABBREVIATIONS

CFS	Committee on Food Security
CH ₄	Methane
CO ₂	Carbon dioxide
DEA	Department of Environmental Affairs
DES	Dietary energy supply
FAO	Food and Agriculture Organisation
FIVIMS	Food information and vulnerability mapping systems
FLW	Food loss and waste
GHG	Greenhouse gas
HLPE	High Level Panel of Experts
kcal	Kilocalorie
Kg	Kilogram
N ₂ O	Nitrous oxide
NFC	Need for cognition
NH ₃	Ammonia
SDG	Sustainable Development Goals
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USD	United States Dollar
WHO	World Health Organisation
WRAP	Waste Research and Action Programme
WWF	World Wide Fund for Nature
ZAR	South African Rand

1.1 General Introduction

Food waste is related to three major global problems. Firstly: food security, secondly greenhouse gas emissions and lastly waste disposal (Oelofse & Nahman, 2013, Cronjé *et al.*, 2018). Food waste has an impact on the resources used in food production and has environmental impacts throughout the food supply chain (Oelofse, 2019). Food loss and waste can occur during all the stages of the food supply chain. During the production stage, it affects farmers' potential to earn a good living. Throughout the rest of the stages (i.e. processing, transport, retail), it influences the price of food products. During the consumption stage, which is the last stage, it affects a household's nutrition and spending. Food that had been harvested for human consumption, but turned to waste, depletes approximately one-quarter of all agricultural water each year and generates roughly 8% of greenhouse gas (GHG) emissions (UNDP, 2019).

The food that turned to waste, represents a third to half of the food produced for human consumption (Marx-Pienaar *et al.*, 2019), while almost one in seven people in the world are estimated to be undernourished (Lipinski *et al.*, 2013, Russel *et al.*, 2017; Oelofse, 2019). Every year this global food loss and waste (FLW) amount to USD940 billion (United States Dollar; ZAR17,3 trillion (South African Rand)). In South Africa, 10,2 million tonnes of food goes to waste every year, equivalent to ZAR61,5 billion (Marx-Pienaar *et al.*, 2019; Oelofse, 2019). Moreover, 90% of the food waste ends up in landfills, placing additional pressure on the environment. Food waste in South African households amounts to approximately ZAR21,7 million annually. In the value chain, 5% of the total food waste occurs at the consumer level, considered household food waste. Preventing household food waste can save money for households and holds economic, social and environmental benefits for the country (Carrie, 2018).

Sustainable Development Goal (SDG) 12 (Target 3) aims to reduce the rate of consumer food waste and loss, including household food waste, by 50% by 2030. Therefore data on how much, where and why food is being lost or wasted is imperative (UNDP, 2019). The United Nation's Food and Agriculture Organisation (FAO) highlights food security

among many South African households as a concern (FAO, 2014). In this light, some scholars agree that the scrutinising of food waste behaviour and reduction of household food waste in South Africa, is of great importance (Cronjé *et al.*, 2018; Marx-Pienaar *et al.*, 2019). However, research regarding food waste, especially household food waste, are limited in this country (Cronjé *et al.*, 2018; Oelofse, 2019; Marx-Pienaar *et al.*, 2019).

In South Africa, 25% of households are at risk of hunger or experiencing hunger, and more than half of the country are food insecure or at risk of food insecurity. Furthermore, food prices are increasing, making food less accessible to the poor (Carrie, 2018). South Africans are facing food security challenges, due to the increasing food prices and rural-urban migration, amongst others. The increasing urbanisation puts pressure on the urban supply chain and creates voids in supply in rural areas (Oxford, 2018).

Consumers in urban areas need to purchase food, as not everyone is equipped to engage in urban farming practices (i.e. vegetable gardens) (Eastham *et al.*, 2017). The high unemployment rate exacerbates this challenge, especially for young consumers. Food security encompasses more than a mere meal on the table; it includes factors like malnutrition, obesity, hunger seasons and low dietary diversity. Furthermore, 35% of women are unable to purchase food for five or more days at once. It is also not uncommon for consumers to skip meals in order to survive (Oxford, 2018).

1.2 Research problem and objectives

1.2.1 Research problem

Food waste is a global concern, yet there is a lack of reported data on food wastage throughout the supply chain, particularly in South Africa (Oelofse, 2019). Reducing food loss and waste can help feed more consumers, save money for farmers, companies and households, create employment opportunities and ease pressure on climate, water and land resources.

Although it is apparent that household food waste is a global challenge (Schanes *et al.*, 2018), limited research is available about South African household food waste (Cronjé *et al.*, 2018). In alignment with SDG 12.3, the South African government aims to reduce food waste by 50% by 2030. Five percent (5%) of all food wasted in South Africa, is of food

waste at the consumption stage, i.e. household food waste. In comparison to all the municipalities in South Africa, Nelson Mandela Metropolitan (33%), Polokwane (31%) and Ethekwini with (31%), are the areas where the most food is wasted. However, it is important to note that of the 284 South African municipalities, only 13 have data available on food waste (Oelofse, 2019).

Based on the records available of food waste studies in South Africa, only data on Kimberley (Cronjé *et al.*, 2018), Ethekwini and Johannesburg (Oelofse *et al.*, 2018) and Rustenburg (Silbernagl, 2001) exist. To the knowledge of the researcher, no food waste data are available for the Mangaung Municipality in the Free State. The only food waste information that could be found was in an article written by Setena (2019), which related to the waste management services in this area. Mangaung is considered a metro, implying that it is an urban area. As mentioned previously, one of the challenges pertaining to food insecurity, is the rural-urban migration, which is also set to increase in the future (Gibson, 2016). Mangaung is situated in the central interior of South Africa. Consumers from rural areas in the Free State migrate to Mangaung, as it is also the provincial capital of the Free State. Furthermore, the population (787 804), consisting of 265 561 (National Government of South Africa, 2019) is sufficient in size for a statistically significant sample. The combination of these factors, renders this area as a suitable site for the exploratory research to be conducted.

Consumers in households tend to discard edible food, serve it to pets, or use it in the garden or compost bin. It is therefore difficult to measure the actual value of food waste. As a result, literature reviews pay attention to why consumers discard food (Schanes *et al.*, 2018), and not necessarily the practices pertaining to contributing to household food waste. More academic studies are focusing on reducing household food waste. These are feasible solutions in the conservation of natural resources and reduction of the environmental impact (Porpino, 2016), yet it is not clear how it translates to South African consumers.

It seems that household food waste is the highest in North America and Oceania, where it is as high as 61%, closely followed by Europe (52%) and industrialised Asia (46%). North Africa, West and Central Asia who waste less food (34%), and Latin America (28%), South and Southeast Asia (13%), Sub-Saharan Africa (5%) even less (UNDP, 2019). South African food wastage cannot be compared with the rest of sub-Saharan Africa, as

South African household food behaviour resembles that of developed countries (Oelofse, 2019). Yet, in a country such as South Africa, although food waste might be low in comparison (5%) to the rest of Africa, but in a country where more than half of the citizens are hungry, food waste reduction must be addressed.

The purpose of this study was thus to determine what food is wasted in Mangaung households and what can be done to reduce food waste and food loss in households. Moreover, household practices were investigated to possibly identify practices that act as drivers of household food waste. The results of this study may be useful to create a more in-depth look at South Africa's food wastage situation and to what extent it can assist with ensuring food security.

1.2.2 Research aim

The study aimed to describe the food purchasing, storing, eating and discarding practices, as well as the types of food mostly purchased, consumed and wasted in Mangaung households. In addition, the researcher aimed to explore and identify possible drivers related to household food waste.

1.2.3 Research objectives

The following objectives of the research were proposed:

1. To identify food purchasing practices by considering consumers' choice of store, frequency of shopping, frequency of using a shopping list, employment and purchasing habits, as well as types of food purchased.
2. To determine the food storage practices by considering the storage of food items and duration before food items are stored.
3. To determine the eating practices by considering the main meal frequency, main meal planning, types of food consumed and type of main meals.
4. To determine the food discarding practices, considering date labelling, sensory aspects, refuse removal methods and types of food discarded.
5. To determine the relationship between food bought, consumed and discarded and the relationship between income and food waste.

1.2.4 Significance of the study

There are limited data available on household food waste in South Africa, as mentioned in section 1.2.1, and no quantitative data on household food waste in Mangaung. This study is further justified by the fact that there are no reported data so far on what food is mostly consumed and wasted, what the consumers' behaviour is concerning household practices, and what Mangaung consumers' discarding practices are.

1.3 Methodology

A quantitative paradigm was utilised to explore purchasing, storing and discarding practices, as well as consumption habits of households in Mangaung, Free State. The design of the study was exploratory and descriptive in nature, with 400 consumers participating in the survey.

Respondents were selected by means of stratified random sampling. A self-administered structured questionnaire was used as the data collection instrument. The questionnaire was designed to gather data specifically related to the objectives of the study (section 1.2.3). The questions were also designed in such a way to be able to identify possible behaviour drivers for household food waste.

Data were analysed descriptively by making use of univariate and bi-variate analysis. Statistical significance between correlations was determined by using the Pearson correlation coefficient.

1.4 Structure

Chapter 1 provides an introduction to global food security and global food waste and food loss' current situation. The chapter concludes with the research problem and objectives of the study that focus on South Africa's household food waste problem, in particular, Mangaung consumers' everyday practices contributing to food waste. Chapter 2 consists of works of literature reviews explaining all concepts related to food security and food waste. Chapter 3 discusses how the research was conducted and what processes were used to do the sampling and data analysis. Chapter 4 is an elaborate discussion and interpretation of the results. Finally, chapter 5 consists of the key findings that have emerged and what it implies in the South African context.

2.1. Introduction

Food waste is a complex and social problem around the world, which is directly related to global food security (Kibler *et al.*, 2018). Food waste has many related challenges, which include environmental impacts, a negative influence on the economy of developed and developing countries (Schanes *et al.*, 2018), social norms, GHG, landfills and the consequent waste of energy and water resources during food production and consumption (FAO, 2013).

Research regarding food waste, especially household food waste in South Africa, is limited (Cronjé *et al.*, 2018; Oelofse, 2019; Marx-Pienaar *et al.*, 2019). In an effort to understand how households waste food, drivers can be identified, possibly assisting in predicting food waste behaviour, which, if tended to could result in food waste reduction (Aschemann-Witzel *et al.*, 2018a; Schanes *et al.*, 2018). Worldwide, multiple studies have been undertaken to address this (Cappellini & Parsons, 2012; Koivupuro *et al.*, 2012; Beretta *et al.*, 2013; Priefer *et al.*, 2013; Abeliotis *et al.*, 2014; Farr-Wharton *et al.*, 2014; Chalak *et al.*, 2015; Jörissen *et al.*, 2015; Qi & Roe, 2016; Chakona & Shackleton, 2017; Ahmed, 2018; Ascheman-Witzel *et al.*, 2018b). More research is necessary concerning household food waste behaviour in a South African context. A better understanding of the factors contributing to and influencing household food waste in South African households, could be of value in an attempt at addressing this challenge.

Cloke (2016) highlights that a food waste does not always form part of research or discussions when considering the drivers of food insecurity. The author goes on to state that a better understanding of how and why food is consumed is necessary and imperative to food security research, and as a consequence, food waste research. The following chapter, thus, firstly looks into what food waste is, how food waste is defined, as well as the food waste in developed and developing countries with its related challenges. The status of South Africa's food waste will also be discussed in depth. Secondly, the concept of food security will be explained, followed by a focused discussion on global food security

and the current status of South Africa's food security. The influences of certain cultural practices on food security will also be discussed – contextualising food waste within the food security scope. In conclusion, a discussion of consumer behaviour in relation to household food waste will follow.

2.2. Food waste

2.2.1 How food waste is defined

Food waste has different terms and is defined in various ways (Parfitt *et al.*, 2010; Schneider, 2013; HLPE, 2014; Martinez *et al.*, 2014). Terms used to describe food waste includes: food wastage, food losses, and food spoilage. Definitions may consist of the place of occurrence, content, destination or use of food waste (Beretta *et al.*, 2013; Garrone *et al.*, 2014; Grandhi & Appaiah Singh, 2015).

Food loss consists of any decrease in quantity or quality of food throughout the food supply chain, whatever the reason may be (Parfitt *et al.*, 2010). Food waste is part of food loss and includes food items, which were made for human consumption, but which was not consumed (Kibler *et al.*, 2018).

According to the Food and Agriculture Organisation (FAO) (2014), food loss and food waste are not clearly defined. There is a clear indication that food loss occurs early in the supply chain, whereas food waste takes place during a later stage when the consumer is involved. Food loss includes mismanagement in the food supply chain or the disposing of consumable items (Bond *et al.*, 2013). However, food waste occurs when food is spoiled due to temperature mismanagement during storage, spoilage when harvesting or consumers discarding edible food (Jörissen *et al.*, 2015). Once discarded, food loss and food waste are used interchangeably as it cannot be separated after that point (Kibler *et al.*, 2018).

Food waste studies vary in the approach it takes, which is partly related to the different definitions used. Some researchers may include or exclude edible fractions in food waste or may research alternative disposal routes like the sink or dumping (Quested & Johnson, 2009; Reynolds *et al.*, 2014; Jörissen *et al.*, 2015). Some consider all as waste, which was intended for human consumption, but did not end up being consumed by humans or

find it waste only when food is discarded and not being valorised in some way (Rutten, 2013).

There are a few studies that also differentiate between avoidable, possibly avoidable, and unavoidable food waste (Parfitt *et al.*, 2010; Monier *et al.*, 2011; Beretta *et al.*, 2013; Principato *et al.*, 2015). Avoidable 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 (Beretta *et al.*, 2013). There are many reasons for this occurrence, of which the possible reasons are discussed later in this chapter. Understanding the cause of this waste is of primary importance, in order to avoid food waste (Principato *et al.*, 2015).

Possibly avoidable waste refers to food that could have been eaten, but which some individuals chose not to eat, because it seemed inedible, although still usable (Monier *et al.*, 2011). Examples of the latter include fruit skins and beet tops, which could be cooked similarly to collard greens or spinach, as an alternative to being discarded (Beretta *et al.*, 2013).

Unavoidable or (inedible) waste mainly involves preparation residues (FAO, 2014). This food cannot be eaten by people, but should be used to feed animals, as compost, or anaerobic digestion. These items include teabags, bones and fruit and vegetable peels and pips (Parfitt *et al.*, 2010).

In this research, the distinction made between food loss and food waste is adopted as Parfitt *et al.* (2010) separate the two terms. Food loss occurs during the production phase, and from there all discarded food is considered food waste. Furthermore, the focus will be on avoidable food waste in consumers’ households.

2.2.2 Global food waste

Approximately one in seven people in the world are estimated to be undernourished (Lipinski *et al.*, 2013, Russel *et al.*, 2017), while almost two billion people are overweight or obese. The inefficient use and wasting of the earth’s natural resources, while the world population is growing exponentially and levels of chronic diseases are increasing (Leaf, 2017), addressing food waste, becomes important (Marx-Pienaar *et al.*, 2019).

It is an essential factor to globally reduce food waste, as it can aid in establishing food security worldwide. It will also free up resources, reduce environmental risks and avoid

financial losses (Jörissen *et al.*, 2015). A third of all food production is wasted every year. The wasted food is enough to lift one-eighth of the global population out of hunger and relieve worldwide pressure on increasing food production (FAO, 2011).

Food production needs to be increased by a projected 50% by 2050 to meet the need of the growing world population (FAO, 2009). If the ongoing production and consumer behaviour continue, food production needs to be increased by 70% to yield enough food for 9 billion people in 2050. In developing countries, this will require 120 million hectares of cultivated land (WWF *et al.*, 2017).

Cereal is the most wasted food commodity with regards to the calorie content (35%), and meat a comparatively small share of 7% (Lipinski *et al.*, 2013). Other food groups like milk, yoghurt and cheese are globally wasted every year at 17,7%, lentils, green peas, chickpeas and seeds that make oils 22.1% and tuna, salmon, shrimp and other seafood 34,7% (Garflied, 2016).

2.2.3 Food Waste in developing and developed countries

Food waste differs in developed and developing countries. Depending on the financial gain, industrialisation and the development of the country, the percentage can vary (Chalak *et al.*, 2015). In developed countries, 56% of food is lost and wasted, while 44% of food loss occurs in developing countries (Lipinski *et al.*, 2013). There is a significant difference between the per capita food waste values for developed and developing countries. For regions in developed countries, food loss/waste is 257kg/year, and in developing countries, food loss/waste is 157kg/year (Wansink, 2018).

The proportion of food wasted by consumers on a per capita basis is higher in developed countries than in developing countries. Europe and North America is 95-115kg/annum, compared to sub-Saharan Africa and South/Southeast Asia, which waste about 6-11kg/annum (Nahman *et al.*, 2012). Netherlands waste 113kg/annum, and France and Sweden waste 100kg/annum. There is an increase in food waste campaigns as more countries are taking action against household food waste (Porpino, 2016).

In most developing countries, income of the population is low, and the food products are unreachable for a large number of people. In developing countries, more food is lost at the post-harvest and physical process levels (Chipunza & Phalatsi, 2019). Poor value chain practices, such as inadequate storage facilities, processing, and transport, as well

as technological, financial and workforce restrictions all contribute to the reasons for food loss at the post-harvest and physical process (Shafiee-Jood & Cai, 2016).

In developed countries where the income is medium to high, food waste is caused mainly by consumer behaviour and the lack of coordination between different actors in the food supply chain (Oelofse & Nahman, 2013). In developed countries, most consumers are unaware of, or less interested in, food waste. An example would be European consumers that waste 53% of the food that they purchase (Wansink, 2018). In 2017 Australia had the highest food waste of 361kg per annum, and on the other end of the spectrum, there were China and Greece with only 44kg per annum (StatsSA, 2017). In the UK, consumers discard a third of the food that they purchase, and much of this discarded food is still fit for consumption. The Netherlands waste about 8% in households, and the USA wasted about 25% of the food that they bought (Nahman *et al.*, 2012).

In Saudi Arabia, 250kg of food is wasted compared to the global average of 15kg. In this country, 30% of the food that is produced is wasted in total, which is approximately 8,3 million tons of food every year (Ashmed, 2018). In Finland, 20% of food is wasted just in the process of preparation and handling. On average, in Finland each consumer wastes roughly 550kg of food per year. This food waste includes prepared, as well as fresh foods. In Switzerland, they have estimated that storage, preparation, serving losses and plate waste all accumulate to nearly 18% of all food bought (Kibler *et al.*, 2018).

In Norway, over 620kg of food per person goes to waste, even though most of the food is imported. Norway has only 3% of land to cultivate food. In Canada, each person wastes an average of 640kg of food, which contributes to 17,5 million tons of waste by the whole nation (Stensgård & Hanssen, 2016). Household kitchens are the leading contributor to this wastage percentage. Another country, Denmark, has only 2% cultivated food and each person wastes an average of 660kg food (Jegade, 2019).

2.2.4 The status of South Africa's food waste

South Africa is a middle-income country with a population of approximately 55 million people. South Africa is divided into nine provinces with adequate resources, financial and service sectors and a modern infrastructure. Almost two thirds (62%) of the population are living in urban areas (Schönfeldt *et al.*, 2018).

South Africa imports 6.4 million tonnes of food per year, and 21 million tonnes of food is produced locally. According to Oelofse and Nahman (2013), 10,2 million tonnes per annum of local food production is lost, including imports, but excluding exports. From the 27 million tonnes of food loss and waste, most losses occur during agricultural production, and 0,5 million tonnes of food is wasted during the consumption stage (Oelofse, 2019; Oelofse & Nahman, 2013).

Approximately ZAR505 million per annum is lost every year in South Africa as a direct result of food waste (Marx-Pienaar *et al.*, 2019; Nahman *et al.*, 2012). According to the Department of Environmental Affairs (DEA, 2011), municipalities have to take responsibility and think of ways to separate organic waste to be used for composting or biogas digesters. South African municipalities claim they have data about consumer food waste and the requiring of safe disposal certificates, although no data are reported (StatsSA, 2008).

In South Africa, only two municipalities, of the 112-municipalities reported food waste figures. Only a few waste characterisation studies have been undertaken in South Africa (Oelofse & Nahman, 2013). A study was conducted in Johannesburg and the Western Cape (Sibernagl, 2011) and in 2011, research was also done in the Limpopo area (Ogola *et al.*, 2011).

According to a study known as the waste characterisation study, conducted in Johannesburg, it was found that food waste varies depending on the household income. A conclusion was made that food waste from low-income households in urban areas comprises a higher proportion of food waste by weight of 12-26,2% in comparison with high-income levels with only 7-7,6% of weight (Oelofse & Nahman, 2013).

According to Martins (2007), low-income households tend to spend more on food as this is a higher basic need for them compared to high-income households. Low-income families tend to throw away less, as there is a limit on their budget for non-food items (Oelofse & Nahman, 2013). This can differ from other areas; for instance in a study conducted in Limpopo in rural areas, it was reported that higher food waste proportions could be anticipated in high-income households compared with low-income households (Ogola *et al.*, 2011).

Unprepared or uncooked food forms part of the food that is wasted, because of incorrect storage in households or food that is bought on impulse (related to hoarding behaviour) when food products are sold at low prices. In contradiction to Oelofse and Nahman (2013) and Ogola *et al.* (2011), households that experience challenges to acquire sufficient food (i.e. low-income), tend to waste less than those who have ample access to food (Van Garde & Woodburn, 1994; Schanes *et al.*, 2018; Wansink, 2018).

Another study conducted in South Africa revealed that 27% of household food that was precooked was wasted, 15% of food that was unprepared was wasted, and 8% beverages were wasted (Chakona & Shackleton, 2017). In South Africa, fruits and vegetables are the most wasted commodity group with cereals second at the consumption stage. As there is not much-captured data on food waste in South Africa, it is challenging to estimate household waste patterns. Analyses in South Africa's landfills are complicated to conduct as the food waste and overall waste stream are mixed (Nahman *et al.*, 2012).

Food waste is disposed of on compost heaps or fed to farm or domestic animals. Food waste can be mixed with garden waste, which can be challenging to separate food waste data from garden waste (Nahman & De Lange, 2013). Rural consumers harvest their food on demand rather than store their food after being bought from the local markets (Taghipour *et al.*, 2016).

In Sub-Saharan Africa, 23% of the total food available is lost or wasted in contrast with 42% in North America, 25% in industrialised Asia, 22% in Europe, north, west and central Africa waste 19%, Latin America waste 15%, South and South East Asia waste 17%. In Sub-Saharan Africa, 5% of fruits and vegetables are discarded at the consumption stage (Oelofse, 2014).

2.2.5 Food waste and related challenges

Economic impact on food waste

The economic impacts on food waste include the cost of food waste, inefficiency in the supply chain, ascending pressure on prices and reduced profits. Food waste cost 500kg of carbon dioxide (CO²) and 250km² of water per year per person globally (Van Dooren & Mensink, 2014). Furthermore, food waste accumulates to US\$1600 per year for a family living in the United States and US\$1000 per year for a household living in the United Kingdom. In China, US\$32 billion of food is discarded (Lipinski *et al.*, 2013).

Social impact on food waste

The social impacts on food waste include reduced labour productivity, as well as lower wages and difficulties in access to food (HLPE, 2014). According to a study done by Van Dooren and Mensink (2014) in the Netherlands, 67% of consumers feel that discarding food is not acceptable. Moreover, 41% of the consumers in the Netherlands indicated that there are a lot of hungry people in the world and therefore, they do not want to waste food. Other arguments include that it is more economical to use all food (61%) and it is better not to waste food as it is harmful to the environment (31%). It can also save resources that are good for the economy (17%) (FAO, 2014; Van Dooren & Mensink, 2014).

Environmental impact on food waste

There was an increase in food production over the past four decades. This increase in food production was at a great expense to the environment. Agricultural practices have not been sustainable and are recognised as one of the major causes of environmental degradation (Shafiee-Jood & Cai, 2016). Cultivated land in the developed world could decrease by 50 million hectares, due to deterioration in the form of corrosion, logging and unsustainable use. Also, changing climate, water scarcity and global warming are causing a decrease in cultivated land (WWF, 2017). Food waste contributes to the ill-use of 28% cultivated land worldwide (Van Dooren & Mensink, 2014). One of the significant environmental damages is the release of GHG (Richter, 2017).

The consumer considers the issues of food waste as a social challenge and less of an environmental challenge (Richter, 2017). Large amounts of produced food are wasted along the food supply chain, as well as by consumers (WWF, 2017). Producing food requires large amounts of energy and other resources and by wasting it, leads to an unnecessary environmental impact (Williams *et al.*, 2012).

The impact of Greenhouse gases (GHG) on food waste

GHG are necessary for maintaining life on earth. Without it, the soil, thus lands, would be permanently frozen. Climate change is occurring because of the continually incoming heat and the surface of the planet that would reflect it to the atmosphere (WWF, 2017).

Increasing the greenhouse effect means that the temperature of the earth would rise. It is said that by 2030 the heat of the surface will increase with 1-2°C (Moss, 2002).

According to the FAO (2014), there are 3,49 billion tons of carbon dioxide (CO²) released by food waste, along the food supply chain. The energy that was needed for processing, transport, packaging and preparation, especially during the later stages of the food supply chain, is lost. It is, therefore, considered to have a significant impact on the environment (Van Dooren & Mensink, 2014).

Approximately 25-70% of the total percentage of municipal solid waste is food waste. Food waste, as already mentioned, releases CO₂ and methane (CH₄). Methane is released in high concentrations of about 40-70% and has a significant influence on the atmosphere's warming potential (WWF, 2017). Other gaseous elements, such as nitrous oxide (N₂O) and ammonia (NH₃), and liquid emissions such as leachate, also have a significant impact on the environment (Hartmann & Ahring, 2006). In South Africa, 4,3% are considered as GHG emissions, which are caused by discarding organic and food waste (DEA, 2011).

Waste of food could also be used as biologically active compounds, namely antioxidants (Schneider, 2013). Antioxidants can help the body to fight against oxidative stress. Fruit and vegetable waste have valuable bioactive compounds like antioxidants, dietary fibres, proteins, natural colourants and aroma compounds and this can be extracted, purified and valorised for the development of nutraceutical products (Socaci *et al.*, 2017). Antioxidant compounds recovered from food waste are high in demand as the sources are cheap, inexhaustible and ample (Moure *et al.*, 2001).

The facts mentioned above are not considered as an ultimate solution as it has negative aspects (Muriana, 2016). When food waste from landfills is mixed together, it turns soggy, stringy and becomes a large heap, and heats up, consequently making storing and transport of organic food waste challenging (Pahla *et al.*, 2017).

The use of landfills as an organic waste management method

In South Africa, landfilling is considered the most practical and most affordable waste management method. This method is adding to existing challenges of the scarcity of available land in nearby neighbourhoods, as well as the landfill gasses, which are a by-product of the decomposition of organic materials (Hartmann & Ahring, 2006). In the

United States, 14,5% of the total municipal solid waste is food loss and waste. These landfills consist of 54% to 97% of food waste. In the United States, there are alternative technologies used to dispose of food waste. However, it is a small fraction, as only 3% of food is recovered through composting, and 2,1% of food waste is processed by anaerobic digestion (Kibler *et al.*, 2018).

Recovery and recycling are not always possible, as it is difficult in separating food waste from the waste stream (Shafiee-Jood & Cai, 2016). Furthermore, a shortage of capacity for alternative treatments' infrastructure is a common problem (Kibler *et al.*, 2018). To remove food waste from landfills has to be both economically and environmentally sustainable to be beneficial for the water and energy sectors when using alternative technologies (WWF, 2017).

Energy is needed to remove food waste from and to the landfills. Transport is also required for leachate, as leachate needs to be transported to treatment facilities (Kibler *et al.*, 2018). In addition, the water quality for surface or groundwater needs to be returned to the environmental standards (Shafiee-Jood & Cai, 2016).

Produced methane can be collected, stored and used, which provides benefits to the energy sector. Other portions of food waste include lignin, and all lignocellulosic material is defiant under anaerobic conditions (Muriana, 2017). All fractions of food waste require pre-treatment. Besides, landfilling is not the best mechanism to utilise food waste for the production of biogas (Kibler *et al.*, 2018).

The use of composting as an organic waste management method

Composting is the degradation of organic wastes where the materials are regenerated to carbon dioxide, ammonia-nitrogen or complex refractory materials, which are referred to as wet substances (Averda, 2019). Composting requires water, oxygen, carbon, and nitrogen, microorganisms, which may be a factor in this process. The process is dependent on energy use, as mechanical agitation is necessary to produce compost. Benefits of composting are that it produces less GHG emissions, less leachate and less impact on ground water (Sibernagl, 2011). In the United States, only 10% of all composting facilities are food waste composting sites (Kibler *et al.*, 2018).

Bokashi composting is a composting technique that can be done in the comfort of the home. Bokashi is a Japanese technique created by Teruo Higa, a professor at the

University of the Ryukyus in Okinawa. Bokashi is fermented compost, which is created by layering food waste or organic waste, calcium and microorganisms. The material is covered and left for 8-10 weeks. The Bokashi technique is not as labour intensive as compost mixtures, as it does not require to be turned (Groeneveld *et al.*, 2018).

Vermicomposting is a process that is used to reduce food waste. This process uses earthworms and microorganisms to create a product that is known as vermicompost, which could be reintroduced to the soil for enhanced nutrient value. The method is eco-friendly and low on costs (Bhat & Pal Vig, 2019).

The use of energy and water in organic waste management

Some resources are needed to provide food. These resources include water and energy. However, there is not enough research concerning the energy and water that is used in managing food waste after it has been discarded. Resolving the food waste problem requires technology-based solutions with direct public involvement and dynamic structures to commute consumer disposal behaviours. Enforcing these solutions requires attention at all three levels (Shafiee-Jood & Cai, 2016; Kibler *et al.*, 2018). At first, the individual level, which needs to focus on the practice of consumers in response to self-motivated waste prevention actions. Second, at local level, government mechanisms are required to reduce the food waste generated by households, commercial and institutional actors (WWF, 2017; Kibler *et al.*, 2018). Thirdly, at a large scale level, where investments in large scale secure technological advancements applications, which can transform waste to alternative forms of energy and materials (Gustavsson *et al.*, 2011). There will always be food waste, but there are opportunities to reduce waste, as well as to alter food waste into useful forms of energy (Shafiee-Jood & Cai, 2016; WWF, 2017; Kibler *et al.*, 2018).

In the study done by Kibler *et al.* (2018), a Food-Energy-Water nexus conceptual model was developed. In this model, they explain how food waste influences the food-energy-water nexus. At first, it needs to start with altered human behaviour and decision-making when purchasing, eating and disposing of food. In addition, joint altered decision-making at social level regarding methods of food production, food loss and waste management (Gustavsson *et al.*, 2011; Kibler *et al.*, 2018).

The production of food, whether consumed or wasted, requires energy, water, fertilisers, pesticides, land and labour (Lampert *et al.*, 2016). Water and power are directly consumed in the production of food. This can be when water is withdrawn for irrigation or when power is used to transport the irrigation water, process and shipping of food, or to manufacture fertilisers and pesticides (Kibler *et al.*, 2018). Indirectly the water is contaminated by agricultural flow or used in energy production (Ribaudó *et al.*, 2011).

The management of food waste requires resources within the energy and water sectors. Energy is needed as the food waste, as well as contaminated effluent needs to be collected, transported and treated (Ribaudó *et al.*, 2011). The result of reduced food waste is the availability of food without the need for increased agricultural production and decreased food waste contamination (Lampert *et al.*, 2016; Kibler *et al.*, 2018).

The amount of water used in the United States in agricultural production is estimated to be 2400m³. The energy resources used in the United States for the production of food range between 8 and 16% of the annual energy consumption (Hoekstra & Mekonnen, 2010). The water footprints of vegetable and grain products range from 0,06-0,9m³ per kg, and for conventionally raised beef, it was estimated to be up to 10m³ (Kibler *et al.*, 2018).

Kibler *et al.* (2018), also stated that calories produced per cubic meter of water, range from 1000 to 7000 for corn, 500 to 200, and 60 to 210 for beef. In the United States, 2% of the energy consumed is dedicated to the production of wasted food. Worldwide, 27m³ water per person is used annually in the production of food that is never consumed, compared to 162m³ water per capita that is used to produce food (Molden, 2007; Kibler *et al.*, 2018).

Governments are an essential factor when it comes to the food, energy and water system. Governments can implement policies and programmes concerning the allocation of resources and also on land use (WWF, 2017). These can have a direct impact on the sustainability and efficient use of water and energy resources. Urban agricultural strategies such as green roofs, farmers' markets, small scale farming, and food composting are examples of policies that can be implemented and can lead to the reduction of food waste (Molden, 2007)).

Such policies may encourage consumers to purchase and consume locally produced food (Schönfeldt *et al.*, 2018). It may have additional benefits like the improvement of urban biodiversity and economic benefits, such as the decrease in food transport and other costs (WWF, 2017). People must be made aware of the connection between water, energy and food. Local governments should develop and implement a policy for the food industry if they do not already follow an approved plan to reduce food waste (WWF, 2017; Kibler *et al.*, 2018).

2.2.6 Food waste in the food value chain

In households, food is mostly wasted after extravagant cooking, preparation or serving. The excess food is not consumed soon enough or stored incorrectly. Food is also wasted because of consumers who are highly sensitive to hygiene, oversized packages or expired best-before dates (WRAP, 2006; Koivupuro *et al.*, 2012; Williams *et al.*, 2012). Moreover, food also gets wasted due to unusual household practices, which are connected with everyday use (Evans, 2012).

Wansink (2018) blames marketing for food waste. According to him, advertising, sales promotions and smart merchandising are the reasons for people to purchase more food than what they need. Oversized packaging leads consumers to prepare more food than required with the wrong illustrations of serving sizes on the packages, which again leads to people to eat more than what is needed (Evans, 2012; Wansink, 2018).

Two-thirds of consumers are aware they waste food, and it is the highest among women and the elderly (WRAP, 2007). According to a study done in the Netherlands, 90% of the consumers intended to reduce food wastage, and one in every five consumers (mostly young people) would like more information or advice on food storage (Janssen *et al.*, 2010). The involvement in recycling, composting, and sorting waste, helps in reducing food waste, and these consumers are more willing to help reduce food waste (WRAP, 2008).

2.3. Food Security

Food security attends to the approach that all people have enough food to eat, not just for today, but every day (Gibson, 2016). Food security has many definitions, in this

research, however, the definition of the Food and Agriculture Organization (FAO) is used: “Food security is a situation that exists when all people at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO 1996; Gibson, 2016).

To many, the logical answer might be to give the excess produced food, or food which is lost due to it being suboptimal quality for retailers, away to those in need. When emergencies occur, this may be a solution, but in non-emergency situations, it may not be practical in the long term (Lipinski *et al.*, 2013). By giving food freely it creates some economic issues that could affect local market conditions and prices (Gibson, 2016). There are also specific policy considerations, especially considering the empowerment model, which many countries, including South Africa, tend to use. It is believed that consumers might be demotivated to fend for themselves if they are to receive food for free (Gibson, 2016; UNDP, 2019).

Most of the food security development agenda is directed at developing nations, yet food insecurity is also a challenge for many developed countries (WWF, 2017), as malnourishment, due to poor diet choices, is also considered food insecurity (Gibson, 2016). To ensure that everyone has adequate food every day is a global challenge, as it encompasses many aspects of consumers’ daily life (Lipinski *et al.*, 2013; Gibson, 2016; WWF, 2017).

Although food scarcity is a big concern and reality for many countries around the world, one-third of the total food production is discarded as food loss and waste (FLW) (Marx-Pienaar *et al.*, 2019). It is vital to reduce FLW as it has a positive effect on both food security and environmental sustainability. It is therefore vital to this study that food security is understood, and the effect of food waste on food security is explained (WWF, 2017; UNDP, 2019).

2.3.1 Food Security Indicators

There is no one way to measure food security; the only way food security situations are determined is to measure variables closely correlated with the concept (Gibson, 2016). Numerous indicators, reflecting different dimensions of food security, are necessary to ascertain the status of an individual, household or country (FAO, 2009). The Committee on Food Security (CFS) and Food information and vulnerability mapping systems

(FIVIMS) recommend specific indicators (Gibson, 2016; Alonso *et al.*, 2018), related to the four pillars of food security.

The first is the availability of food, which is correlated to the amount of food available to the individual or the nation. The primary measure that is generally used as an indicator of availability is the average dietary energy supply (DES). DES is referred to in kilocalories (kcal) per person per day and reflects the amount of food available for each person during the reference period (Riely *et al.*, 1999; Maunder, 2006; Gibson, 2016). If the food loss increases and the agricultural producers lack the necessary capacity to produce more, the result will be decreased (Alonso *et al.*, 2018).

Secondly, it is access to food and consists of both physical and economic access (Maunder, 2006). Physical access is growing food or the locations from markets from which consumers can purchase food (Alonso *et al.*, 2018). This includes the ability of a person to travel or non-financial limitations to acquire food. Economic access refers to the ability to pay for food or trade goods in the marketplace (Riely *et al.*, 1999; Gibson, 2016). If food waste persists, knock-on effects on markets will be felt, increasing food prices, thus becoming less accessible to the poor (FAO, 2013).

In food security, the concept 'utilisation' refers to adequate and proper biological utilisation of food (i.e. digestion in humans) (FAO, 2014). It can also imply the optimum use of food, including sustainable practices of disposal. Inherently, appropriate diets contain essential nutrients, but also include non-food inputs, such as clean water and decent sanitation (Gibson, 2016; Alonso *et al.*, 2018). If food is lost or wasted, it directly violates the optimum utilisation thereof, and as a consequence, the inefficient use of valuable non-renewable resources such as water (Cloke, 2016).

Lastly, stability is considered. Stability includes several variables that can be monitored and is often used as risk indicators (Maunder 2006). The food production index reflects the ups and downs of each growing season and the food price index reflects the demands and supply of markets. Other measures are the number of natural disasters affecting a country (Cloke, 2016). Natural disasters like drought and flood affect food security, as do human-made disasters like war and conflict (Alonso *et al.*, 2018). Stability is a vital component for any food supply chain, which is related to food prices. Increased food prices for the world's poorest, continue to be a challenge. Increased food loss and waste

could be a potential threat to the stability of food production in developing nations (Gibson, 2016).

2.3.2 Global Food Security

Globally, food security remains a challenge as one in nine people in the world is food insecure (Cloke, 2016). Approximately 868 million people are undernourished, and roughly two billion people are suffering from the negative health consequences of micronutrient deficiencies (Shafiee-Jood & Cai, 2016). Despite efforts to reduce malnutrition and the number of hungry people in the world, numbers are still increasing. Recent estimates indicate that malnutrition in the world hovers at 10,8% and 11%, which is 794 and 815 million people (FOA, 2019).

Moreover, according to the World Bank (FAO, 2009), 83 million people in 45 countries are starving. In developed countries, the undernourished represent 5% of the population, and in developing countries, it can be as high as 13% (WWF, 2017). In African countries, the undernourished is 20% of the population, and Asian countries 13% (Prosekov & Ivanova, 2018). The food security status of countries in Africa, Southeast Asia and West Asia is becoming progressively worse (Lipinski *et al.*, 2013; Alonso *et al.*, 2018).

Hunger and malnutrition are caused by a variety of factors, including natural disasters, armed conflicts, population growth and poverty (Gibson, 2016). Countries with active conflicts have a decline in food supply, but in countries with no conflict, there is a decrease in food security, because of the global financial crisis (WWF, 2017). In addition, by 2050 the world's population is expected to be between 8,3 and 10,9 billion people, which will require an increase in food supply of 50% to 75% (Prosekov & Ivanova, 2018).

As much as undernourished people are a challenge, so is reducing the number of obese people. Therefore it is crucial to provide a country with enough food, as well as a framework that includes a healthy diet (Lipinski *et al.*, 2013). This will aid the health of the nation and the security of the country. It is important to note that one country cannot ensure its own food security, both the US and EU are needed to ensure global security (Prosekov & Ivanova, 2018).

2.3.3 The current status of South Africa's food security

South Africa is considered a food secure nation and has enough food for every citizen (WWF, 2017). Nevertheless, in reality, one in four people (13 million) suffer from starvation on an everyday basis. People also live in unstable circumstances that cause them to be at risk of going hungry. Furthermore, most consumers in this country do not have enough money to purchase food (StatsSA, 2019).

The poor generally receive the lowest wages and can only purchase food once a week after they have received their wages, and spend approximately 50% of their income on food (StatsSA, 2019). In the same, 23% of households run out of money to purchase food and 21% have to skip meals to stretch the use of food for longer (Oxfam, 2012).

South Africa has an unemployment level of 27,2%, and only an estimated 25% of households grow their own food. The price of maize, a staple food for low-income families, has increased by 50% since 2010. This exacerbates the situation even further (StatsSA, 2019). Currently, 26% of the population in South Africa regularly experience starvation, while another 28% are at risk to experience hunger (Oxford, 2018). Food security affects the formal and informal settlements in both the rural and urban areas. Urban informal settlements are the largest group that experience starvation with 32%, and in informal rural regions, 37% (Oxfam, 2012).

In Africa, South Africa is the 4th largest wheat producer. Local demand exceeds production, which provides growth opportunities for domestic production or imports. South Africa also has the most advanced and refined food and beverage market on the African continent (StatsSA, 2019). In 2017, beverages, spirits, vinegar, sugar and the residue food industry were the most significant contributors to South Africa's exports with a value of R36,6 billion (Thusini, 2018).

Over 80% of South Africa's land is for grazing and livestock, which is a big investment opportunity for the country. Stock farming contributes 48% towards the country's output values at approximately R50 billion (Thusini, 2018). The largest subsector of agriculture processing is manufacturing, with 64%-75% of the raw material locally produced (StatsSA, 2019).

2.3.4 Demographic background of the Free State

The Free State is one of the provinces in the centre of South Africa. There is approximately a total number of 946 639 households, where 58,3% are male-headed, and 41,7% are female-headed. There are three types of housing in the Free State which are formal, traditional and informal. Informal housing is described as areas that are not formally planned, but are nevertheless occupied illegally by people. Formal housing can then be described as housing that has followed legal rules and regulations. Traditional housing is houses that are made from materials that are found in nature. A total of 83,6% are living in formal housing, informal housing (14,0%) and traditional housing is a total of 1,6%. The average household size in the Free State is 3,0 persons per household (StatsSA, 2018).

Whether the house is female or male-headed it significantly influences the household's food security status, as do the type of housing. The type of housing has an effect on how the household has access to food either through purchase, trade, barter, growing food themselves or donations from family (Gibson, 2016). In certain households, women do not have an equal share of the food, and in some instances, children are only fed after the male in the household has eaten enough (Maxwell & Frankenberger, 1992; Gibson, 2016).

In the Free State, 37,8% of households have access to piped water inside their dwelling with 52,7% of households having access to piped water in their yard. A total of 5,7% of households have access to water from an access point outside the yard, and 84,5% of households have access to safe drinking water. A total of 69,7% of households have their waste material removed once a week, whereas 17,5% of households had to dump their waste (StatsSA, 2018).

Access to piped water influences the food security status of a household. Water, sanitation, education, health services and care practices of the households are all non-food issues that have an effect on the food security status of the household (Maxwell & Frankenberger, 1992; Gibson, 2016).

2.3.5 Demographic background of Mangaung

Mangaung is a Metropolitan Municipality, which is located in the Free State province. Mangaung has a population of 747 431 of which 83,3% are black African, 11,0% are

white, and 5,0% are coloured. Considering of people 20 years and older, 4,7% have completed primary education, 33,2% have some secondary schooling, and 30,3% have completed matric, and of which 14,2% have some other form of higher education. A total of 4,3% have had no formal schooling (StatsSA, 2018).

In Mangaung there are 231 931 households, and there is an average of 3,1 persons per household. A total of 86,1% of households have access to piped water in their dwelling or the yard. Homes that do not have access to piped water amounts to 2,1%. Of all homes, 91,4% have access to electricity or lighting. Many of the homes (78,9%) have their waste removed by the local authority/private company at least once a week. A total of 40,7% of the population are economically active, with an unemployment rate of 27,2% in the metro. Of the households, 20,2% are receiving a household income of R19 604 - R38 200 with 2,8% receiving a very of income of R1 - R4 800 and 9,5% receiving no income (StatsSA, 2018).

2.3.4 Food security, cultures and diversity

Food is associated with human culture. Understanding the magnitude of culture and its influence on food security is a crucial part of moving towards sustainable, healthier diets (Cloke, 2016). Culture is a significant consideration in food security. It is known that well-intentioned food security interventions fail when cultural behaviour is not taken into account (Alonso *et al.*, 2018).

Definition of culture

Culture can be defined as the core concepts of values, beliefs and norms. Values, beliefs and norms can be socially transferred within and across generations, including how the world works and what is good and evil, wrong or right or valuable or invaluable (Gershman, 2016). Culture is a constantly changing concept and is shaped and reshaped by social, political, economic and ecological environments. Cultures are seen as a mix of different culture models that may unite or have a conflict with each other (Alonso *et al.*, 2018).

Influences of cultural practices on food security

Culture influences each of food security's different pillars (availability, access, utilisation and stability), and it will also influence food security measurements (Gershman, 2016).

Food distribution practices are culturally determined, and food habits may affect the amounts consumed, for instance, certain food items are consumed regularly in quantities compared to irregularly consumed foods (Alonso *et al.*, 2018). Dietary diversity reflects culturally determined differences in food habits and not differences in food security statuses. Self-reported perceptions and behavioural responses to food insecurity are affected by cultural factors. Cultures decide what food is, which in turn influences what is produced locally and what diets consist of (Gibson, 2016).

Agricultural technology is linked to culture as culture influences producers in new food technologies and innovations in food production (Lipinski *et al.*, 2013). Ensuring the availability of sufficient and nutritious food depends to a great extent, on post-harvest losses and a waste of food (Eastham *et al.*, 2017). Cultures dictate how food is processed and stored, consequently driving waste behaviour (Gibson, 2016; Alonso *et al.*, 2018).

The food and nutrient intake depend on the household's and individual's ability to obtain food (WWF, 2017). Economic access to food is mostly determined by income, and there is no apparent impact of culture on household and individual food access through its effects on revenue (FAO, 2014). Culture shapes social access and also affects how households distribute food, the values, beliefs and norms about different types of foods and how household members serve and share their meals (Mahajan *et al.*, 2008; Gershman, 2016; Alonso *et al.*, 2018).

A specific example would be in lower-income households where male members tend to get more food than female members (Fieldhouse, 1995; Scott *et al.*, 2014)). Weddings and funerals dictate what food is offered to the guest as these are culture-based social gatherings. Culture shapes eating patterns and dictates what a proper meal is and where and when it should be eaten (Gershman, 2016). Unfamiliar cultural practices can limit food security in creating difficulties with the new environment and preparing unfamiliar foods. Food taboos can negatively affect access to food and food choices (Gibson, 2016; Alonso *et al.*, 2018).

Culture influences how we prepare food and the way these foods are processed. Food combinations include traditional food preparation, which plays a crucial role in everyday food preparation (Cardoso *et al.*, 2005). Culture predicts processing, storage of food and longer shelf life of food, which negatively affects the seasonality of food and contributes to the stability of food consumption (Hotz & Gibson, 2007; Alonso *et al.*, 2018).

In cultures, there are certain genders, family structures and decision-making power situations (Helman, 2007). What preferences, beliefs, norms and practices one is expected to display or observe is determined directly by gender. Gender may also influence who is in charge of food purchases in households (WHO, 2012). The family structure includes relations and responsibilities of family members. Everyday family life plays a role in the development of eating habits/practices and can affect food security (Alonso *et al.*, 2018). Decision-making power is a significant factor in culture and food security as this influences who decides when and what food to purchase or produce, and how it is distributed within the household (Scott *et al.*, 2014; Alonso *et al.*, 2018).

2.4 Consumer behaviour concerning food waste

Concerning household food waste, consumer values, practices and attitudes may be the reasons for the high amount of food that is discarded (Bond *et al.*, 2013). As mentioned throughout the literature, too much food waste is generated by consumers, and most of the social science research regarding food waste is centred on the behaviours related to consumer-generated waste (Kibler *et al.*, 2018). Following is a discussion on consumer behaviour, attitude, perceptions and emotions. A good understanding of these intrinsic components could shed light on the drivers of household food waste (Principato *et al.*, 2015; Schanes *et al.*, 2018) as discussed in section 2.5.

Apart from the discussion regarding behaviour towards food waste, attitude, perception and emotions are also included. Some scholars propose that perception and emotions related to food waste, influence food waste behaviour (Khan & Mohsin, 2017; Russel *et al.*, 2017; Sirieixa *et al.*, 2017). Although the purposes of this research specifically focuses on behaviour, it is important to include a discussion on attitude, perception and emotions to better understand consumers' behaviour towards household food waste.

2.4.1 Behaviour

Consumer behaviour was only studied from the late 1960s as it had little history and lacked research of its own. Earlier consumer behaviour theories were based on economic theories that consumers only bought goods and services that satisfy their needs (Richter, 2017). Only later on, it was discovered that consumers purchase impulsively. Impulsive purchases are influenced by family and friends, advertisements, role models, moods,

situations and emotions (Russel *et al.*, 2017). All these concepts created a framework that includes both cognitive and emotional aspects of consumer behaviour (Schiffman & Kanuk, 2019).

Consumer behaviour is defined as the behaviour consumers display when they search for, purchase, use, evaluate and dispose of products (i.e. food products) that will satisfy their needs (Schiffman & Kanuk, 2019). Consumer behaviour includes how individuals, families and households make decisions to spend their time, money and effort on food products (Schanes *et al.*, 2018). Consumers are unique in their way, but in the end, they are all consumers, and regularly, need to consume food (Russel *et al.*, 2017). Consumers play an essential role in the economy and the purchase decisions they might make, affect the demand for necessary raw materials, for production and also affect the employment of workers and the use of resources (Richter, 2017).

Marketers need to know as much as they can about consumers to succeed in the evolving marketplace (Wansink, 2018). Of particular importance is an understanding of personal and group influences that affect consumers' decisions, as well as media choices, as they need to know how and where to reach consumers. Marketers use digital technology to customise their products, services and promotional messages (Schiffman & Kanuk, 2019). By using these technologies, marketers are collecting and analysing complex data on consumers' purchasing patterns, personal characteristics and specify consumer needs (Russel *et al.*, 2017). The consumers also use these technologies in the comfort of their homes to acquire adequate information to make informed decisions (Richter, 2017; Wansink, 2018).

Personalities influence consumption behaviour and, as such, marketers need to know of these differences. Being aware of the consumption behaviour of consumers enables them to understand consumers better and to divide and target consumers who are likely to respond positively towards a specific product (Schiffman & Kanuk, 2019). Cognitive personality factors influence various aspects of consumer behaviours. The need for cognition (NFC) measures a person's craving for or enjoyment of thinking. An example of this personality characteristic is consumers with a high NFC are more likely to notice the information when looking at an advert, as for consumers with a low NFC will only notice the background information of the advert (Gbadamosi, 2017). Another personality characteristic is that individual consumers are more likely to prefer written words as a way

of securing information as other consumers prefer visuals images or messages as a source of information (Schiffman & Kanuk, 2019; Wansink, 2018).

Consumers have various consumption and possession traits, of which consumer materialism is one. There is a relationship between indebtedness and materialism among low-income consumers, implying that low-income South African consumers are highly materialistic (Gbadamosi, 2017). Another form of consumer behaviour is fixated computation behaviour. This type of behaviour is displayed by consumers who flaunt their objects of purchase to others who have a similar interest (Darnton *et al.*, 2011). Compulsive consumption is behaviour shown by consumers who have an addiction and are in some way out of control, and their actions are damaging to them and those around them (Schiffman & Kanuk, 2019).

2.4.2 Attitude

Attitudes are explained in a consumer behaviour context as a learned preference to behave in a consistently agreeable or adverse way towards a given object (Schanes *et al.*, 2018). Attitudes are evaluated by asking questions or making assumptions from observed behaviour (Russel *et al.*, 2017). An example would be when questioning a consumer who frequently purchases a product and even recommends it to friends and family. This illustrates that the consumer has a positive attitude towards the brand of product (Schiffman & Kanuk, 2019). Attitudes are relevant to purchase practices. Attitudes are also formed when direct involvement with the product are experienced, lingual information, broadcasting advertising, internet, social media and other forms of marketing (Wansink, 2018).

2.4.3 Perception

Perception is defined as a process from which an individual prefers, coordinates and clarifies stimuli into a meaningful and coherent picture of the world. Two persons may be exposed to the same stimuli, but each may select, organise and interpret the stimuli differently, because each person's values, needs and expectations differ. The sensation is the direct response of the sensory organs that creates stimuli (Gbadamosi, 2017). Stimulation from the stimuli occurs while looking at products, packages, brand names, advertisements and commercials (Berman, 2005). When actions like purchases and evaluation of consumer products are done, the sensory functions (sight, hearing, taste,

smell) come into play. Retail environments make use of certain smells, which impacts the fragrance in the store and enhances the shopping experience (Gbadamosi, 2017). This practice makes the time while examining merchandise, waiting in line and waiting for help seem shorter than it is for consumers. The South African homeware retailers often display open diffusers, which fills the stores with pleasant smells (Schiffman & Kanuk, 2019).

Retail stores have a specific brand or corporate image that influence the decisions of consumers as to where to shop (WRAP, 2008). The image includes the merchandise they carry, the brands they sell, product prices, level of service and the store's physical environment (Wansink, 2018). Grocery retail stores do not want to reduce the number of products they have, because of concern that perceptions of a smaller range will reduce the likelihood that consumers will shop in their stores (Berman, 2005). Price discounts also affect a retail store's image. Stores that frequently offer small discounts on a large number of products are labelled as discount stores rather than prestigious stores (Schiffman & Kanuk, 2019). It is important to note that poorly chosen price discounts cause confusion and negatively impact consumers' perception of stores (Wansink, 2018).

2.4.4 Emotions

Emotions are defined as a reaction to an object or an event, which includes both a feeling and cognitive component. Emotions play an essential role in driving food waste behaviours (Sirieixa *et al.*, 2017). Food waste behaviours occur because of other waste prevention actions or pro-environmental objectives (Graham-Rowe *et al.*, 2014). Food waste behaviour is thus habitual and part of a consumer's emotional behaviour. Emotion is not a driver for food waste, but might be only related to food waste (Sirieixa *et al.*, 2017). Consumers are only expressing a sense of guilt about wasting food, and it is also part of moral attitudes when consumers engage in wasteful behaviour (Russel *et al.*, 2017).

Negative emotions are expressed when discarding food. Consequently, wasteful consumption is connected to guilt (Graham-Rowe *et al.*, 2014). A few studies indicated that consumers have a terrible conscience concerning wasting food (Hamilton *et al.*, 2005; Baker *et al.*, 2009; Graham-Rowe *et al.*, 2014). According to experts, preventing food waste can cause positive attitudes (Lipinski *et al.*, 2013; Abeliotis *et al.*, 2014; Jörissen *et al.*, 2015). Many consumers exhibit optimal behaviour when using shopping

lists, planning meals, using the correct storage while purchasing, preparing and consuming food (Aschemann-Witzel *et al.*, 2018a).

Another issue emanating through developed and developing countries alike, is obesity (FAO, 2014). Encouraging individuals to overeat themselves to reduce food waste is not an acceptable method of waste management (Wansink, 2018). There are more sound solutions such as to prepare smaller portions and to encourage people to consume the rest of the food at a later stage (Abeliotis *et al.*, 2014). Individuals can also freeze their leftovers. The overconsumption of food is linked to emotion and thus should be considered in food waste intervention and prevention (Wansink, 2018).

2.5 Drivers influencing household food waste generation

Consumers are unaware in some instances, of the impact related to food waste and also how much food is wasted in households (Kibler *et al.*, 2018). Consumers also differ in their attitude toward food waste. Guilty food wasters are consumers who feel guilty about wasting food (Aschemann-Witzel *et al.*, 2018b). Some consumers are not attentive to food waste and its implications, possibly causing higher amounts of food waste. These consumers also purchase food, which they do not always use (Richter, 2017). Several possible drivers from a behavioural point of view will subsequently be discussed below:

2.5.1 Household size and composition

Families are referred to as households and households might include individuals who are not related by blood, marriage or adoption and also includes family friends, roommates, foster children, live-in domestic workers or boarders (Richter, 2017). In South Africa, 13% of all households are couples without children (StatsSA, 2018). Couples have a high spending power as there are often two incomes, and after paying for all necessities, there is a disposable income left to spend (Schiffman & Kanuk, 2019; Schanes *et al.*, 2018).

The nuclear household includes a husband, wife and one or more children. Single-parent households and female-headed households have become more prevalent in recent years. Some households are headed by a relative other than a parent, who can be a

grandparent, aunt or one of the children (Schiffman & Kanuk, 2019). In South Africa, it is more common for children to be the head of the household, which is the case with approximately 100 000 households. An estimated 3.7 million orphans live in South Africa - half of them have lost their parents to Aids-related diseases (StatsSA, 2012). Fifty percent (50%) of households have no father figure, and only 35% of children live with both their biological parents (StatsSA, 2018).

An extended household is a nuclear household with one grandparent living within the household. In the past, African families were extended households with a male figure as the head of the family. This changed because of cultural differences in the value of looking after elders (Schiffman & Kanuk, 2019). The new emerging black middle class, as it has been coined, is more likely to adopt the western nuclear family structure (Mattes, 2015). Another reason is that younger generations move to the cities to seek employment. This creates a different type of an extended household as the grandparents are left to look after the children and the mother works in the city (Mattes, 2015; Gbadamosi, 2017).

The composition of the household significantly affects the amount of food wasted. Food waste behaviour is more prominent in family households with children than in homes with older and single persons (WRAP, 2006). Children can be picky eaters, and might not always consume what is prepared, which is discarded in most instances (Van Geffen *et al.*, 2016). In addition, larger households waste less than smaller households, most probably because they are more disciplined (Segrè *et al.*, 2014). It is important to note that many of these studies were carried out in western society, and from the discussion above, it can be seen that South African households substantially differ from western households.

2.5.2 Income

Different South African population groups reflect different spending patterns and these spending patterns contribute to particular consumer behaviour of South African families (Mattes, 2015). The average annual income of female-headed households is approximately ZAR70 830 per annum, whereas male-headed households are estimated at ZAR151 186 (UNICEF, 2012).

South Africans households spend roughly 32% on housing, water, electricity, gas and other fuels, while 12,8% is spent on food and non-alcoholic beverages. Seventeen

percent (17%) is spent on transport, and 14,7% are spent on miscellaneous goods and services. It seems that the least amount is spent on food (StatsSA, 2012). It is important to note that it is the average of the country and that lower-income households still spend a significant proportion of their income (>50%) on food (FAO, 2014).

Wealthy consumers waste more than poorer households, just as higher-income nations waste more food per capita than lower-income countries. To save money is greater than any other motivating factor for promoting less wasteful food behaviours (Kibler *et al.*, 2018). Considering the household size and income, the portion of food waste differs between specific households (Hamilton *et al.*, 2005; Cox & Downing, 2007; Koivupuro *et al.*, 2012). The wealthier the consumer, the lower the value associated with food (Hamilton *et al.*, 2005).

In contradiction, Wansink (2018), found that low-income consumers waste more than their middle-class equivalents. It is suggested that, a possible explanation for this occurrence can be that the person who prepares the food in low-income families may have suffered from hunger or food insecurity as a child. The food preparer might have negative feelings toward seeing an empty plate, even when it has long passed, and may prepare more, so that their family may know there was still more food left if they wanted it (Wansink, 2018).

2.5.3 Gender and Age

It seems that single women tend to waste the highest amount of food (Koivupuro *et al.*, 2012; Richter, 2017). Also, food waste is higher where women are responsible for food purchasing (Hamilton *et al.*, 2005; Cox & Downing, 2007; Baker *et al.*, 2009; Koivupuro *et al.*, 2012).

Younger consumers waste more food than older persons, who waste the least. Older persons tend to waste less food, because they are part of the post-war generation, thus also value food more (Russel *et al.*, 2017). They also have more time to plan and execute their food purchases (Cox & Downing, 2007). Another group that are high food wasters is young professionals and young families (Richter, 2017).

2.5.4 Planning purchases

Most consumers do not plan their shopping, which results in purchasing too much food. Food with a shelf life of less than a week more often turns to food waste (WRAP, 2007).

Purchasing more food, as mentioned previously, is a cause of food waste, and over-provisioning is identified as a significant challenge (Priefer *et al.*, 2016). Consumers often also do not take note of what is already in their pantry and fridge before going to grocery stores or compiling their list (Kibler *et al.*, 2018). Over-purchasing is a direct result of food that is not consumed in time and is driven by poor planning, impulse or bulk purchasing (Bond *et al.*, 2013; WRAP, 2007).

Marketing is also considered a significant factor in food waste, as it can lead consumers to purchase more than needed or that they will never use (Hebrok & Heidenström, 2019). These accusations are based on the four P's of marketing (product, promotion, pricing and place). Placement makes it excessively convenient for a consumer to select a product, which they do not need (Schiffman & Kanuk, 2019). Price of a product can appear like a reduced price when advertised as a multi-pack or as a 'buy one get one free' offer (Wansink, 2018).

It seems that there might be a trend where more branded shelf-stable food is discarded (Jörissen *et al.*, 2015). Marketing strategies such as sale promotions convince consumers to try these branded products out even if they are not sure their family will eat it (Wansink, 2018). Consumers purchase these shelf-stable food products out of sheer optimism, only to discard it later on. Some consumers purchase these products to use in a recipe, which might not be cooked (Hebrok & Heidenström, 2019).

In some instances, food is bought for a specific reason or a special occasion that was postponed or even cancelled (Aschemann-Witzel *et al.*, 2018a). Many consumers also purchase food products, because it was on sale (Hebrok & Heidenström, 2019), they wanted to try a new product, bought it on impulse (Jörissen *et al.*, 2015), or they bought it because of an advertisement (Wansink, 2018). A conclusion can be made that marketing did not make this consumer purchase these products, but rather the consumer's own optimism (Jörissen *et al.*, 2015; Wansink, 2018).

The layout of supermarkets is designed to influence our food choices. An example would be the placement of sweet treats (i.e. chocolates) close to the pay points to promote impulse purchasing (Leaf, 2017). Retail stores can reduce price offers and "purchase one get one free" promotions and focus on providing consumers with value for their money (WWF, 2017). More information should also be relayed to consumers when they purchase

food. Examples would be to give visual representations of quality changes that are still acceptable and different uses of food in different phases (Hebrok & Heindenström, 2019).

2.5.5 Labels

The expiration date labels, use-by labels or best-by dates are used on all products to give consumers an indication of the safety of the product (Graham-Rowe *et al.*, 2014). The further the date is in the future, the more the consumer is optimistic about purchasing the product as it increases the opportunity to prepare and consume the product at home (Grandhi & Appaiah Singh, 2015). Current date labelling systems are confusing to consumers (Hebrok & Heindenström, 2019).

Date labelling contributes to both an increase and reduction in uncertainty about food risk and quality (Hebrok & Heindenström, 2019). These uncertainties can be reduced by changing the packaging and labelling with communication and training in grocery stores, which can assist in food risk and quality (Wansink, 2018). However, it was found that an increase in strategies consumers are comfortable using to determine if food is still good to eat, the more food they will waste (Cox & Downing, 2007). Consumers that may only use their eyes and smell to know if the food is still good to eat, waste less food (Hebrok & Heindenström, 2019).

Emotions and caretaking responsibilities also influence the evaluation of food (Schiffman & Kanuk, 2019). Stores could rely more on information to consumers when they purchase food, such as giving visual representations of quality changes that are still acceptable and different uses of food in different phases (Hebrok & Heindenström, 2019).

The food industry can simplify date labels and ensure consistency across food products (WWF, 2017). The government can also assist by guiding the food industry on what dates should be printed on their packaging. By doing this, consumers would stop guessing what date to use to determine the quality of food and also the safety of food. The food industry can use a code that can be scanned to or read-only by the retailer and not by the consumer. Retailers can provide leaflets, online guidance, and messages on grocery bags that can explain what the specific dates are on food products (Lipinski *et al.*, 2013).

2.5.6 Packaging

The packaging of food products is essential in reducing food waste. It is a challenge to fulfil consumers' expectations when it comes to packaging. If the packaging is too big, it is difficult to empty the packages, yet some request larger packaging for larger households (Cox & Downing, 2007). Packaging can also cause consumers to purchase too much, as well as promotional offers that encourage consumers to purchase more items (i.e. take three and pay for two) (Williams *et al.*, 2012).

The packaging is used as a positioning element. Packaging must carry the image that the brand communicates to consumers (Grandhi & Appaiah Singh, 2015). An example would be of Pick and Pay that has a cleaning range that promotes eco-friendly products (Schiffman & Kanuk, 2019). New technology can be developed to indicate the shelf-life of a product. A Norwegian intervention named 'Keep It' indicates to the consumers how the storage conditions impact the food inside the packaging. It can also show how many days are left of its shelf-life through a timeline. Another innovation is the British technology that makes the label go bumpy when the food inside the package has spoiled (Hebrok & Heidenström, 2019).

2.5.7 Over-provisioning or extravagant cooking, preparation and serving

The current pace of life and work schedules is resulting in food that is kept in the fridge or cupboard for too long, or food which requires time and effort to cook (Williams *et al.*, 2012). Although some consumers might plan meals, plans may change and instead of a nutritionally prepared meal, a 30-minute meal or take-out might be replacing the planned dinner (Schanes *et al.*, 2018). As a result, the food goes uneaten and eventually goes to waste. As a consequence, prepared meals are increasingly replaced by other food, which is easier to prepare and consume (i.e. convenience meals) (Kibler *et al.*, 2018).

By cooking too much food, more leftovers are generated, which could turn to food waste. Many consumers are uncertain how much to prepare per person, and cultural preference is also a factor to consider (Kibler *et al.*, 2018). The challenge is further worsened with more abundant recipes and smaller households. In essence, consumers are cooking too much per person, even if they rely on a recipe (Hebrok & Heidenström, 2019; Wansink,

2018). Thus, more research, education on planning, and managing food purchases are needed on an individual and household level (Williams *et al.*, 2012)

Other reasons for discarded food that was prepared, but not eaten, include burnt food or food that fell on the floor (Cox & Downing, 2007). New recipes that were tried might not taste as good as was hoped or does not suit the preferences of the family. Also, in some instances, individuals might not eat the packed lunch taken to work, due to a change in plans (Nahman *et al.*, 2012). People prepare fresh food, and if the food is not hot or cold anymore, it loses its appeal and gets discarded (Nahman & De Lange, 2013; Wansink, 2018).

Besides, people also over prepare food as they are unaware of how hungry their family is. Of the food served to themselves, roughly 91.7% is eaten (Schanes *et al.*, 2018). Women eat approximately 92%, and men around 90% of the food served. Those who are distracted consume 89% of the food they served themselves (Hebrok & Heidenström, 2019). People who are eating out of smaller plates and bowls eat 96% of their food. Children only eat 59% of the food they serve themselves and are also unsure how much to feed themselves and are also uncertain about what they like and dislike (i.e. too bland or spicy food) (Wansink, 2018). A child learns this by experience, thus some consider this expected behaviour (Schanes *et al.*, 2018).

2.5.8 Leftovers

Consumers have high-quality standards and also a high sensitivity to food safety. High standards of food that is prepared, is a factor resulting in high food waste (Cox & Downing, 2007). Consumers also do not know what to do with leftovers. Most consumers consider leftovers as used food or contaminated food (Williams *et al.*, 2012). Consumers also receive confusing information, as they are urged to avoid food waste, but at the same time to be cautious about bacterial contamination and best-before dates (Kibler *et al.*, 2018). Not all consumers have sufficient knowledge to accurately determine whether food is still edible, and as a result, instead discard the food (WWF, 2017).

Government programmes in the UK and Netherlands have websites to encourage people to use leftovers. However, the time and effort put into these programs outweigh the motivation of most people who tend to over-prepare. Marketing can help people to use

leftovers by instructions, packaging and portioning, and it can do so through the expectations it generates (Wansink, 2018).

2.6 Consumer knowledge and awareness campaigns

Consumers should spend time on understanding date labels; this is especially true for the person that does the grocery shopping in the household (Williams *et al.*, 2012; Schanes *et al.*, 2018). Meal planning should be a daily practice, as well as checking the food inventory at home before going to stores. Consumers should only purchase what is needed and avoid “purchase one get one free” promotions. Daily practices like preparing only what is needed, freezing leftover food, storing fresh products on eye-level and re-using packaging can be adopted and to reduce household food waste (WWF, 2017).

Online grocery shopping is a significant benefit as it can assist consumers in checking their stock and streamlining the use and portioning of food. It is an excellent method to help with over-purchasing, over-portioning and the amount of food left in storage that is still not consumed. The benefit of using online apps and online grocery shopping is that it can be done from the comfort of their homes (Hebrok & Heidenström, 2019). There are a variety of free shopping list apps available, which is a quick and easy method to assist in planning (Farr-Wharton *et al.*, 2014). Among the most used are AnyList, Mealttime, Out of Milk, Bring! Grocery Shopping list and Flipp (Pierre, 2019). Consumers can use these and create lists for basics like milk, coffee, toilet paper and butter, thus regular grocery items. In addition, they can have a separate list for all their dinner dishes and use recipes from the websites or other food blogs (Hebrok & Heidenström, 2019).

The packaging deserves attention and should be redesigned, compatible with the way that the consumer handles the food (Pierre, 2019). Features that should be included would be accurate portioning, divisions, visibility and stackability (Lipinski *et al.*, 2013). Practical suggestions to reduce food waste in households when it comes to storing practices, is to use smaller refrigerators and freezers to minimise the amount of food that can be stored (Williams *et al.*, 2012). Refrigerators and freezers need to be designed differently to reduce food waste. It should include features like improved visibility, ability to track shelf-life and better food handling practices (Hebrok & Heidenström, 2019).

Communication campaigns could influence consumers' behaviour, subsequently creating awareness among consumers about the amount of food they waste (Williams *et al.*, 2012). Retailers can provide information regarding food waste on shopping bags, and information on how to store food and provide a better shelf-life for fruits and vegetables. Information in retail stores on how to reduce food waste can be executed through in-store displays, leaflets and online websites (WRAP, 2007). Cooking demonstrations could also be a useful tool, in combination with recipe sharing and re-using leftovers that can improve households' every functioning (Lipinski *et al.*, 2013).

2.7 Concluding Remarks

Throughout the literature review, the concerns and challenges regarding food waste were highlighted. There are ways to minimise food waste, which includes information campaigns that can be implemented to help reduce and limit over-purchasing and extravagant cooking. Better technologies to help consumers track their inventory better, plan meals, and the re-use of leftover food. People should also use the free shopping list apps that are available to make better purchasing decisions and track their inventory at home. Bright packaging and storage solutions with smaller portion size packages and extended shelf-life could also contribute to food waste reduction.

3.1 Introduction

This chapter provides details of the research design, approach, methods and data analysis adopted for this study. The study aimed to describe the food purchasing, storing, eating and discarding practices, the types of food mostly purchased, consumed and wasted in Mungaung households. In addition, the researcher aimed to explore and identify possible drivers related to household food waste. This chapter also considered potential limitations arising out of the methods and sampling procedures used, and considerations were given to issues of bias and ethics in the context of the research.

3.2 Research Design

The research design is a theoretical structure (Pandey, 2015) or plan to answer the researcher's questions and also includes which individuals will be studied and when, where, and under which circumstances they will be studied. The end goal of a research design is to provide results that are judged to be credible (McMillan & Schumacher, 2010).

A quantitative research paradigm highlights objective measurements with statistical, mathematical or numerical analysis of data collected through questionnaires and surveys. It also includes the manipulating of pre-existing statistical data, using computational techniques. The type of research design focuses on gathering numerical data and generalising it across groups of people or explaining a particular phenomenon (Babbie, 2010). The main reason for quantitative research studies is to locate the relations between an independent variable and a dependent variable within a population (Moore, 2016).

Quantitative research enables the researcher to collect information in a relatively short period of time, especially important of explorative studies. This approach, to a great extent, excludes bias from appearing in most situations, due to the randomised process to collect information (Babbie, 2010). Moreover, the data from quantitative research can

be statistically applied to the greater demographic being studies (McMillan & Schumacher, 2010). As food waste is a sensitive topic to research, anonymity is important, which is possible to achieve with this design (Moore, 2016). The researcher aimed to exclude bias, generalise the results and create anonymity for the participating consumers in order to optimise data pertaining to this research. The quantitative design was thus considered suitable for the purpose of conducting household food waste research in Mangaung.

An exploratory design is often used to conduct research on a specific topic that has not been studied intensively. It is the most appropriate research design for research projects that addresses a subject about which there are high levels of uncertainty and/or ignorance (Pandey, 2015). Exploratory research is flexible, and it explores research questions without necessarily intending to offer solutions. In addition, it is used to determine the precise scope of a challenge, clarifying the concepts and gaining more insight (Moore, 2016).

Descriptive research design studies are associated with relations (Babbie, 2010). The value of a descriptive design is based on the premise that problems can be solved and practices improved through observation, analysis, and description (Koh & Owen, 2000). A common way in which descriptive research is conducted, is by use of a survey utilising questionnaires (Babbie, 2010).

To obtain information from consumers, the use of household surveys can be done by utilising questionnaires (Jörissen *et al.*, 2015; Schanes *et al.*, 2018). By doing oral interviews with a consumer, the response received back can be influenced as people are influenced by the presence, status and actions of the person asking the questions (Jörissen *et al.*, 2015). Regardless of the measuring instrument used (i.e. questionnaire, food diaries, interviews), consumers are influenced by representing them in a positive light or by giving answers, which they view as the acceptable answer (also known as social desirability bias) (Quested *et al.*, 2020). The use of questionnaires is thus widely accepted in food waste research (Parfitt *et al.*, 2010; Williams *et al.*, 2012; Principato *et al.*, 2015; Cronjé *et al.*, 2018; Schanes *et al.*, 2018; Quested *et al.*, 2020).

Consequently, an exploratory descriptive quantitative research design is used in this study, with the intention only to associate between relations and articulate Mangaung consumers' practices contributing to household food waste.

3.3 Population and Sampling

3.3.1 Population

Bloemfontein is the capital city of the province of the Free State, South Africa, and is also known as one of the seven largest cities in South Africa. Approximately 67km and 70km East of Bloemfontein lie the towns of Botshabelo and Thaba Nchu, respectively. The Mangaung Metro Municipality consists of these three locations and has a population of 787 804 and 265 561 households. The ethnic groups consist of Black African (86%), White (11%), Coloured (4%) and Indian or Asian (0,4%) residents. Mangaung is a total of 9 899,1 square kilometres, with 79,6 people per square kilometre (StatsSA, 2018).



Figure 3.1: Map of the Free State – 2011 Demarcation

It is important to note that on 3 August 2016, the Naledi Municipality was absorbed into the Mangaung Metro Municipality. As such the towns of Wepener, Dewetsdorp and Soutpan were included in the new demarcation. However, in this research, the old demarcation was adopted, since Statistics South Africa used the old demarcation during the Community Household Survey of 2016. This enables more accurate data comparisons and representations.

Children and youth mostly constitute the Free State population. In Mangaung, the average annual household income is R29 400, with an average of 3 persons per household. Seventy-four percent (74%) of the consumers live in a house. More households are headed by males (58,3%) than females (41,7%) (StatsSA, 2018).

To the knowledge of the researcher, no food waste data is available for the Mangaung Municipality in the Free State. The only food waste information that could be found was in an article written by Setena (2019), which related to the waste management services in this area. Mangaung is considered a metro, implying that it is an urban area. As mentioned previously, one of the challenges pertaining to food insecurity, is the rural-urban migration, which is also set to increase in the future (Gibson, 2016). Mangaung is situated in the central interior of South Africa. Consumers from rural areas in the Free State migrate to Mangaung, as it is also the provincial capital of the Free State. Furthermore, the population (787 804), consisting of 265 561 (National Government of South Africa, 2019) is sufficient in size for a representative sample. The combination of these factors, renders this area as a suitable site for the exploratory research to be conducted.

3.3.2 Sampling

A probability sampling method is any method that is used on the premise that the participating consumers are randomly selected. The method of sampling is set up in such a way that they have equal probabilities of being chosen (Trochim, 2020). Principato *et al.* (2015) is of the opinion that probability sampling is suitable for household food waste studies.

Stratified random sampling is a probability sampling method used, where the population is divided into smaller sub-groups known as strata. The strata are formed on the population members' shared attributes or characteristics (i.e. income, gender). Stratified

random sampling is also referred to as proportional random sampling or quota random sampling (Hayes & Westfall, 2020). Prescott *et al.* (2019) regards stratified random sampling as an effective method to conduct household food waste research.

The sample was determined by drawing the Census 2011 data, according to the 2016 demarcated wards in Mangaung, including data on the number of households, average household size, average household income, the share of residents over 18 with a post-matric qualification, share of residents aged 18 to 64 employed, the shares of residents speaking Sesotho, Afrikaans, and the share of residents under 15. This data was loaded into SPSS (version 25), and between group-linkage, hierarchical cluster analysis was performed to cluster the wards into similar groups.

Based on the dendrogram output, it was decided to make use of five clusters or wards as this presented relatively internal homogenous, but distinct groups. From the clusters, several wards were selected, and several households within each ward included. The number of households selected was determined by proportionality to the number of households in the cluster, ward and the total in Mangaung. Households were evenly distributed geographically in each ward, using ward maps (Appendix A).

The minimum sample size to be selected was 270 households, based on a 95% level of significance, 80% power, 50% defects (which gives the maximum sample size) and 0.05 margin of error (Wessa, 2018). To compensate for incomplete or non-usable questionnaires, the sample size was determined to be 400. Of the 400 questionnaires administered to households, 376 usable questionnaires could be used for data analysis. Table 3.1 is a representation of the demographic composition of the consumers and households in this sample.

Table 3.1: Demographics of Mangaung households

Home Language (n=345)	Sesotho	49,9%
	Afrikaans	27,5%
	Setswana	17,4%
	IsiXhosa	4,6%
Household size (n=348)	1	6,6%
	2-4	55,5%
	5-6	25,0%
	>7	12,9%
Households combined income (n=357)	No income	0,8%
	R 1 - R 9 600	69,8%

	R9 601-R19 600	7,6%
	R19 601-R38 200	6,4%
	R38 201 +	9,1%
	Do not want to disclose the household's income	6,7%
Level of education (n=342)	No schooling	3,8%
	ABET	0,3%
	Primary school up to grade 7	15,5%
	Secondary schooling up to but excluding matric	25,4%
	Matric/grade 12 or equivalent	26,6%
	Post-school diploma certificate	5,3%
	Bachelor degree/Honours Degree/Advanced diploma	19,9%
	Postgraduate degree (Masters/PhD)	3,2%
Employment status (n=362)	Still in school	0,0%
	Student	1,7%
	Formally employed full-time	28,7%
	Formally employed part-time	3,0%
	Self-employed	7,7%
	Unemployed	33,4%
	Retired	24,3%
	Other	1,1%

It is important to note that there were more income categories in the questionnaire (Appendix B), but some were combined for the representation in Table 3.1.

Certain inclusion criteria for participating households was considered. Inclusion criteria are defined as “the key features of the target population that the researchers will use to answer their research question” (Patino & Ferreira, 2018). Although households were surveyed, individual consumers within the sampled households completed the questionnaires. These consumers could participate, if he/she is above 18 years and responsible for food purchase and/or food preparation in households. The inclusion criteria are defined at the onset of a study to ensure that the data obtained are aligned with the research objectives (Patino & Ferreira, 2018). If the questionnaire is completed by a consumer younger than 18 years of age, consent must be given by a parent or guardian, and in many instances accompany the minor during questionnaire completion (Macenaite & Kosta, 2017). In such an instance, it is considered redundant for both to be present, as only the parent or guardian could complete the questionnaire. An exception would be in cases where the older participating consumer is illiterate or has a physical disability that will make it impossible for them to complete the questionnaire without

assistance. In the household food waste context, obtaining information from a participating consumer who is not responsible for food purchases or food preparation in the household, leads to incorrect data concerning consumption and discarding practices (Principato *et al.*, 2015; Quedsted *et al.*, 2020).

3.4 Data collection instrument

A structured questionnaire is a formal instrument to collect quantitative data from participating consumers (Møller *et al.*, 2014). In this context, it is a structured way of obtaining information regarding Mangaung consumers' household practices concerning food purchases, consumption and discarding, as well as addition of information (i.e. demographic information). Questionnaires have been used in household food waste studies with success, as reported by Principato *et al.* (2015), Cronjé *et al.* (2018), Prescott *et al.* (2019) as well as Quedsted *et al.* (2020).

The questionnaire was developed specifically to answer the objectives of this research, and consisted of four sections (Appendix B). A description of each of the sections in the questionnaire follows Table 3.2, which summarises the sections, subsections with the type of question used.

Table 3.2: Questionnaire composition

Section	Question content	Question type
Section 1	Predominant home language (Mother tongue)	Categorical close ended (nominal)
	Number of people living in household	Categorical close ended (ordinal)
	Combined monthly household income	Categorical close ended (ordinal)
	Source of energy for cooking	Categorical close ended (nominal)
	Household electronics and appliances	Categorical close ended (nominal)
	Level of education	Categorical close ended (nominal)
	Employment status	Categorical close ended (nominal)
	Working hours	Categorical close ended (nominal)
	Shopping hours	Categorical close ended (nominal)
	Literacy	Categorical close ended (nominal)
Section 1 Subsection A Food Purchasing	Frequency of purchases	Categorical close ended (ordinal)
	Place of purchase	Categorical close ended (nominal)
	Frequency of using a shopping list	Categorical close ended (ordinal)
	Last purchase of specific food items	Categorical close ended (ordinal)
Section 1	Storage of food items	Categorical close ended (nominal)

Subsection B Food Storage	Duration of time after purchase before storage	Categorical close ended (ordinal)
Section 1 Subsection C Eating habits/practices	Main meals family consumed in the past week	Open ended question*
	Time of eating main meal	Categorical close ended (nominal)
	Frequency of eating main meal as family	Categorical close ended (nominal)
	Planning of main meal	Categorical close ended (ordinal)
	Consumption of specific food items	Categorical close ended (ordinal)
Section 2 Subsection D Food Discarding	Specific food items discarded	Categorical close ended ordinal)
	Reasons for discarding food	5-point Likert scale**
	Food discarding practices	5-point Likert scale**
	Disposal of discarded food	Categorical close ended (nominal)
	Discarded food habit	5-point Likert scale**
Section 2 Subsection E Strategies for planning and managing leftovers	Strategies for planning and managing leftovers	5-point Likert scale**

*The particular question was documented as a menu or list of dishes for the seven days preceding participation in the survey (Appendix C). The data was captured in an excel sheet in a table format. Similar items were grouped together to compile a preliminary list of main meals consumed, with the frequency indicated (i.e. the number of times it was listed by participating consumers). The summary is presented in Chapter 4, section 4.4.4..

**Researchers often use Likert scales to measure respondents' opinion. A 5-point Likert scale is an ordinal scale where the respondent is presented with a statement, after which his/her level of agreement is indicated. This scale subsequently captures the intensity of the respondent's feeling (Moore, 2016). The Likert scales used in this questionnaire are mostly interval measures.

The first section comprised of the basic demographics pertaining to the predominant language spoken at home, combined household income, source of energy for cooking, level of education, employment status and basic literacy questions.

Section two included the participating consumers' practices related to household food waste behaviour. Section two was divided into five subsections, namely: (A) food purchasing, (B) Food storage, (C) Eating habits/practices, (D) Food discarding and (E) Strategies for planning and managing leftovers.

Subsection A addressed the frequency of food purchases, the chosen store or place of purchase, the frequency of using a shopping list as well as the last purchase of specific food items. The list of 38 food items was categorised in vegetables, fruit, meat and dairy and other. For each item the participating consumer had to indicate when last it was purchased (i.e. never, in the past 2 days, in the past 3-6 days, a week ago, longer than a week ago).

Subsection B consisted of two questions, each with a list of 7 items. The questions related to the preferred storage location of particular food items and the duration of time that passed after the food was purchased until it was store.

Subsection C pertained to the eating habits and practices of the household. The main part of this section was devoted to a list of main meals the household consumed in the week prior to the survey. The data obtained from this question will present a comprehensive list of food consumed within the households. The remainder of the questions determined the preferred time when the main meal was eaten, the frequency of eating the main meal together as a family, the planning of the main meals and a list of specific food items that was consumed.

Subsection D consisted of questions attempting to determine specific food items discarded, the reasons for discarding food items, food discarding practices, how discarded food is disposed of and general habits relating to the discarding of food.

Subsection E pertained to the strategies for planning and managing leftovers of the household.

The questionnaire was compiled in such a way to ensure that the questions and statements were understandable for all the participating consumers, i.e. simple wording and an easy layout. The questionnaire was given to ten randomly selected consumers for pre-testing. Only minor adjustments were necessary: (a) the adjustment of a Likert scale which only contained numbers, and (b) the inclusion of the word pension next to retired (question 1.9 option g).

3.5 Data Collection process

Data were collected over three months during June, July and August of 2018. Trained fieldworkers assisted in physically administering all the questionnaires over this period. Data were collected in the residential areas, demarcated in specific wards (Appendix A). The fieldworkers received demarcated maps of the wards selected, during the sampling procedure. The number of consumers necessary for the specific ward was also provided. They then cold canvassed and had consumers complete the survey until the intended number was reached. The fieldworkers distributed the number of consumers evenly (geographically) throughout the specific ward.

The focus of consumers to complete the questionnaire was based on persons who are responsible for purchasing the food in households and/or also prepares meals in homes. Fieldworkers administered a questionnaire to the relative persons to be completed. The fieldworkers 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 40 minutes to complete the questionnaire. A total of 376 questionnaires were completed. All of the consumers participated voluntarily, and no incentive was given to them.

In order to protect the anonymity of the participating consumers, all signed consent forms were separated from the questionnaires once data collection was completed. The questionnaires did not contain any identifying information. The consent forms and the questionnaires were stored separately in a locked space, to which only the researcher and supervisor had access. As per the policy of the University of the Free State, all hard copies will be destroyed once the research is completed.

3.6 Data Analysis

Descriptive statistics also referred to as summary statistics, are used to summarise, organise and reduce large numbers of observations. The reduction of large numbers is made by mathematical formulas that represent all observations in each group of interest (Wessa, 2018).

In this study, summary tables were created for each categorical question, and Pearson's chi-squared tests were implemented. The Chi-square test is intended to test how likely it is that an observed distribution is due to chance (Fall, 2008). The assumption was made

that the expected number of responses in every category is the same for a single question. The probability was calculated, and there were differences in the categories. The categories were seen as broad or more significant than what was observed under the assumption. If the probability is small, the conclusion was that there was evidence of grouping or consensus. To avoid false claims, the probabilities were adjusted to account for the fact that there are multiple tests. When the probabilities are large, then all significant results must be ignored from the previous section as they could be a coincidence.

One-way analysis of coded data was used. At first, the percentage of positive responses, calculated and tested by doing the Binomial test, was done. Followed by the average code for a question reported and tested by Student's t-test. Missing information, or, also known as non-responses, was summarised, as excessive non-responses can result in biased analyses. Missing information for each question was summarised and stored in an Excel file. Then the proportion of rows that are completed for each was given. For the binary questions, the proportion of positive responses was compared to 0.5 on an individual basis. Questions which allow for multiple option selection are often broken down into multiple binary responses, in which case the statistical test is not always relevant.

Canonical correlations were also done, which is a multivariate version of the Pearson correlation (question 4.11-4.48, 4.65-4.102, 4.103-4.140). The Pearson correlation is the bivariate correlation and is a measure of the linear correlation between two variables. Numbers are used to interpret the data. The number represents the correlation, and it can range from -1.00 to +1.00. A high positive value represents a high positive relationship and for a low positive value, it represents a low positive relationship. A moderated negative value represents a moderated negative relationship. A value of 0 means no value (McMillan & Schumacher, 2010).

The statistical analysis was carried out by a statistician at the Department of Mathematical Statistics and Actuarial Science: Statistical Consultation Unit of the University of the Free State. All data were stored on a password-protected computer, to which only the researcher, supervisor and statistician had access.

3.7 Reliability and Validity

3.7.1 Reliability

Reliability can be defined as the consistency of measurements or an individual's performance, of a test or the absence of measurement error. There are two types of reliability, namely relative and absolute (Babbie, 2010). Relative reliability is the degree to which individuals maintain their position in a sample with repeated measurements. Absolute reliability is the degree to which repeated measurements vary for individuals (McMillan & Schumacher, 2010).

The reliability of the questionnaire was ascertained by executing a pre-test. The measuring instrument was tested on a group of 10 consumers who completed it without the assistance of a fieldworker. The pilot test revealed that the questions were understood and answered without any difficulties.

Cronbach's alpha is mostly used to determine the internal consistency coefficient of questionnaires. 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. It is statistically calculated, based on the pairwise correlations between different variables.

3.7.2 Validity

Validity is the degree to which scientific clarifications of results match reality. It also refers to the sincerity of findings and conclusions (Babbie, 2010). Explanations are the results and include the reality or truth. The degree to which explanations are accurate, comprises the validity of the design. In quantitative research, there are four types of validity designs (McMillan & Schumacher, 2010).

Statistical conclusion validity incorporates the use of statistical tests to determine whether purported relationships are a reflection of actual relationships. Internal validity focusses on links between the independent and dependent variables (Moore, 2016). Construct validity is a judgment that is made on the extent to which interventions and measured variables represent certain elements. External validity refers to the generalisability of the results and conclusions to other consumers and locations (Møller et al., 2014).

The research supervisors scrutinised the questionnaire to ensure internal validity, construct validity and external validity.

3.8 Limitations of the Study

The fieldworkers determined the primary selection of consumers eligible to complete the survey on behalf of the household. One should consider that in today's fast-paced modern world, often more than one person in the household could purchase food for the household. However, given that the point of this study was to use only the consumers that purchase food for the households as a starting point of reference for further research about the food security of South Africa, these omissions were considered acceptable.

The second limitation is that the results cannot be used for any area other than Mangaung and can therefore not be generalised for the province of the Free State or South Africa. Nevertheless, the same study can be replicated elsewhere and comparisons drawn between the areas. A database of various areas' responses and practices can consequently be built.

Social desirability bias occurs when people respond to a question in such a way that would make them appear in a positive light, but in reality, they may not fully believe or practice those responses. It is unlikely that social desirability could be fully controlled in this study, as food waste is a sensitive topic. Also, the use of a questionnaire as the only form of data collection can be limiting, because participating consumers do not have the space to elaborate further on their responses, as there is limited physical space on the questionnaire (Bowling, 2005).

The instrument itself presented a limitation in that the participating consumers experienced respondent fatigue, as it was a comprehensive and lengthy questionnaire to complete.

3.9 Ethical Considerations

Ethics are connected with moral beliefs of what is wrong or right. The researcher should be open to all consumers about all aspects of the study. Specific information can be withheld, and this may only be done when it can affect the validity of the results. Voluntary participation means that participating consumers cannot be forced to participate (Moore, 2016). It is also necessary to make sure that consumers agree to participate, and to give as much information as possible so that they can decide whether or not to participate (McMillan & Schumacher, 2010).

Researchers should never physically or mentally injure participating consumers. This includes revealing information that may result in embarrassment or danger to anyone, as well as direct negative consequences (Møller *et al.*, 2014). It is the researcher's responsibility to anticipate such risks carefully and to minimise them. Privacy of all participating consumers must be protected (Babbie, 2010). It is the researcher's responsibility to ensure privacy by using these three practices, namely: anonymity, confidentiality and appropriate storing of data (McMillan & Schumacher, 2010).

Ethical clearance for this research was approved by the University of the Free State's Ethical Clearance Committee before the commencement of the fieldwork (Appendix D). Inherent to ethical clearance is the explicit stipulation of a strategy to avoid and mitigate the above-mentioned ethical considerations. All of the aspects were thus incorporated and tended to.

3.10 Concluding Remarks

In summary, a questionnaire was administered to consumers representing households to explore the research objectives. The data were analysed from the questionnaires, using

descriptive statistics and quantitative methods. The following chapter presents the results of the data collected and analysed, as outlined in this chapter.

4.1 Introduction

Research on food waste and loss in South Africa suggests that the total cost of edible food waste throughout the value chain is ZAR 61,5 billion per annum (Nahman & De Lange, 2013). South African consumers are responsible for between 3% and 7% of household food waste (per person), which is an average of between 0,48kg and 0,69kg respectively, per household per week. Per capita food waste measures between 8kg and 12kg per annum (Oelofse *et al.*, 2018). Food waste, however, is not only caused by consumer behaviour, but the whole supply chain is involved (Aschemann-Witzel *et al.*, 2018b). South Africa as a country needs to address the matters of food wastage to ensure the benefits of South Africa's natural, economic and social resources (Marx-Pienaar *et al.*, 2019).

In this chapter, the results of the research concerning the objectives are presented and discussed. Firstly, food purchasing practices are discussed. Secondly, the responses to food storage practices will be presented. Eating practices will follow, and lastly, results regarding the discarding practises will be presented.

4.2 Food Purchasing Practices

Consumers are the central point when it comes to marketing practices and is considered the most prominent economic group. Today, marketing practices have to consider the increase in consumers' income and also the quality and quantity of products, which will satisfy the consumers. Food purchasing practises include the determination of quality and quantity chosen by consumers (Gupta & Panchal, 2009).

4.2.1 Consumers' choice of store

More than a third of the consumers in Mangaung (39,7%; n=363) purchase their food at convenience supermarkets (Table 4.1). Convenience supermarket stores are small retail stores that only stock limited stock in comparison with a hypermarket or supermarket chain (Leaf, 2017).

Supermarket chains are the preference of 18,7% (n=363) of the consumers, while hypermarkets and wholesalers are the choices of 16,5% (n=363) of the consumers (Table 4.1).

Since 1994, there has been a significant growth of supermarkets with 50%-60% retail sales and the rise of urban living with the increase in income. This affected the demand for high-value food. Consumers started to spend more on fruits, vegetables and processed foods, as well as convenience meals, and less on staples, such as maize and wheat flour (Ronquest-Ross *et al.*, 2015).

Table 4.1: The use of different stores to purchase groceries (n=363)

Type of store	Frequency
Convenience Supermarkets	39,7%
Hypermarkets	16,5%
Street Vendors	0,6%
Independent retailers	7,7%
Spaza shops	2,8%
Supermarket chains	18,7%
Upmarket chains	0,3%
Wholesalers	16,5%

The increase of supermarkets has formed South Africa's shopping behaviour, despite the increase of spaza shops, convenience stores and street vendors. From 1994 to 2012 the number of supermarkets increased by 164% in Cape Town. Advantages of supermarkets include more food varieties, both healthy and unhealthy, and lower prices than spaza shops and street vendors (Odunitan-Wayas *et al.*, 2018).

A very small percentage of consumers in Mangaung use convenient Spaza shops (2,8%)(Table 4.1). Spaza shops are retail stores that are considered to be small and owner-managed. An owner is usually a local person or can be a foreigner. Spaza shops employ more than five, but less than twenty staff members and mostly do not adhere to municipal rules regarding the running of small retail stores in residential areas. Consumers living in townships make use of spaza shops. The benefit of these stores for consumers is that they are open until late at night. The main goods sold at these stores are bread, milk, grain staples, cool drinks, soap, cigarettes and alcohol (Chipunza & Phalatsi, 2019).

Spaza shops create employment, provide credit to their customers and ensure economic activities in areas where there are only a few such opportunities. Still, spaza shops are not successful in the long-term. Reasons for failing are the lack of business literacy and skills, restricted access to finance and markets and personal values. Spaza shop owners do not have the business skills to be competitive. Furthermore, they cannot be diverse, do not plan, are often in the wrong location, have poor customer service, have a lack of necessary market analysis information, and have no marketing or financial management skills. The skill shortage is due to poor education, not enough training programmes and restricted government support (Hare & Walwyn, 2019).

The consumers in Mangaung also used Street Vendors (0,6%)(Table 4.1). Street Vendors are shops with no formal infrastructure where foods and cool drinks are prepared in a separate location (i.e. home) and then sold in public places. During a study by Saha *et al.* (2019), he found that street vendors sold a better variety of vegetables. In contrast, spaza shops sold a better variety of fresh fruits and juices, starchy food, and protein-rich food. Both stores sold food that is high in sugar and fat.

Consumers who emphasise a high level of convenience orientation and also price orientation during shopping are more likely to report food waste incidents in their households. On the other hand, consumers that are more aware of the relationship between price and quality are less likely to report food waste in their homes (Aschemann-Witzel *et al.*, 2018a). Supermarkets create specific products and arrays, and this influences how consumers see certain foods and perceive which products are the best. Consumer perception is changed when changes take place in the supply chain or communication about food. Consumers' choice, behaviour and attitudes of what is best and acceptable, impacts supermarkets' management on what to offer and what standards to use when they order from wholesalers and processors (Aschemann-Witzel *et al.*, 2018b).

4.2.2 Consumers' frequency of shopping

In Mangaung, 63,3% (n=346) of the consumers purchase their food items for their households monthly, and a mere 1,7% (n=346) purchase their food items daily. A tenth (10,4%) of the consumers visit stores weekly (Figure 4.1). Forty-two percent (42,0%) of the consumers indicated that they strongly disagree with the fact that they purchase large amounts of food, because there is not enough time to go to the stores more often (n=349).

As only 29,6% (n=368) of consumers in this research own a car, we speculate that monthly visits are not because of time constraints, but rather due to a lack of private transport. A study in Cape Town, by Odunitan-Wayas, 2018, concluded that 67,2% of their low-income residents walked to the grocery stores, and 62,1% spent at least 10 minutes traveling to the supermarkets from their home. The high-income households use a private car (73,2%), and 88,7% spend less than 10 minutes on travelling to the supermarket.

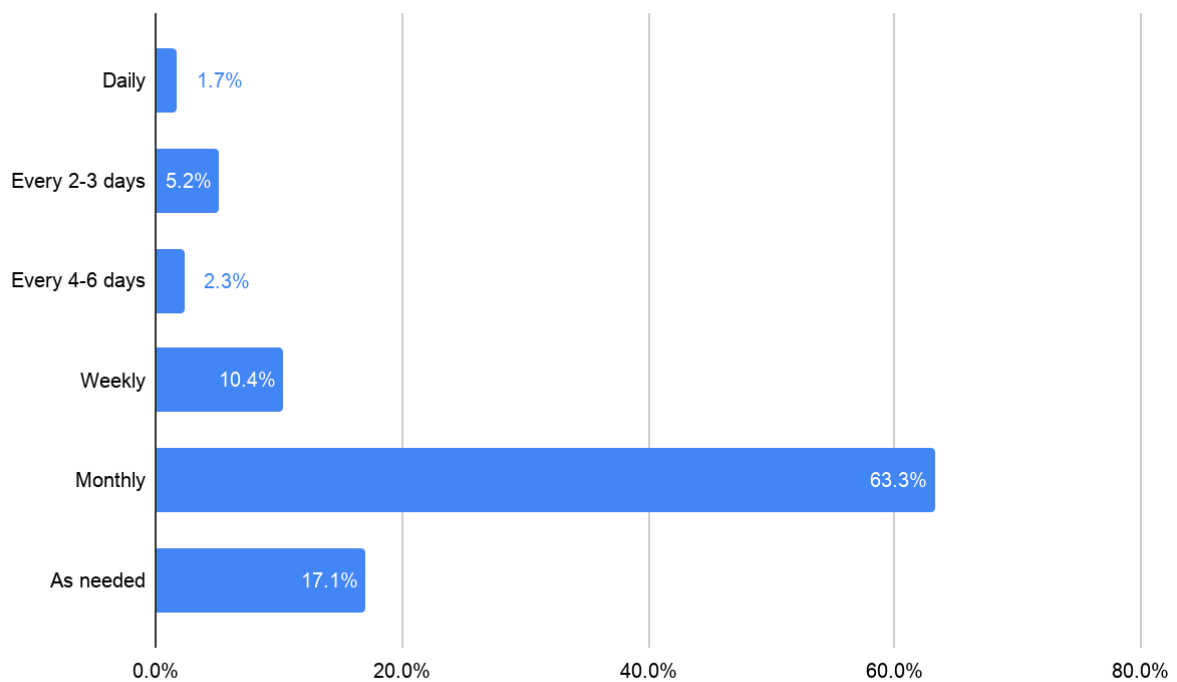


Figure 4.1: Frequency of grocery shopping (n=346)

Compared to a study done in Cape Town, the frequency of shopping is quite different. Capetonian consumers did weekly (46,0%) and daily (10,4%) shopping more often than consumers in Mangaung (10,4% and 28,4%; respectively). However, monthly purchases in Mangaung (63,3%) are more common than monthly purchases in Cape Town (24,9%). Factors that may contribute to the weekly shopping pattern is the lack of transportation and storage facilities. Walking may hinder consumers from purchasing more than they can carry, and many do not have refrigerators to store their fresh products (Odunitan-Wayas *et al.*, 2018).

Consumers who make less shopping trips tend to discard more food as opposed to consumers who visit grocery stores more often. Once a month or extensive shopping trips

are also done as a matter of habit, without planning what is in storage at home (Visschers *et al.*, 2015; Farr-Wharton *et al.*, 2014). Consumers that purchase their food daily have smaller “top-ups” of purchasing (Farr-Wharton *et al.*, 2014). Long-term planning is vital for reducing household food waste. This can be done once a week by doing a weekly meal plan and purchasing those food products needed for a specific meal plan. Purchasing fresh food more frequently can be one approach to better food purchasing practices and reduce food waste; however, it is better to have flexible planning when it comes to fresh foods (Hebrok & Heidenström, 2019). In Cape Town, 41,1% of high-income consumers purchase fruits and vegetables once a week, while only 37,8% of low-income residents purchase fruits and vegetables once/twice a month (Odunitan-Wayas *et al.*, 2018).

4.2.3 Planned purchases

It is essential to adhere to the planning and use the items the family bought, before it goes to waste, and it is also advisable to follow through with the planning. Consumers waste less food when they purchase food items that they can use in a variety of dishes. However, this necessitates planning. Moreover, some consumers find it challenging to follow through with the plan, because of the unpredictable and constrained nature of everyday events (Hebrok & Heidenström, 2019). The utilisation of shopping lists and communication amongst household members is therefore considered of utmost importance (Pierre, 2019). Meal planning is further discussed in section 4.4.2 (page 62).

Using a shopping list has many benefits for the consumer and their purchasing habits. Nevertheless, only 35,7% of the consumers in this study indicated that they always use a shopping list when they purchase their food items. A staggering 29,6% of the consumers never use a shopping list (Table 4.2).

Table 4.2: Frequency of using a shopping list (n=345)

How often the consumers' used a shopping list	Frequency
Always	35,7%
Often	15,4%
Regularly	3,5%
Occasionally	5,2%
Seldom	10,7%
Never	29,6%

Communication in the home concerning grocery items is also essential. In Mangaung, 89.7% of the consumers own a cellphone, and 32.3% owns a computer, which makes it possible for consumers to have access to shopping apps and online shopping possibilities (n=368). Online grocery shopping is a significant benefit as it can help consumers to check their stock and streamline the use and portioning of food. It is an excellent method to help with over-purchasing, over portioning and the amount of food left in storage, which is still not consumed. The benefit of using online apps and online grocery shopping is that it can be done from the comfort of the home even when the shops are already closed (Hebrok & Heidenström, 2019).

There are a variety of free shopping list apps available, which is a quick and easy method to assist in planning (Farr-Wharton *et al.*, 2014). Among the most used are AnyList, Mealtime, Out of Milk, Bring! Grocery Shopping list and Flipp (Pierre, 2019). Consumers can use these and create lists for basics like milk, coffee, toilet paper and butter and regular grocery items. Also, they can have a separate list for all their dinner dishes and use recipes from the websites or other food blogs (Hebrok & Heidenström, 2019). The Mealtime application allows consumers to do all this in one application. Diet preferences (i.e. gluten-free), number of portions, as well as food preferences can be stored on the profile. Recipes are then generated of which appropriate ones can be selected for a weekly menu. The data is then used to generate an automatic shopping list of the selected recipes. In addition, it estimates the amount of food waste in kilogrammes (kg) and gives consumers tips on how to minimise it (Mealime Meal Plans Inc., 2019).

In this study, a lack of planning on the part of the consumers could be identified as one of the major contributing factors for household food waste. The unprepared consumers would then purchase similar food items, stockpiling on food items they already have in the refrigerator or pantry. Consumers must be aware of what food items are stored within the household before they go to the supermarket as this would decrease over-purchasing (Farr-Wharton *et al.*, 2014).

4.2.4 Employment and purchasing habits

It is important to note that the person responsible for making the purchases of the household completed the questionnaire. In the first section, the employment status of the

consumer was established, and 33,4% were unemployed, 28,7% were formally employed full time, and 24,3% were retired (n=362). The unemployment rate is high as 26,6% of consumers in this study have Matric/Grade 12 or equivalent, with 25,4% only having secondary schooling up to, but excluding Matric (n=342). However, South African unemployment rates are estimated at 29,0% (StatsSA, 2019) and are also considered high. Furthermore, a study done in Cape Town found that there was an unemployment rate of 28,2%, and 50,4% was employed with only 12,1% retired (Odunitan-Wayas *et al.*, 2018). The unemployment rates in the two studies are similar, although the current study has less employed and more retired consumers.

More than half (56,2%) of the employed consumers have working hours from 8:00 to 17:00 (n=137). Forty-five percent (45%) go to the shops between 8:00 and 12:00, while 28,0% go after 12:00, but before 14:00, presumably in their lunch break (n=361). Furthermore, only 16,0% of consumers indicated that they use a system where no additional food is purchased until all the food that is currently in the kitchen is used or eaten (n=103), although a significant proportion of 70,3% of consumers strongly disagreed with the statement that they purchase more food than they can consume (n=343). This might lead to purchasing products that are already in the household or purchasing products that cannot be eaten before the expiry date.

4.2.5 Types of food purchased

Vegetables and Fruit

Table 4.3 is a summary of the vegetables and fruit consumers purchase, as well as the frequency of purchasing these items. Mangaung consumers indicated that 44,0% purchased onions, tomatoes (41,7%), potatoes (40,5%) and cabbage (40,0%) in the 2-6 days preceding the survey. Also, 69,9% of consumers purchased beans a week or longer before the survey and 65,4% bought pumpkin, spinach (64,9%) and carrots (61,8%) a week or longer before the questionnaire was completed. More than two-thirds of Mangaung consumers never purchase the following vegetable items when they do grocery shopping: broccoli (71,2%), cauliflower (69,1%), mushrooms (64,4%). Moreover, cucumber (53,1%), lettuce (52,5%) and sweet potato (44,4%) are never the choices of some consumers.

Table 4.3: Vegetable and fruit items purchased

Food Item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago	Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago
Vegetables							Fruit						
Beans	n=339	14,2%	5%	10,9%	10,6%	59,3%	Apples	n=338	5,9%	13,3%	23,4%	18,9%	38,5%
Broccoli	n=344	71,2%	3,8%	5,5%	4,9%	14,5%	Avocado	n=330	35,2%	9,1%	11,5%	10,6%	33,6%
Cabbage	n=330	9,7%	15,2%	24,8%	20,3%	30%	Bananas	n=338	8%	17,2%	21,9%	18,3%	34,6%
Carrots	n=330	6,7%	6,4%	25,2%	20%	41,8%	Clementina	n=313	34,2%	7,7%	10,9%	14,4%	32,9%
Cauliflower	n=337	69,1%	3%	6,5%	5,6%	15,7%	Grapes	n=309	52,8%	3,6%	1,6%	3,9%	38,2%
Cucumber	n=341	53,1%	5,9%	6,5%	6,7%	27,9%	Melons	n=309	54%	1,9%	3,6%	3,2%	37,2%
Lettuce	n=341	52,5%	6,2%	6,5%	7,3%	27,6%	Oranges	n=323	11,1%	17,6%	21,7%	17%	32,5%
Mushroom	n=337	64,4%	5,6%	5,6%	7,4%	16,9%	Pears	n=313	18,2%	8,9%	17,3%	14,7%	40,9%
Onions	n=323	8,4%	22,9%	21,7%	16,4%	30,7%	Strawberry	n=334	69,2%	2,7%	4,5%	3,6%	20,1%
Peppers	n=320	27,2%	8,8%	17,5%	10,6%	35,9%	Berries	n=338	74,6%	2,7%	2,4%	3%	17,5%
Potatoes	n=328	2,1%	15,25	25,3%	20,4%	36,9%	Mango	n=321	58,9%	2,2%	3,4%	1,9%	33,6%
Spinach	n=319	10,7%	7,5%	16,9%	12,9%	52%							
Tomatoes	n=324	3,4%	17%	24,7%	19,8%	35,2%							
Sweet potato	n=331	44,4%	4,5%	7,3%	8,5%	35,3%							
Pumpkin	n=329	6,7%	7,6%	20,4%	20,4%	45%							

Mangaung consumers indicated that 39% purchased oranges and bananas 2-6 days before the survey, while 26,2% bought pears and 20,6% purchased avocado during the same time. In addition, 57,4% of consumers purchased apples, pears (55,6%), bananas (52,9%) and oranges (49,5%) a week or longer prior to the survey. More than two-thirds of Mangaung consumers never purchase the following fruit items when they do grocery shopping: berries (74,6%) strawberries (69,2%) mangoes (58,9%), melons (54,0%), grapes (52,8%)

Meat and Dairy items

Table 4.4 is a summary of the meat and dairy consumers purchase, as well as the frequency of purchasing these items. Less than half of Mangaung’s consumers purchased chicken (37,0%), red meat (21,3%), and fish (12,4%) 2-6 days prior to the survey. Many of the consumers (73,1%) purchased red meat a week or longer before the questionnaire was completed, as is the case with fish (70,8%) and chicken (62,6%). Sixteen percent (16,0%) of consumers never purchase fish, and only 5,6% never purchase red meat, while all the consumers who participated in the study, purchase chicken.

Table 4.4: Meat and dairy food items purchased

Food Item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago	Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago
Meat							Diary						
Chicken	n=345	0%	14,5%	22,9%	21,4%	41,2%	Cheese	n=332	30,4%	9,6%	10,2%	15,4%	34,3%
Fish	n=338	16,9%	6,8%	5,6%	10,7%	60,1%	Eggs	n=336	1,5%	11,3%	17,3%	18,5%	51,5%
Red meat	n=338	5,6%	11,5%	9,8%	16,9%	56,2%	Milk	n=331	0,9%	27,8%	19,6%	19,9%	31,7%
							Yoghurt	n=330	14,2%	9,4%	12,7%	16,1%	47,6%

Less than half of the consumers bought milk (47,0%), eggs (28,6%), yoghurt (22,1%) and cheese (19,8%) during the week preceding the survey. Many consumers (70,0%) purchased eggs more than a week before the questionnaires were completed. Food products, such as yoghurt (63,7%), milk (51,6%) and cheese (49,7%) were also not purchased by consumers during the week leading up to the survey. Almost a third (30,4%) of Margaung consumers never purchase cheese, 14,2% never purchase yoghurt, 1,5% never purchase eggs and 0,9% never purchase milk.

Staples and Other

Referring to Table 4.5, Margaung consumers indicated that 25,8% purchased maize meal in the 2-6 days before questionnaire completion, and only 7,7% bought samp during the same period. Also, 71,4% indicated that they purchased maize meal, and 65,6% bought samp a week or longer prior to the survey. Only 2,9% of consumers indicated that they never purchase maize meal, while 26,6% of consumers indicated that they never purchase samp.

Treat items, take away meals and convenience meals were purchased by 28,3%, 25,9% and 13,0%, respectively, of the consumers during the 2-6 before the survey. Also, 62% indicated that they bought convenience meals a week or longer than a week ago, while 50,2% purchased treat items, and 40,6% bought take away meals during the same period. A third (33,4%) never purchase take away meals. Convenience meals are never purchased by 25,2% of the consumers, and treat items never make it to 21,5% of the consumers' shopping basket.

Table 4.5: Staples and other food items purchased

Food Item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago	Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago
Staples							Other						
Maize meal	n=346	2,9%	11,6%	14,2%	21,4%	50%	Convenience Meals	n=330	25,2%	5,2%	8,2%	17%	44,5%
Samp	n=338	26,6%	2,7%	5%	11,5%	54,1%	Treat items	n=339	21,5%	18%	10,3%	13,3%	36,9%
							Take Away meals	n=335	33,4%	14,3%	11,6%	8,7%	31,9%

The many vegetables, fruit, meat, dairy, staple and other items purchased less often, or more than a week before the survey, can be explained by the findings in section 4.2.2, where many of the consumers (63,3%) indicated that they visit stores only once a month. As a result, food waste will be influenced as some food items, especially fresh produce, will spoil during that period if not stored correctly.

4.3 Food Storage Practices

The correct storage of food items can decrease the time for food to spoil, and in this way, assists in combating food waste. There is a need to inform consumers about correct and efficient food storage practices by providing a system of organisation. This system will enable consumers to locate their food items quickly. Cleaning out the refrigerators is an essential factor as consumers tend to store more food in the refrigerator when it has already reached its capacity. Consumers who are aware of food items stocked in their refrigerators have no food waste, because their storage system is structured and orderly. Consumers who are conscious of the shelf life of food items stored in their refrigerators, and use different assortments of containers when storing food items, tend to waste less food (Farr-Wharton *et al.*, 2014).

A study done by Hebrok and Heidenström (2019), found a difference between households that own a combined refrigerator and freezer unit and homes with separated units. Large freezer units gave less overview of the stored food items, and consumers overstuffed these freezers, resulting in food items stored for several years. Consumers who own a combined unit were more aware of space. The freezer is also mostly used to portion food

items and leftovers for the families (Hebrok & Heidenström, 2019). More than half of consumers (57,9%) in this study never freeze surplus food, and instead, keep it in the refrigerator to decide what to do with it at a later stage (n=356).

An essential feature of refrigerators is that it can extend the shelf-life of food items. However, the design of the refrigerator does not provide a sufficient overview of the available food items stored, and location and size are also essential to look at. The use of refrigerators and freezers enables, and to a certain extent, encourage, consumers to purchase more food items. Most food waste occurs when food is stored at the back of the refrigerators, vegetables at the bottom of the drawer and jars that are stored in the refrigerator door. In this study, only 34,6% of the consumers use clear containers to store food in their refrigerators (n=107), and 76,9% of Mangaung consumers do not consider it necessary to throw out the last bit of condiments (n=350). Leftovers and other food items that consumers do not want any more are kept in the refrigerator until it is spoiled. It thus goes to waste, because consumers only eat what they desire at the moment, rather than eat what is in their refrigerators (Hebrok & Heidenström, 2019).

It is evident from table 4.6 that the majority of the consumers are storing their leafy vegetables (77,1%), fresh meat (95,9%) and milk (93,8%) in the refrigerator. Eighty-six percent (86,0%) of the participating consumers own a refrigerator, which is in good working order (n=368). Only 20% of the South African population does not own a refrigerator, and this is mostly low-income consumers (Odunitan-Wayas *et al.*, 2018).

Table 4.6: Storage of food items

Storage location	Whole fruit (n=341)	Root vegetables (n=329)	Leafy vegetables (n=327)	Fresh Meat (n=342)	Milk (n=336)	Bread (n=340)	Leftovers (n=337)
Not applicable	3,5%	0,6%	1,5%	0,6%	0,6%	3,5%	2,1%
Refrigerators	58,4%	54,4%	77,1%	95,9%	93,8%	22,15	91,4%
Kitchen Counter	26,7%	14,9%	9,5%	1,2%	2,4%	33,8%	3,0%
Cupboard	6,2%	8,2%	3,1%	0,95	3,3%	32,1%	2,1%
Pantry	1,8%	12,8%	4,0%	0,0%	0,0%	7,1%	0,6%
Other	0,0%	0,3%	0,6%	1,5%	0,0%	0,9%	0,6%

It takes the consumers approximately 1 to 5 hours after fruit (73,5%), root vegetables (74,4%), leafy vegetables (73,7%), fresh meat (73,4%) and milk (70,6%) items were bought to store it (Table 4.7). Forty-three percent (43,0%) strongly disagree that having a well-stocked food cupboard is not a sign of prosperity (n=354).

Table 4.7: Duration before food items are stored

Duration before storage	Whole fruit (n=355)	Root vegetables (n=355)	Leafy vegetables (n=353)	Fresh Meat (n=353)	Milk (n=354)	Bread (n=347)
Not applicable	1,4%	0,3%	0,3%	0,0%	0,3%	0,0%
Immediately	23,1%	22,8%	23,5%	24,9%	26,8%	40,3%
Within 1-5 hours	73,5%	74,4%	73,7%	73,4%	70,6%	57,3%
Longer than 6 hours	1,7%	2,0%	2,0%	1,7%	1,4%	1,7%
Following day	0,3%	0,6%	0,6%	0,0%	0,6%	0,0%
After two days	0,0%	0,0%	0,0%	0,0%	0,3%	0,6%

Specific refrigerator technology like the ZmartFri- technology has an expiration date alert and also comes with an automatic shopping list. Another technology used is Colour Coding that aims to help consumers organise and keep track of the refrigerator's contents. The US Environmental Protection Agency initiated a campaign 'Food: Too good to waste', where this logo is placed on a shelf in the refrigerator to indicate that these food products must be eaten first. It is still unclear if these interventions assist in reducing food waste, as one of the significant challenges lies with the complexity of planning, and sometimes unpredictable, everyday life. The packaging deserves attention and should be redesigned to be compatible with the way that the consumer handles the food. Features that should be included would be accurate portioning, divisions, visibility and stackability. Practical suggestions to reduce food waste in households when it comes to storing practices, is to use smaller refrigerators and freezers to minimise the amount of food that can be stored. Refrigerators and freezers need to be designed differently to reduce food waste. It should include features like improved visibility, ability to track shelf-life and better food handling practices (Hebrok & Heidenström, 2019).

4.4 Eating practices

Family functioning is essential as it helps shield the family against, amongst others, fast food intake, lack of exercise and disordered eating. Family functioning is also linked with family meals. Eating family meals together decreases negative behaviours, like disordered eating and increases self-esteem and school success (Hausken *et al.*, 2019).

4.4.1 Main meal frequency

From table 4.8, it can be seen that most of the main meals are eaten at dinner time (77,2%), whereas 12,7% of the consumers indicated that their household does not have a main meal of the day. The majority of the consumers (78,0%) eat their main meals, daily, together as a family, and these meals are always eaten at home (70,6%). This is confirmed, as 70,7% of consumers strongly disagree that the household members' schedules are unpredictable, making this possible (n=341). The source of energy that the majority (88%) used for cooking meals is electricity with paraffin 26,9% and gas 10,6% (n=368). The majority (88,9%) of the participating consumers indicated that they have an electric or gas stove in good working order (n=368).

The main meal improves the family's conversation about food, as well as builds community and a sense of social belonging. The time spent together at a dinner table allows the parents to promote healthy eating. Eating dinner regularly decreases the odds of poor diet quality and breakfast skipping (Hausken *et al.*, 2019). Half (52,2%) of Manguang's consumers strongly agree that it is expected that you eat all the food on your plate (n=360).

Table 4.8: Main meal practices in Manguang

Main meal	Option	Frequency
Time of day when main meal is consumed (n=338)	Breakfast	0,9%
	Lunch	9,2%
	Dinner	77,2%
	No main meal	12,7%
Frequency of main meal consumed as a family where the majority of family members are present (n=314)	Never	1,9%
	Occasionally	9,2%
	Monthly	2,9%
	Weekly	5,4%
	Daily	78,0%
Location of weekly or daily main meal consumed as a household (n=299)	Always at home	70,6%
	Mainly at home	22,7%
	Partly at home	5,4%
	Mainly away from home	1,3%
	Always away from home	0,0%

4.4.2 Main meal planning

From table 4.9 almost half (48,6%) of the consumers never plan for their main meals a day in advance, while 40,8% of the consumers daily plan for the main meal at least one day in advance. Sixty-two percent (62,0%) of the consumers mentioned that they never decide to go off the meal plan of the household or change the main meal. It is essential to plan for meals 2-3 days ahead, as this creates to accommodate unexpected events during the week (Hebrok & Heidenström, 2019). Of all the consumers that participated in the survey, only 29,3% try new recipes twice a month, and 39,7% never try new recipes (Table 4.9).

Consumers need to organise their meals to reduce food waste. Consumers that prefer to purchase fewer food products should use it in particular meals on the days that follow. Consumers who experiment more with food and unfamiliar ingredients and who plan different dishes from day to day tend to waste more. On the other hand, consumers that use familiar ingredients in more than one meal are more successful in putting all the food to use (Hebrok & Heidenström, 2019).

Table 4.9: Meal planning practices and strategies in the Mangaung region

Meal Planning Practices						
	Never	Daily	Every 2-3 days	Every 4-6 days	Weekly	Twice a month
Plan for this meal at least a day in advance (n=358)	48,6%	40,0%	5,9%	0,6%	3,1%	1,1%
Go off-plan (n=355)	62,0%	12,7%	8,7%	3,4%	6,5%	6,8%
Try new recipes (n=358)	39,7%	7,8%	3,9%	7,8%	11,5%	29,3%
Have leftovers from a previous meal as this meal (n=353)	18,7%	19,0%	4,2%	8,5%	5,7%	7,9%
Host gatherings of double the number of household members (n=349)	54,4%	8,0%	1,1%	2,0%	7,7%	26,6%
Meal Planning strategies						
	Always 1	2	3	4	Never 5	
Plan meals for household in advance (n=107)	19,6%	20,6%	31,8%	8,4%	19,6%	
Calculate the appropriate portions of food (n=105)	24,8%	21,9%	18,1%	4,8%	19,6%	

Use leftovers to create new meals (n=108)	23,1%	22,2%	26,9%	7,4%	20,4%
Cook a number of meals simultaneously to consume later during the week (n=107)	5,6%	10,3%	24,3%	14,0%	45,8%
Often cook more food than can be consumed in a single meal (n=340)	50,0%	6,5%	8,5%	14,1%	20,9%
Household members tend to dish up more than they can eat (n=340)	63,2%	7,1%	11,8%	8,2%	9,7%

Nineteen percent (19,0%) of the consumers have leftovers from the previous meal as the main meal, with an almost equal number of consumers (18,7%) never having leftovers from a previous meal as the main meal. The frequency of this occurrence lessens, as is indicated that only 4,2% are having leftovers from a previous meal as the main meal every two to three days, and 8,5% every four to six days. However, 79,6% strongly agree that leftover food is still good to eat a day after it was made (n=343). Although 60,7% strongly disagree that leftover food is still good to eat a week after it was made (n=354).

Just more than half of the consumers (54,4%) never host gatherings of double the number of household members, while 26,6% does it twice a month. Half (50,0%) of the consumers strongly disagree that they cook more than they can eat in a single meal and 63,2% strongly disagreed that more food is dished up than can be eaten (Table 4.9). They also strongly disagree with 62,9% that serving large amounts of food is not a sign of affluence (n=353) with 52,1% strongly disagreeing it is not considered a sign of hospitality to serve an abundance of food (n=353).

4.4.3 Types of food consumed

Vegetables and Fruit

Table 4.10 is a summary of the vegetables and fruit consumers eat, as well as the frequency of consuming these items. Margaung consumers indicated that 72,5%, 72,1%, 62,5% and 58,2% consumed onions, potatoes, tomatoes and cabbage, respectively, in the 2-6 days preceding the survey. Also, 52,4% of the participating households consumed beans, 50,3% consumed pumpkin, and 49,4% consumed spinach and tomatoes a week

or longer before the questionnaires were completed. More than two-thirds indicated that they never consume the following vegetable items: broccoli (72,1%), cauliflower (68,4%), and mushroom (66,5%). In addition, cucumber (56,0%), lettuce (55,2%), sweet potato (46,7%) and peppers (26,4%) are never consumed by Mangaung households.

More than half of the Mangaung households consumed bananas (55,2%) and apples (51,5%) during the 2-6 days before participating in the survey. Less than half consumed pears (46,3%) and apples (41,1%) a week or longer before the survey. It seems that berries (75,1%), strawberries (71,5%), mangoes (60,2%), melons (57,6%), grapes (57,5%) and Clementina (35,6%) are not the preference of the households.

South African consumers in urban areas tend to consume the most fruit and vegetables. However, South Africans are eating two or fewer portions per day, which revealed a low intake of fruit and vegetables. The problem is cost and availability with fruits and vegetables, which is also a challenge worldwide. Fruits are the most commonly purchased food item at street vendors, although seemingly limited to bananas and apples. Tomatoes, onions and potatoes increased in consumption since 1994, in addition to oranges, bananas and apples (Ronquest-Ross *et al.*, 2015).

Table 4.10: Vegetable and fruit items consumed

Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago	Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago
Vegetables							Fruit						
Beans	n=305	15,1%	13,8%	18,7%	19,3%	33,1%	Apples	n=324	7,4%	29,9%	21,6%	16,7%	24,4%
Broccoli	n=323	72,1%	5,3%	8,4%	5,3%	9%	Avocado	n=311	34,4%	15,4%	17,4%	9,6%	23,2%
Cabbage	n=292	7,5%	27,7%	30,5%	18,2%	16,1%	Bananas	n=317	9,1%	35,3%	19,9%	12,3%	23,3%
Carrots	n=307	9,4%	18,6%	33,2%	15%	23,8%	Clementina	n=289	35,6%	27,3%	9%	8,7%	19,4%
Cauliflower	n=323	68,4%	3,4%	8,4%	5,3%	14,6%	Grapes	n=293	56,7%	4,4%	3,1%	2,4%	33,4%
Cucumber	n=318	56%	4,7%	11,6%	11,3%	16,4%	Mango	n=299	60,2%	3,3%	3%	2,3%	31,1%
Lettuce	n=315	55,2%	6,7%	12,7%	10,5%	14,9%	Oranges	n=300	10,7%	37,3%	19,7%	9%	23,3%
Mushrooms	n=319	66,5%	9,1%	11%	5%	8,5%	Pears	n=298	16,8%	19,1%	17,8%	10,4%	35,9%
Onions	n=284	8,8%	52,1%	20,4%	5,3%	13,4%	Strawberry	n=319	71,5%	4,7%	4,1%	3,1%	16,6%
Peppers	n=292	26,4%	18,5%	23,3%	13%	18,8%	Berries	n=317	75,1%	3,5%	3,5%	2,5%	15,5%
Potatoes	n=293	3,8%	36,9%	35,2%	10,9%	13,3%	Melons	n=299	57,6%	3,5%	3,8%	2,1%	33%
Spinach	n=281	11,7%	12,1%	26,7%	14,2%	35,2%							
Tomatoes	n=296	7,4%	33,1%	29,4%	14,2%	35,2%							
Sweet Potato	n=306	46,7%	6,9%	10,8%	12,4%	23,2%							
Pumpkin	n=300	8,3%	13,3%	28%	21,3%	29%							

Meat and Dairy

Table 4.11 summarises the meat and dairy consumption of Mangaung households, as well as the frequency of consuming these items. Eighty four percent (84,0%) of Mangaung households consumed chicken, 55,2% consumed red meat and 18,8% consumed fish during the six days before participating in the survey. Moreover, 53,0%, 38,1% and 13,9% of the households consumed fish, red meat and chicken, respectively, a week or more before completing the questionnaire. Eighteen percent (18%,0) of households in Mangaung never consume fish, while only 6.8% never consume red meat and, 1,3% indicated that they never consume chicken.

Table 4.11: Meat and dairy items consumed

Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago	Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago
Meat							Dairy						
Chicken	n=302	1,3%	51%	33,8%	7,3%	6,6%	Cheese	n=305	31,5%	26,6%	15,4%	9,8%	16,7%
Fish	n=293	18,8%	9,2%	18,8%	15%	38,2%	Eggs	n=299	2,0%	42,8%	26,4%	11,7%	17,1%
Red meat	n=292	6,8%	27,1%	28,1%	15,8%	22,3%	Milk	n=296	2,0%	65,5%	21,6%	4,7%	6,1%
							Yoghurt	n=296	16,90%	19,30%	15,20%	16,60%	32,10%

The majority of Mangaung consumers (87%) consumed milk 1-6 days prior to the survey, while only 10,8% consumed it a week or longer before the survey. During the six days leading up to the survey, 69,2% of consumers consumed eggs, and 28,8% consumed it a week or longer than a week before. Forty-two percent (42,0%) of the participating households indicated that they consumed cheese during the 1-6 days before, and 26,5% consumed it a week or longer before the questionnaires were completed. Yoghurt was consumed by 34,5% of households during the six days before, and 48,7% consumed it a week or longer before the survey. Milk is thus the dairy product that is consumed most as well as most often by Mangaung consumers.

On average, every South African consumes approximately 18kg of meat more per year (2009) than they did in 1994. According to the South African Food-Based Dietary Guidelines, it is recommended that either chicken, fish, red meat, milk or eggs are eaten daily. Both eggs and fish decreased in consumption from 2009 to 2012 with eggs from 55,8% to 24,1% and fish from 27,0% to 26,7%. From 1999 there was an 18,5% increase in cheese and a 6.8% increase in drinking milk with a significant increase of 73,7% in

yoghurt and sour-milk products. Cheddar is the most popular cheese (31,0%) and gouda with 20,0% (Ronquest-Ross *et al.*, 2015).

Staples and Other

Roughly three quarters (71,6%) of Mangaung households consumed maize meal, while only 17,6% consumed samp during the six days prior to the survey. Twenty-one percent (21,0%) of the households consumed maize, and 56,0% consumed samp a week or longer before the survey. Less than a tenth (6,9%) of households never consume maize, whereas approximately a quarter (26,5%) never consume samp.

Table 4.12: Staples and other items consumed

Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago	Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago
Staples							Other						
Maize meals	n=275	6.9%	58.5%	13.1%	9.5%	12%	Convenience Meals	n=309	25.2%	14.2%	28.8%	12.6%	19.1%
Samp	n=302	26.5%	7%	10.6%	18.9%	37.1%	Treat items	n=311	22.5%	31.8%	12.5%	9.6%	23.5%
							Take away meals	n=317	36.9%	19.2%	11.4%	9.5%	23%

The results indicate that 44,3% of the Mangaung households consumed treat items during the 1-6 days before completing the questionnaire, 33,1% consumed it a week or more before and 22,5% indicated that treat items are never consumed (Table 4.12). Concerning convenience meals, 43,0% consumed it during the six days leading up to the survey, 31,7% consumed it a week or longer before and 25,2% of Mangaung never consumed convenience meals. During the 1-6 days before questionnaires were completed, 30,6% consumed take away meals, while 32,5% consumed it a week or more before, while 36,9% of households never consume take away meals.

During 2012 South Africans consumed 104 kg maize per person per year. Rice consumption was 12.6kg/capita/year, which includes packaged rice of all varieties, as well as ready-to-eat formats. Almost half (48,0%) of South Africans reported that they have eaten out before with 23,3% mentioning that they eat out weekly (Ronquest-Ross *et al.*, 2015).

Most consumed food items are onions, tomatoes, potatoes, cabbage, beans, bananas, apples, chicken, milk and maize. There is a difference between the most food items bought and the most food items consumed (section 4.6.1). A study by Ronquest-Ross *et al.* (2015) found that the most commonly consumed food items by South Africans were maize, sugar, tea, bread, non-dairy creamer, brick margarine, chicken meat, full cream milk and green leaves (Ronquest-Ross *et al.*, 2015).

Finding a use for specific food items that was purchased can be a challenge, but for most consumers, the biggest challenge is during preparation and portioning (Aschemann-Witzel *et al.*, 2015). The researcher thus deduces that portioning food is not easy for consumers, as most consumers usually cook more food than needed, and it is difficult for consumers to assess how much household members will eat on a particular day. Hebrok and Heidenström (2019) states that factors to keep in mind when it comes to portioning, is knowing the family's habits, for example, how much a family member usually eats and how to make a meal with different amounts of ingredients. The portioning instructions on the package of the food item will not necessarily be the same as the amount that the family members eat (Hebrok & Heidenström, 2019).

4.4.4 Type of main meals

The questionnaire contained an open question where the consumers had to list the seven main meals they ate the past seven days (Appendix C). The majority of the participating consumers eat pap, which is made from maize meal and paired with ingredients like milk, maas, chicken, tinned fish, frankfurters, beans, spinach, tomatoes, onions and cabbage.

“Vetkoek” or often referred to as “magwenya” is a deep-fried dough in a round shape. Vetkoek with french polony is a very trendy meal, as it was mentioned a few times by the consumers. Tea was often mentioned as the drink they consume when eating bread and pap. Take away meals were also part of some of the consumers' main meals with some mentioning KFC, McDonalds and also Stadium Inn as the places they go to purchase the meals.

There are a few of the consumers that mentioned chicken hearts, sheep tripe and beef tripe as the main meal. This main meal trend confirms the indication that 76,2% of consumers do not consider it necessary to discard organs from animals, as this possibly

indicates they eat it (n=349). Fish was often paired with chips, and the fish was mostly hake, with a few mentioning tinned fish.

Pasta was also an ingredient that was mentioned by a few consumers, which they mostly paired with mince or chicken. Dishes like lasagne, spaghetti bolognese and chicken alfredo were mentioned a few times. Chicken and rice with vegetables were also mentioned multiple times. Barbequing red meat and paired with pap was a popular main meal.

4.5 Food discarding practices

It is vital to understand why and how consumers discard food in households. Understanding this behavioural practice makes it possible to identify where consumers need more knowledge and information to reduce food waste.

4.5.1 Date labelling

Considering how often consumers discard food for specific reasons, date labelling is essential. From Table 4.13, it is evident that 55,1% of the consumers never discard food, because it is past the use-by date, in contrast, 17,3% always discard food when it is past the use-by date. Forty-six percent (46,0%) of the consumers do consider it necessary to throw away food items that are past their use-by date (n=353), and 45,8% strongly agree that you will become sick if you eat food that is past its use-by date (n=358). The majority of the consumers (85,0%) never throw food out if they bought more than needed or prepared more than needed (82,7%).

Current date labelling systems are confusing to consumers. Date labelling contributes to both an increase and reduction in uncertainty about food risk and quality. These uncertainties can be reduced by changing the packaging and labelling with communication and training in grocery stores, which can assist in food risk and quality (Hebrok & Heindenström, 2019).

4.5.2 Sensorial aspects

When sensorial aspects such as appearance, smell, touch and taste are considered, a variety of behaviours were observed. When food appears mouldy and slimy, 42,0% of the consumers never discard their food, although 34,9% do discard their food for this reason.

Food that does not appear appealing to eat anymore, is not discarded by almost half (47,5%) of the consumers, whereas 31,9% always discards it. When it comes to food that only smells, 35,4% discard the food and 46,4% never discard it. Only 19,4% of consumers always discard the food when they do not like the taste of the food, while 54,8% do not discard it.

Table 4.13: Discarding practices in the Margaung region

Discarding Practices	Never 1	2	3	4	Always 5
Past use-by date (n=336)	55,1%	10,1%	12,8%	4,8%	17,3%
Bought more than needed (n=341)	85,0%	3,5%	5,0%	4,7%	1,8%
Prepared more than needed (n=342)	82,7%	4,7%	4,1%	4,4%	4,1%
Mouldy (n=338)	42,0%	10,1%	5,3%	7,7%	34,9%
Slimy (n=339)	47,8%	6,8%	4,4%	5,0%	36,0%
Appearance is not appealing (n=339)	47,5%	6,5%	6,8%	7,4%	31,9%
Smelled off (n= 336)	46,4%	9,5%	2,7%	6,0%	35,4%
Did not like the taste (n=341)	54,8%	9,7%	7,6%	8,5%	19,4%
To make space in the freezer (n=339)	87,0%	3,5%	5,6%	2,7%	1,2%
To make space the refrigerator (n=341)	87,4%	3,5%	5,0%	1,8%	2,3%
To make space in the cupboard (n=336)	88,1%	3,9%	3,3%	1,2%	3,6%
The item was already spoiled when I opened the bag/container (n=332)	51,2%	7,2%	8,7%	12,7%	20,2%
Health reasons (n=339)	78,8%	4,4%	5,6%	2,1%	9,1%
Accidents (food dropped on the floor) (n=338)	52,7%	16,6%	8,0%	7,1%	15,7%
Freezer failure (n=333)	74,2%	9,3%	5,7%	3,0%	7,8%
Could not store it properly (n=338)	71,0%	15,1%	6,8%	3,6%	3,6%
Prepared too much and did not want to save leftovers (n=342)	85,7%	6,7%	4,4%	1,8%	1,5%
Prepared too much and could not save the leftovers (n=339)	82,3%	6,2%	6,2%	2,4%	2,9%
Food was burnt/ruined during the cooking/ preparation process (n=341)	54,5%	19,1%	7,0%	8,5%	10,9%
I have control over the amount of food that the household discard (n=338)	18,9%	10,9%	10,9%	11,2%	47,9%

The more strategies consumers use to determine if food is still good to eat, the more food they waste. Consumers that may only use their eyes and smell to know if the food is still good to eat, waste less food (Hebrok & Heidenström, 2019).

4.5.3 General discarding reasons

Interestingly, the consumers indicated (Table 4.13) that they never discard food to create more space in the freezer, refrigerator or cupboard (87,0%, 87,4%, 88,1%; respectively). When the item that they bought was already opened, 51,2% of the consumers do not discard the food, while 20% will always discard it. For a reason like health (9,1%), when accidents occur (15,7%), freezer failure (7,8%) and food that was stored incorrectly

(3,6%), food will always be discarded. Forty-three percent (43,0%) consider it not all necessary to discard food that was not stored properly (n=345).

4.5.4 Preparation and leftovers discarding practices

A small number of the consumers (1,5%) will always discard food when they prepared too much and did not want to save leftovers, and 2,9% always discard it if they could not save the leftovers. Eighty-one percent (81%) do not consider it necessary to throw away excess ingredients from a prepared meal (n=347), while 73,8% mentioned they do not throw away leftovers on a plate after a meal at all (n=347) and also 87,3% do not throw out leftovers still in the pot/serving dish (n=347). When food was burnt or ruined during cooking or preparation, 10,9% of the consumers discard the food. When food falls on the floor, 35,8% consider it necessary to throw out, with 32,5% indicating they do not throw out the food (n=338). Almost half of the consumers (47,9%) strongly agree that they have control over the amount of food that the household discards (Table 4.13).

4.5.6 Refuse removal

As indicated in the below illustration (Figure 4.2), 43,8% of Mangaung residents make use of the municipality or private companies at least once a week to remove their refuse. In the Free State, households rated the municipality's services, and 51,3% rated it an excellent performance whereas 9,0% mentioned they had no access to municipal services to remove their household waste (StatsSA, 2019).

There are individual role players in managing and reducing food waste. The government can introduce new policies, waste management companies can deviate food waste from landfills, and society can assist by being aware of discarding practices at households' levels. The South African government is committed to halving food waste by 2030 (SDG 12 target 3). In order for this to happen, they need to adjust the laws and introduce new legislation. Waste management companies are searching for other sustainable solutions than just landfills to offer better ways to dispose of food waste (SDG 12 target 3).

More awareness and knowledge about composting is needed as vegetable trimmings are added to the soil as a natural fertiliser. According to the results, consumers do not consider it necessary to throw away vegetable or fruit peels (64,4%)(n= 352). This may indicate that they are already active with, or positive towards, composting by using the vegetable and fruit peels. Consumers at home should be more aware of what they discard

and should consider using an appropriate composting method (Averda, 2019). Composting methods include cold composting, hot composting, industrial composting, mechanised turning-unit compost systems, sheet composting or trench composting (Carter & Carter, 2019).

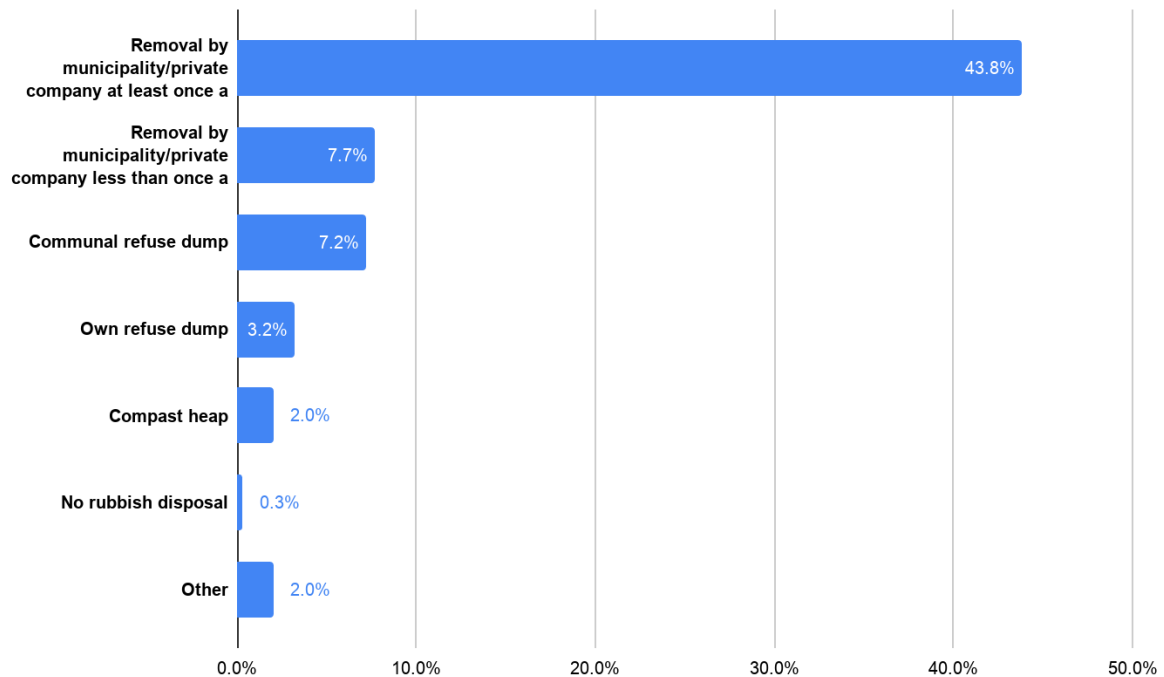


Figure 4.2: Refuse removal methods used in Mangaung

The consumers indicated that 37,3% give edible food away to someone else, while 26,8% never give edible food away to someone in need. Almost two-thirds of consumers (60,5%) never separate their food waste from other waste. Only 20,4% always separate their waste. Separating the waste in different categories (i.e. plastic; glass; paper; metal; organic) is the best way to recycle and is a low costing method, which is also easy to implement (Ludwig, 2016). A mere 12,3% of the consumers compost organic material. Most of the consumers (79,7%) never pour liquid waste down the drain. It is important to note that 44,1% of consumers give food to domestic animals.

Giving food to domestic animals is not always considered beneficial or ethical. Domestic animals have a different digestive system than humans and can therefore not eat all the food humans eat. Some of the foods that cannot be digested by household pets are chocolate, artificial sweets, grapes, raisins, alcohol, onions, fruit pips, sweets and cooked bones. Another popular trend is to feed household pets uncooked meat, which certain

people believe is a healthy and natural diet. However, if raw meat is not stored correctly and not adequately handled, it can become contaminated and cause foodborne diseases in households pets (Philipson, 2014).

4.5.7 Types of food discarded

Vegetables and Fruit

During the six days prior to the survey, 5,3%, 5,0%, 4,7% and 4,2% discarded tomatoes, cabbage, cucumbers, and peppers, respectively (Table 4.14). Approximately one in ten households (10,2%) discarded tomatoes a week or longer before the survey. Similarly, households discarded potatoes (10,1%), beans (9,2%), and lettuce (9,4%) during the same period. The majority of the consumers indicated that they do not discard vegetable items.

Table 4.14: Vegetable and fruit items discarded

Food Item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago	Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago
Vegetables							Fruit						
Beans	n=361	87,3%	1,7%	1,9%	1,4%	7,8%	Apples	n=362	85,9%	2,2%	1,9%	1,9%	5,8%
Broccoli	n=362	89,8%	0,8%	2,2%	2,2%	5,0%	Avocado	n=362	88,1%	2,2%	1,7%	0,8%	7,2%
Cabbage	n=357	87,7%	0,8%	4,2%	1,4%	5,9%	Bananas	n=361	87,5%	2,8%	1,7%	0,8%	7,2%
Carrots	n=363	87,9%	0,3%	3,6%	1,7%	6,6%	Clementina	n=359	90,8%	1,7%	1,4%	0,6%	5,6%
Cauliflower	n=361	88,9%	0,6%	2,2%	1,7%	6,6%	Grapes	n=356	89,3%	2,0%	2,2%	0,8%	5,6%
Cucumber	n=363	86,2%	0,8%	3,9%	1,9%	7,2%	Melons	n=362	0,9%	0,8%	2,5%	0,3%	5,5%
Lettuce	n=362	86,5%	1,1%	3%	2,5%	6,9%	Oranges	n=360	89,4%	0,6%	2,8%	1,9%	5,3%
Mushroom	n=362	89,5%	1,4%	1,4%	1,9%	5,8%	Pears	n=358	89,1%	0,6%	2,2%	1,1%	5,5%
Onions	n=359	88,3%	2,2%	1,7%	1,4%	6,4%	Strawberry	n=361	89,8%	1,4%	2,2%	1,1%	5,5%
Peppers	n=356	88,2%	0,8%	3,4%	1,4%	6,2%	Berries	n=360	90,0%	0,3%	2,2%	1,9%	5,6%
Potatoes	n=358	86,6%	0,8%	2,5%	3,1%	7,0%	Mango	n=359	90,5%	0,8%	2,5%	0,3%	5,8%
Spinach	n=357	87,4%	0,6%	2,8%	2,5%	6,7%							
Tomatoes	n=361	84,5%	2,5%	2,8%	3,3%	6,9%							
Sweet potato	n=360	88,9%	0,6%	1,9%	2,5%	6,1%							
Pumpkin	n=359	89,4%	0,6%	1,1%	2,8%	6,1%							

Mangaung households indicated that 4,5% discarded bananas, 4,2% discarded grapes and 4,1% discarded apples in 1-6 days before completing the questionnaire. Considering the period of a week or longer before the survey, 8,0% of households discarded avocado

and bananas, 7,7% discarded apples and 7,5% discarded berries. The majority of the consumers indicated that they do not discard fruit items.

In a study done in Kimberley by Cronje, it has been found that bananas and apples are the fruits that are the most wasted, with tomatoes and potatoes as the vegetable that is the most wasted (Cronjé *et al.*, 2018). In another study done in Switzerland, 35,0% of the sample never discarded fruits and vegetables and 68% of the consumers never discard ready to eat food (Visschers *et al.*, 2015).

Meat and Dairy items

Table 4.15 is a summary of the meat and dairy items discarded, as well as the frequency of discarding these items. A minority of households discarded chicken (5,9%) 1-6 days before, and 7,8% discarded chicken a week or longer before the survey. Only 5,8% of the consumers mentioned that they discarded red meat in the six days preceding the survey, while 7,0% discarded red meat a week or longer before questionnaire completion. Considering fish, only 3,4% discarded it 1-6 days before, whereas 8,8% discarded fish a week or longer before the survey.

Table 4.15: Meat and dairy items discarded

Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago	Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago
Meat							Dairy						
Chicken	n=359	86,4%	2,8%	3,1%	0,6%	7,2%	Cheese	n=358	89,4%	1,4%	3,6%	0,6%	5,0%
Fish	n=360	87,8%	1,7%	1,7%	1,9%	6,9%	Eggs	n=358	89,9%	1,7%	2,2%	0,3%	5,9%
Red meat	n=361	87,3%	2,8%	3,0%	0,6%	6,4%	Milk	n=356	87,6%	2,5%	3,4%	0,8%	5,6%
							Yoghurt	n=359	88,0%	1,1%	3,1%	1,1%	6,7%

A mere 5,9% discarded milk, 5,0% discarded cheese and 4,2% discarded yoghurt during the six days leading up to the survey. A week or longer passed before 6,4% of households discarded milk, 5,6% discarded cheese, and 4,2% discarded yoghurt. Three percent (3,0%) discarded eggs in 1-6 days prior to the survey, while 6,2% discard eggs a week or longer before the survey.

Staples and Other

The majority of the Mangaung households (90,1%) indicated that they never discard maize meal, 4,5% discarded it 1-6 days before, and 5,4% discarded it a week or longer than before the survey (Table 4.16). Samp is never discarded by 91,2% of the households and 1% indicated that they discarded it in preceding 1-6 days before, and 7,0% discarding it a week or more before the survey. Moreover, the majority of Mangaung households do not discard convenience meals (88,8%), treat items (89,0%) or take away meals (88,7%).

Table 4.16: Staples and other items discarded

Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago	Food item	Sample	Never	In the past two days	In the past 3-6 days	A week ago	Longer than a week ago
Staples							Other						
Maize meals	n=353	90,1%	1,7%	2,8%	0,6%	4,8%	Convenience Meals	n=357	88,8%	1,4%	2,2%	1,7%	5,9%
Samp	n=354	91,2%	0,3%	1,1%	2,0%	5,4%	Treat items	n=356	89,0%	2%	1,7%	0,6%	6,7%
							Take away meals	n=354	88,7%	1,7%	2,5%	1,1%	5,9%

In conclusion, it is evident from Tables 4.14; 4.15 and 4.16, the Mangaung households reported that they do not often discard food items. All items discarded in less than a week preceding the survey, occurred in less than 5,0% of households.

4.6 Relationships

4.6.1 Relationship between food bought, consumed or discarded

Consumers were presented with the same list of food at different intervals in the questionnaire, indicating which items they purchased (Table 4.3), consumed (Table 4.10) and discarded (Table 4.14). The questions determined when last the household bought any of these food items, when last it was consumed in a meal and the last time any of these food items were discarded. The consumers were given a list of the most common food items grouped in vegetables, fruit, meat and dairy and others. The last-mentioned group included two staples (maize meal and samp).

Pearson correlations were used to determine the relationship between the food items purchased, consumed or discarded. At first, the data were collapsed to each food group and were then correlated by using the principal component analysis. Zero indicates no correlation, minus (-) indicates a negative correlation, while plus (+) indicates a positive correlation. In the context of this study, positive implies that the food items that were bought were consumed by the consumers and was not necessarily discarded. Strength (r)¹ and direction were used to report the data.

Figure 4.3 is a visual representation of the data output of the correlations.

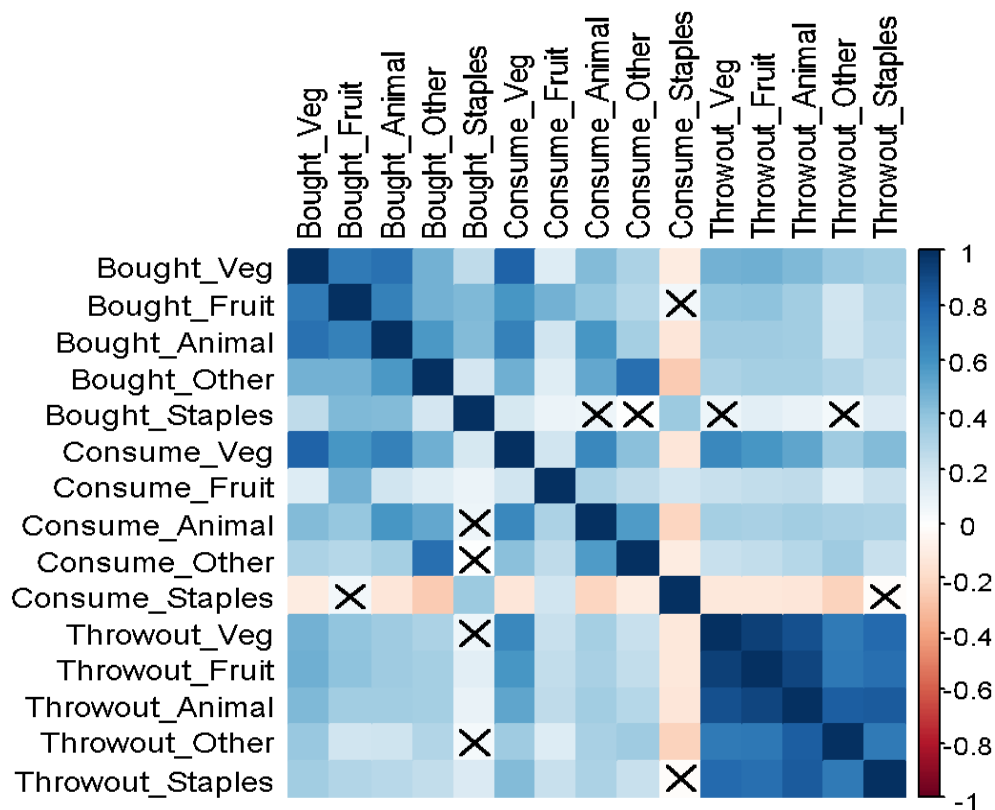


Figure 4.3: Relationship between food items purchased, consumed and discarded

Refer to figure 4.3. There is a moderate positive correlation ($r=0.8$) between vegetables consumed and vegetables purchased. The relationship between vegetables purchased and vegetables discarded is weak ($r=0.3$). This is indicative that consumers in Mangaung

¹ $r=0$ - no correlation; $0 < r < \pm 0.4$ = weak correlation; $\pm 0.4 \leq r < \pm 0.7$ = moderate correlation; $\pm 0.7 \leq r < \pm 1$ = strong correlation; ± 1 = perfect correlation.

purchase vegetables, they consume the vegetables they bought, and only a small amount would be discarded.

There seems to be a moderate relationship ($r=0.5$) between purchasing fruits and fruit consumption. There is a weak correlation ($r=0.2$) between consuming and discarding fruit, confirming the consumers' self-reporting of food items discarded, as discussed in the previous section.

There is a strong correlation ($r=0.7$) between purchasing and consuming meat. The correlation between purchasing and consuming meat and discarding it, is weak ($r=0.2$). Comparing the purchasing and consumption of staples resulted in a moderate correlation ($r=0.4$), as well as a weak correlation compared to discarding staples ($r=0.1$). These findings are confirmed by the limited discarding of food reported by the households in Mangaung.

4.6.2 Relationship between income and food waste

Supermarkets in lower-income areas, with more food insecure consumers, stock less healthy and lower quality food, compared to supermarkets in high-income areas. Consumers in low-income areas have greater access to healthy food, because of financial constraints. There are consumers from low-income status, different educational levels and food security status, stating that healthy foods are not expensive. However, in South Africa and other countries, there is evidence that healthier foods are often more expensive. It is also important to note that healthier food may have a different meaning for low-income and high-income consumers. Consumers in a township in Cape Town, Gugulethu, classify maize meal, chicken strips, sweets, puffed corn, Fanta and Lemon Twist as healthy. A low-level of education may also play a part in the understanding of healthy and nutritional food. However, the most influential factor is the price when choosing where to make purchases (Odunitan-Wayas *et al.*, 2018).

According to Visshcers *et al.* (2015), the amount of money spent on grocery shopping is related to the amount of food wasted and that households with a higher food budget tend to waste more food. Also, consumers spending more money on eating out, tend to waste more food, as well as forgetting about food that is stored at home. Among the Mangaung consumers, it was found that the lower-income households reported less incidents of discarding food. Higher income groups obtained significant ANOVA p-values (p-

value=0.01), as opposed to lower-income groups (p-value=0.32). Furthermore, education was not a significant indicator for household food waste (p-value=4.73).

The results indicated various everyday food purchasing, storing, eating habits and discarding practices, displayed by Margaung consumers. A more in-depth look is needed to suggest possible reasons for consumers to act in this manner, as well as expanding on what the behaviour means for the household food waste theory. The next chapter will be a discussion on the conclusions and recommendations for all the findings in this study.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Summary of the key findings

The general aim of this research was to investigate food purchasing, food storage, eating practices and discarding practices, which contribute to food waste in households and also to establish what types of food are being wasted in Mangaung, Free State.

5.1.1 Food purchasing, storing and consumption behaviour

Mangaung consumers mostly use convenience supermarkets to purchase their groceries and visit stores monthly to make their grocery purchases. It is possible that time constraint is not the reason for this, rather personal transport, as many make use of public transport, limiting the amount that can be purchased.

Mangaung consumers indicated that only a few always use a shopping list when doing grocery shopping. This practice is a concern, as habitual purchases instead of planned purchases, might lead to an increased amount of household food waste. Moreover, food items are purchased before all food that is currently in the kitchen is used or eaten.

Meal planning is considered an essential factor to reduce food waste, and Mangaung consumers need assistance in this regard, as only 40,8% plan for their meals in advance. Leftover food is not a major concern among Mangaung consumers and cannot be expected to be a major driver towards food waste as Mangaung consumers strongly agree that it is safe to eat leftover food after preparation. Also, more than half of the consumers mentioned that they do not cook more than they can eat in a single meal.

Consumers in Mangaung are well aware of correct storage practices that may reduce food waste. In addition, they do not freeze surplus food in order to decide what to do with it at a later stage, and in many instances, the left-over food is consumed the following day. This may indicate that Mangaung consumers do not prepare more food than necessary, consume it the next day or they eat all the food that was prepared, so there is

no need to freeze prepared food. Nevertheless, more consumers need to use clear containers when storing food in the refrigerator, as this is a method to reduce food waste. Most of the consumers own a refrigerator and most also indicated that they stored their food items in the refrigerator.

5.1.2 Food discarding practices

Considering the discarding practices in Mangaung, certain factors need to be addressed. Mangaung consumers are unsure about the safety of food after its use-by, sell-by or best-before date is reached, and feel it is necessary to discard food items that are past its use-by date. It is not necessary to immediately discard food products after the date has expired, as in most instances it is safe to eat. However, if consumers lack knowledge and confidence to determine if the food is safe to consume, it will be discarded. Nevertheless, many indicated that they would become sick if the food that is past its use-by date is consumed, which is not necessarily true.

The majority of Mangaung consumers do not discard excess ingredients from a prepared meal. They also do not discard leftovers left on a plate after meals and leftovers are still left in a pot/serving dish. In these instances, it is kept to be consumed at another time. This practice is positive as the discarding of leftovers is one of the major drivers of household food waste. Only half of the Mangaung consumers have control over the amount of food wasted in households, which means the other half of consumers are aware of what is wasted in their households.

Service delivery might be a concern as only 43,8% of Mangaung consumers make use of municipal services for removing their waste, and only 51,3% indicated that the municipality has excellent service. Mangaung consumers are not satisfied with municipal services.

Mangaung consumers do not discard vegetable or fruit peels, and this may indicate that they use it for composting. A concern is that only 20,4% of Mangaung consumers separate their waste. Separating waste is a simple, easy manner to recycle and is also considered as a low costing method. Another socially contested challenge that needs to be addressed is the fact that Mangaung consumers give food to their domestic animals, although a human could still consume it safely.

5.1.3 Food purchased, consumed and wasted

In general, Mangaung households mentioned that they did not discard food items regularly, although certain food items are discarded more than others. Tomatoes are discarded most by Mangaung consumers, yet tomatoes are one of the most consumed food items, as well as onions. The consumers indicated that they like to eat pap (maize meal) paired with onions and tomatoes as the main meal and this also indicates why Mangaung consumers purchase tomatoes and onions more frequently than other vegetables.

The most bought fruits are apples and bananas, thus they are the most consumed and most discarded fruit items. Chicken is the most bought and consumed meat item and only a few consumers indicated that they discard chicken. Milk is the most bought, consumed and discarded dairy food item. Milk is one of the main ingredients that are consumed with maize meal and was one of the most often main meals eaten in the past seven days. It may be deduced that pap, made from Maize meal is an essential food item in Mangaung. This can be seen on the frequency with which it was mentioned in the survey when the question was posed concerning the type of main meal eaten. Maize meal was the most bought and consumed food item according to the answers received in the questionnaire.

5.2 Recommendations

It is recommended that further research needs to be conducted concerning the attitudes and perceptions of household generated food waste. A qualitative approach could prove to add valuable information to the current description of practices. Furthermore, these insights could possibly aid in developing intervention and awareness campaigns designed for different consumer groups.

Service delivery and disposal methods of food waste should be established in order to disseminate appropriate and correct information to consumers, increasing awareness. This could be done in cooperation with the government, and have the potential to inform policy.

It could also prove valuable to repeat this study in other parts of the country, in order to draw comparisons amongst consumers.

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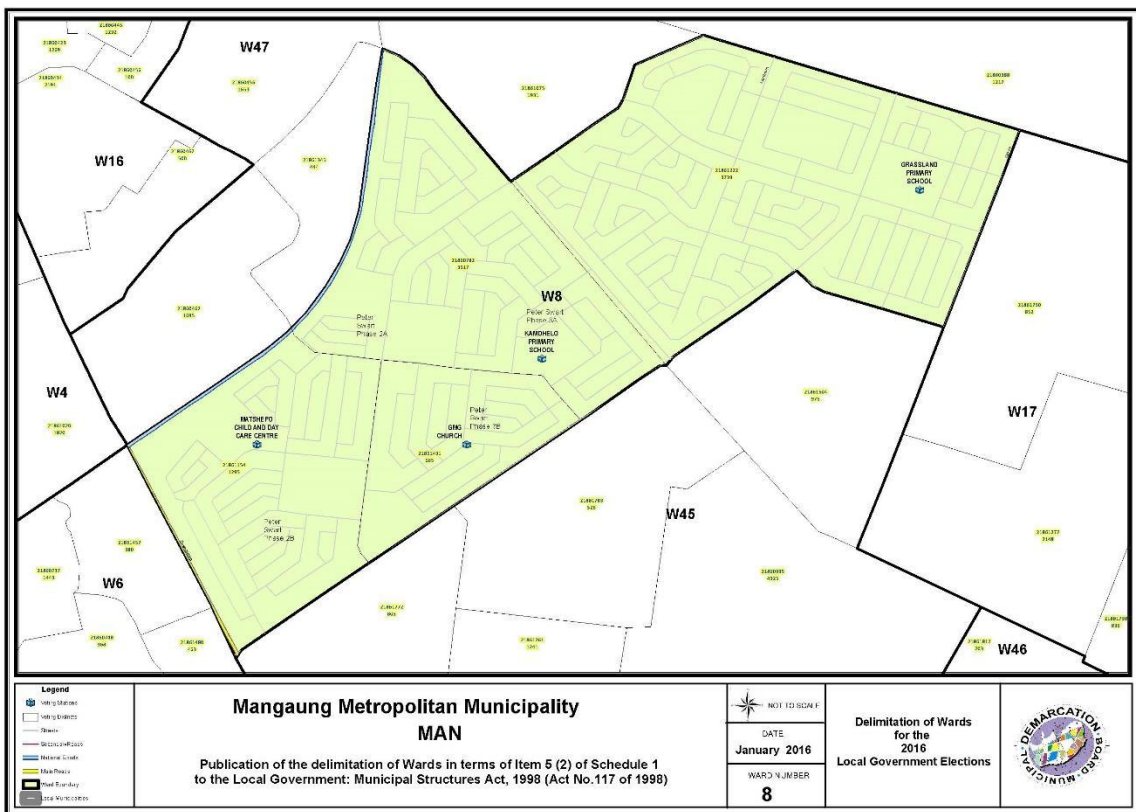
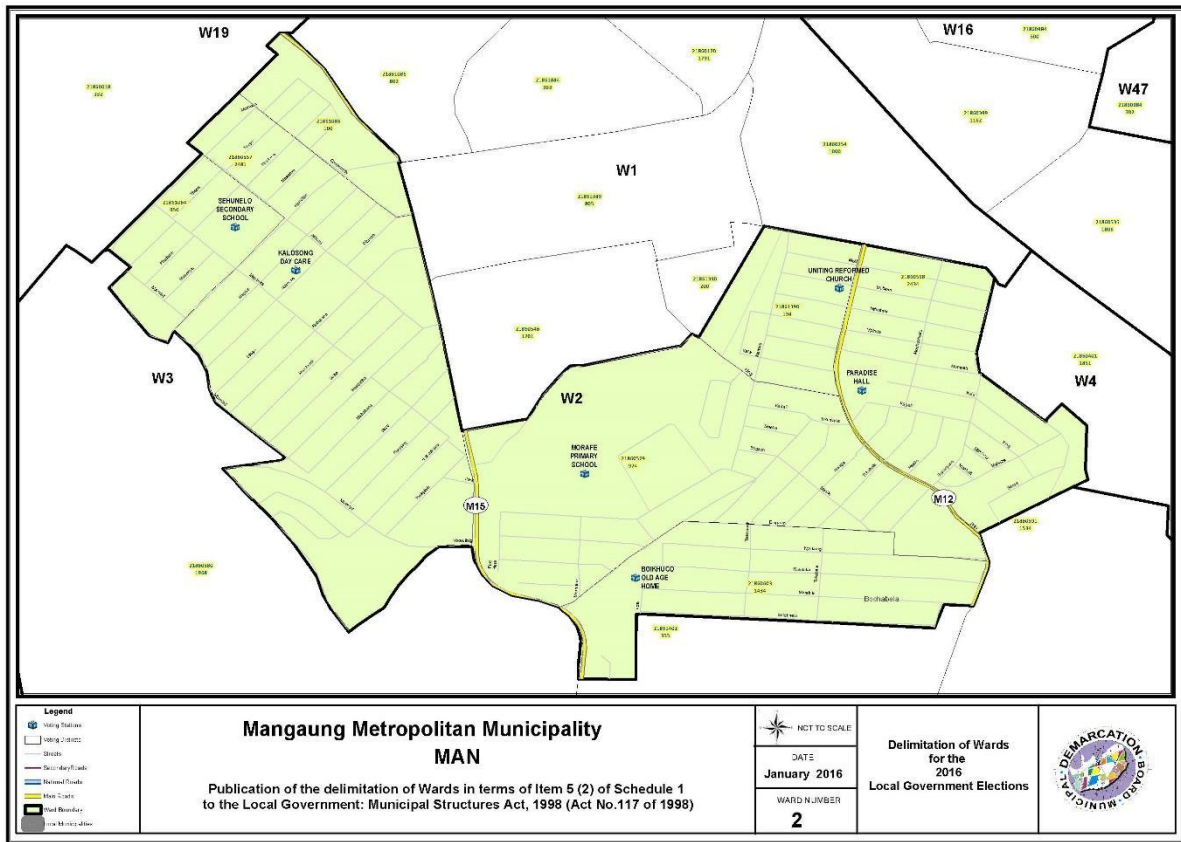
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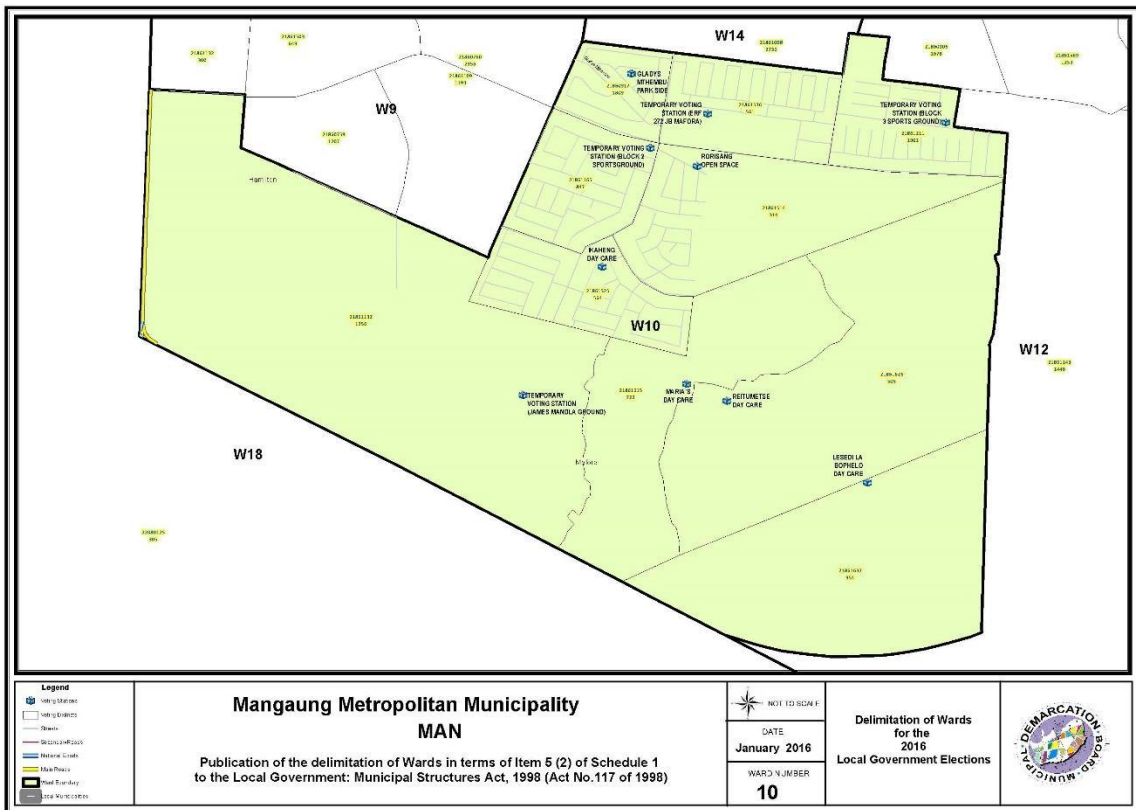
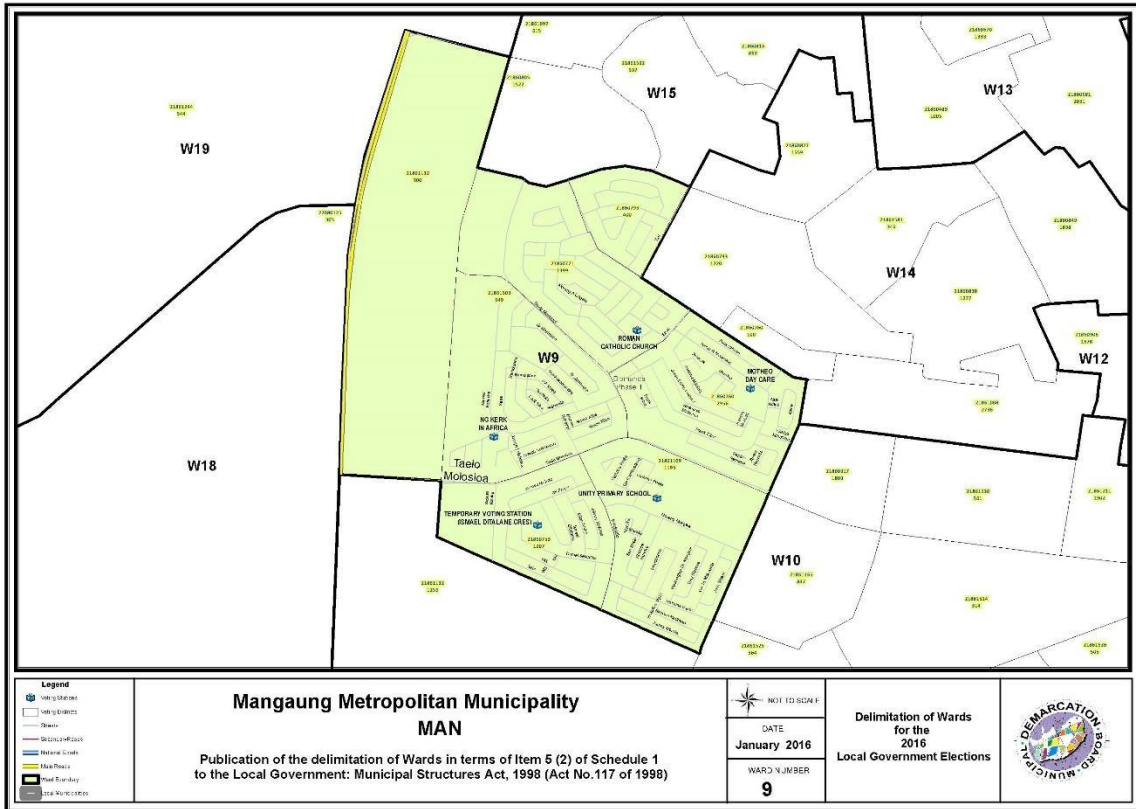
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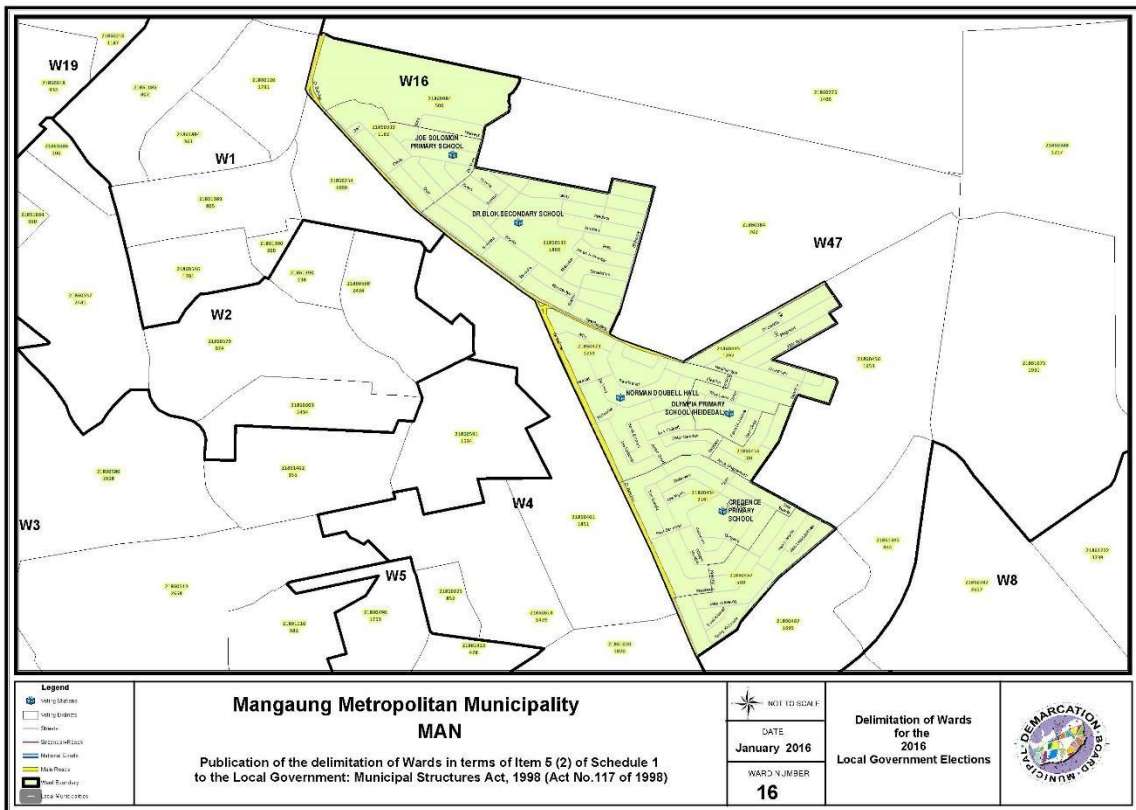
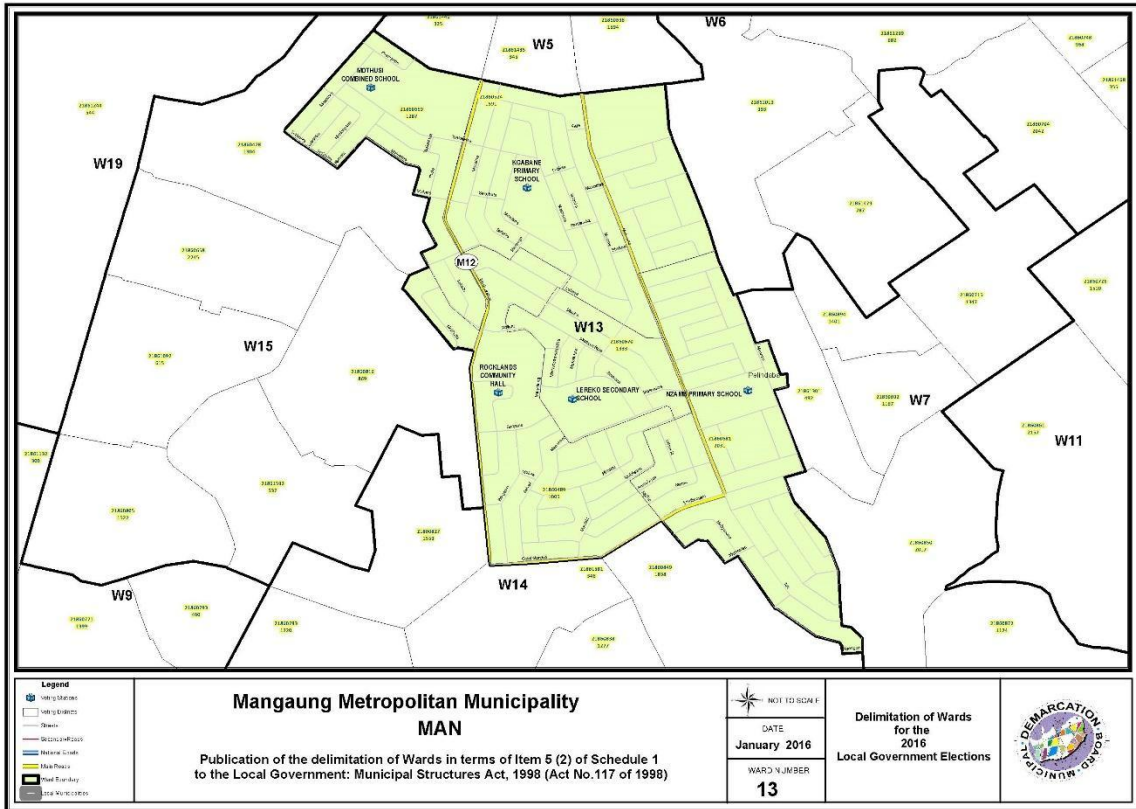
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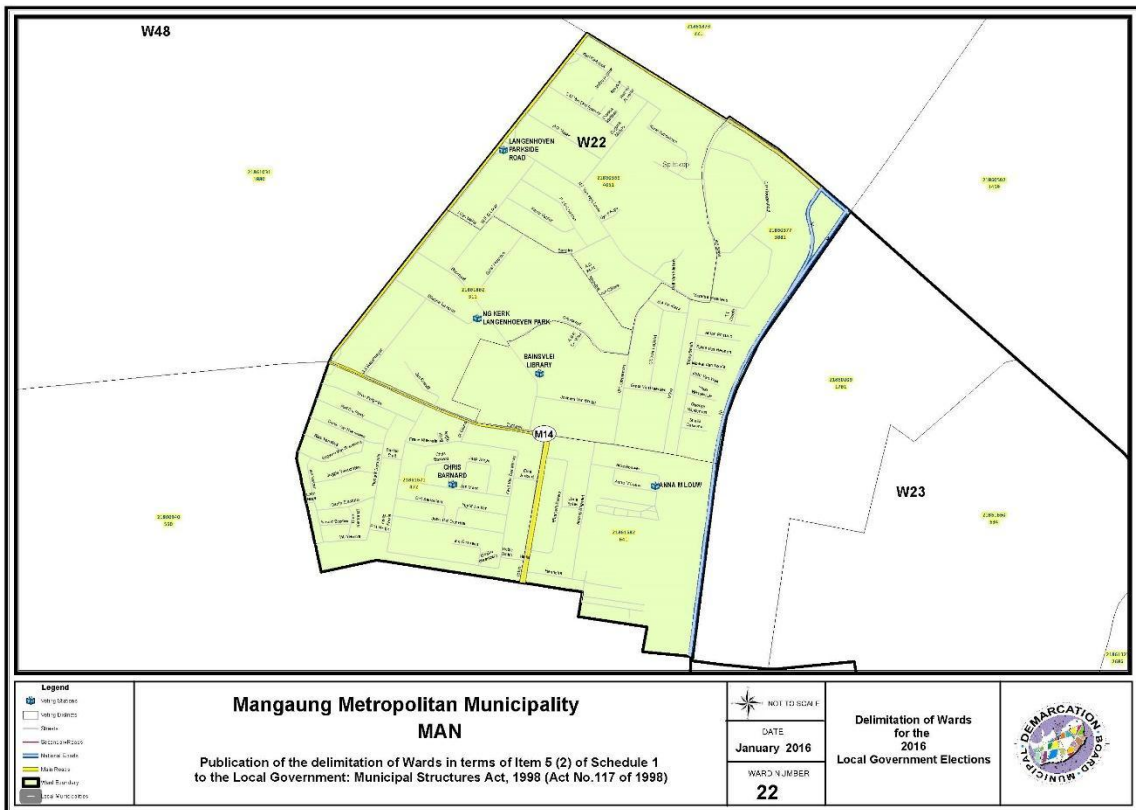
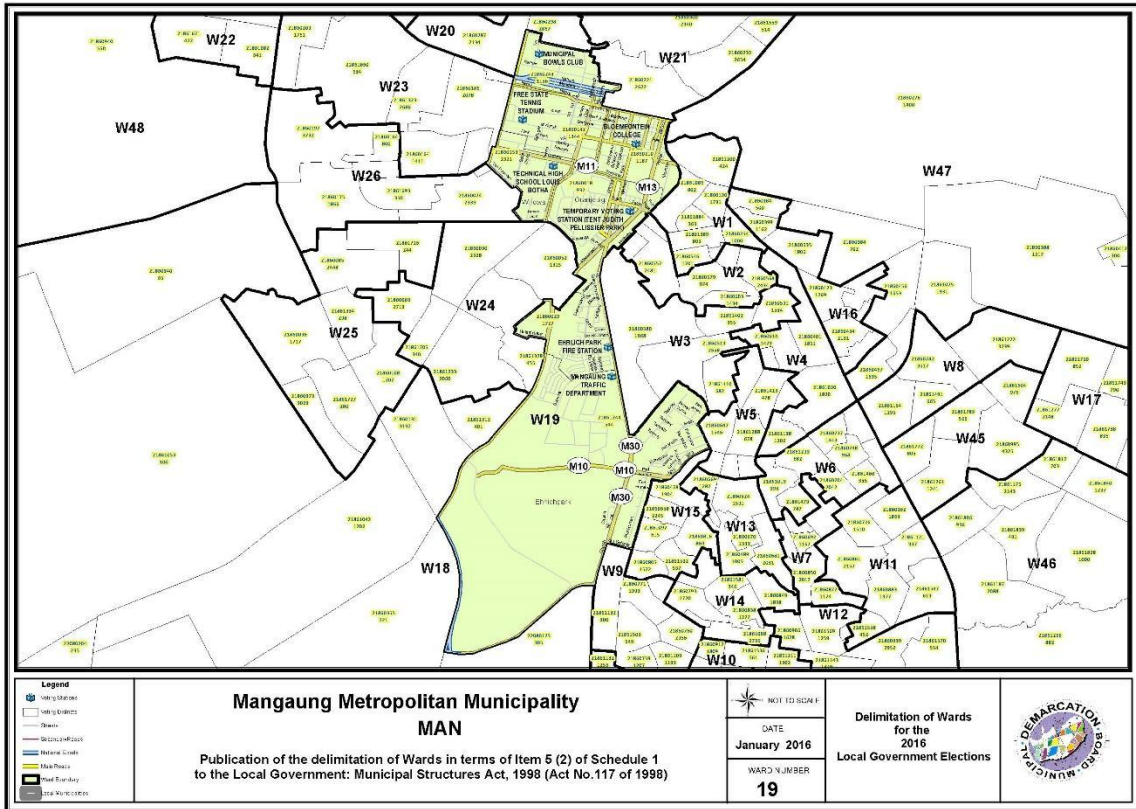
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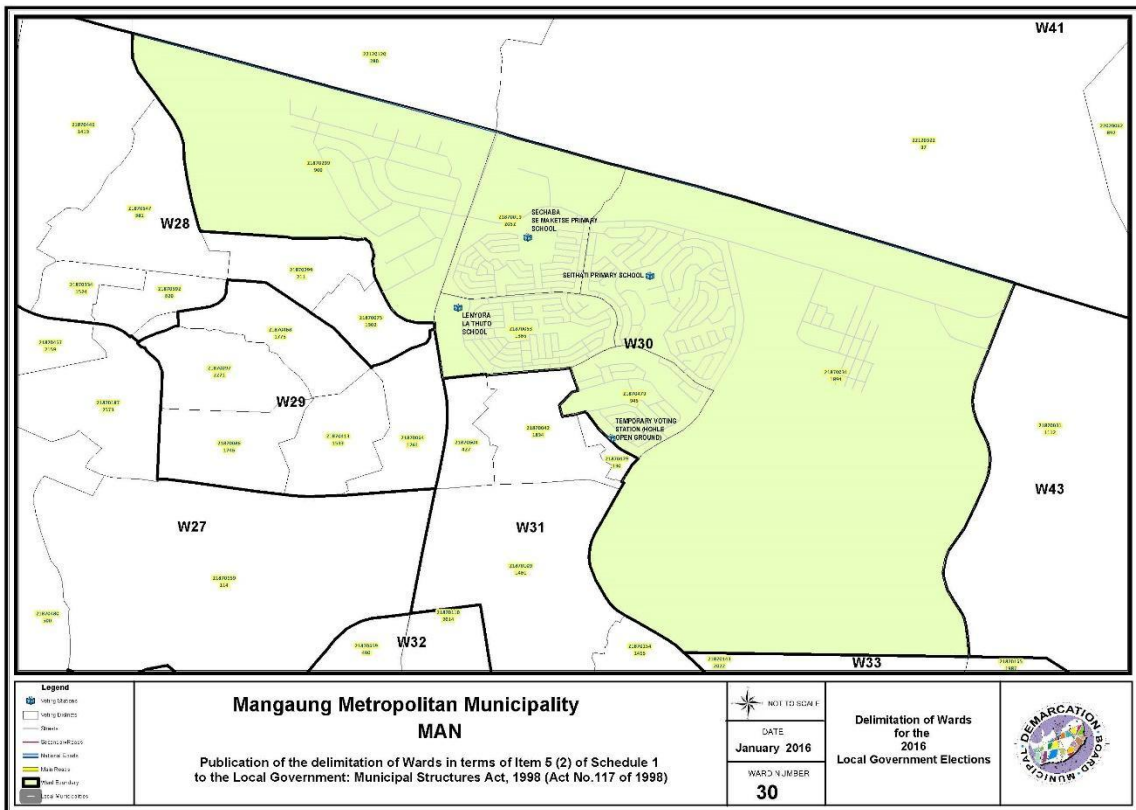
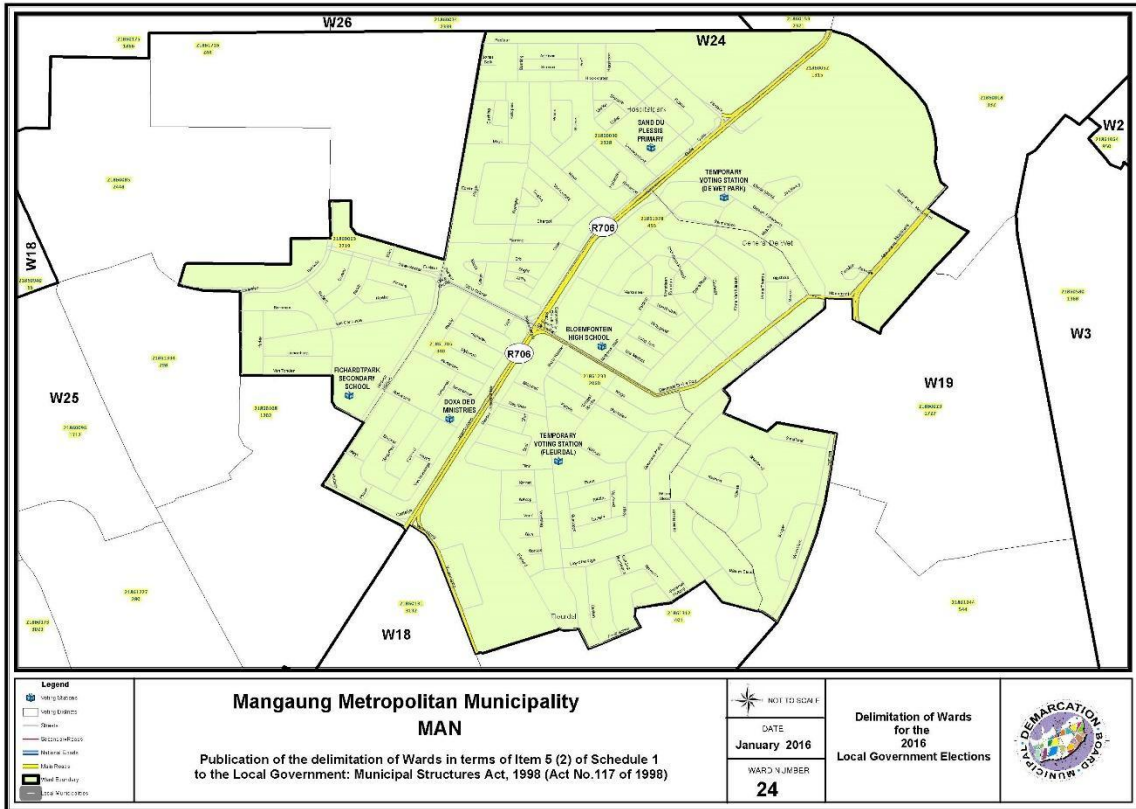
Appendix A – Sample Wards

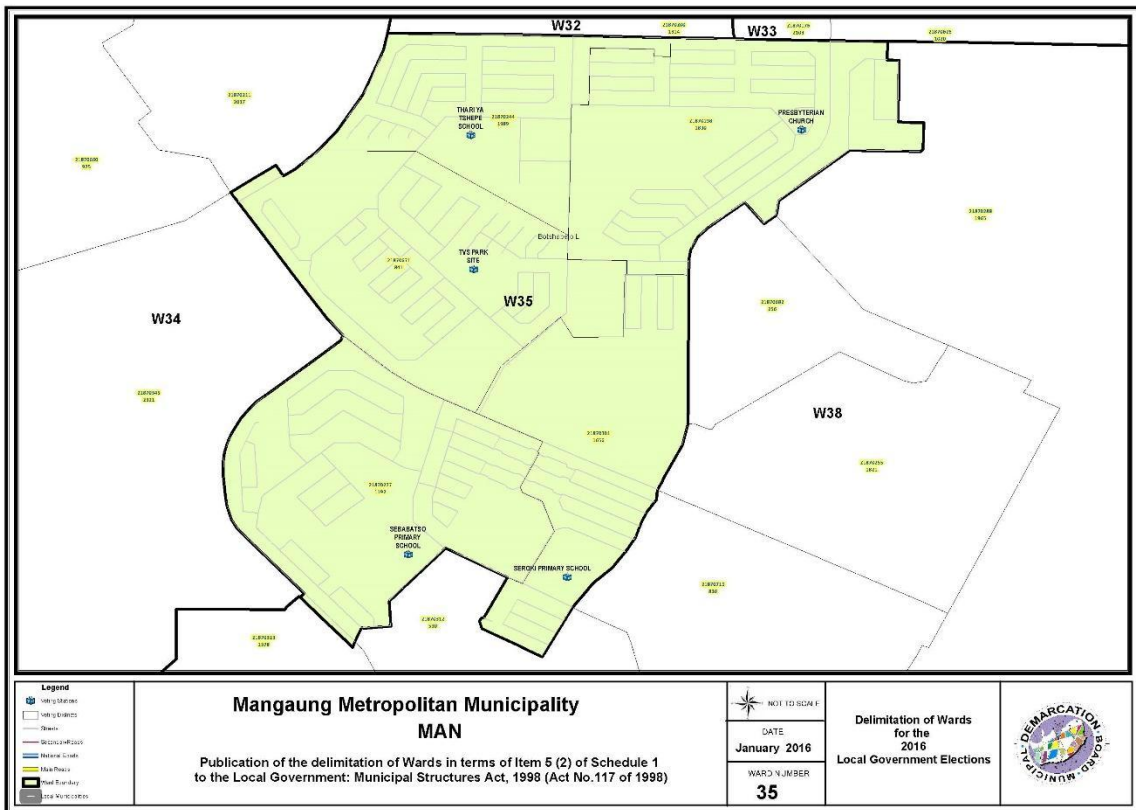
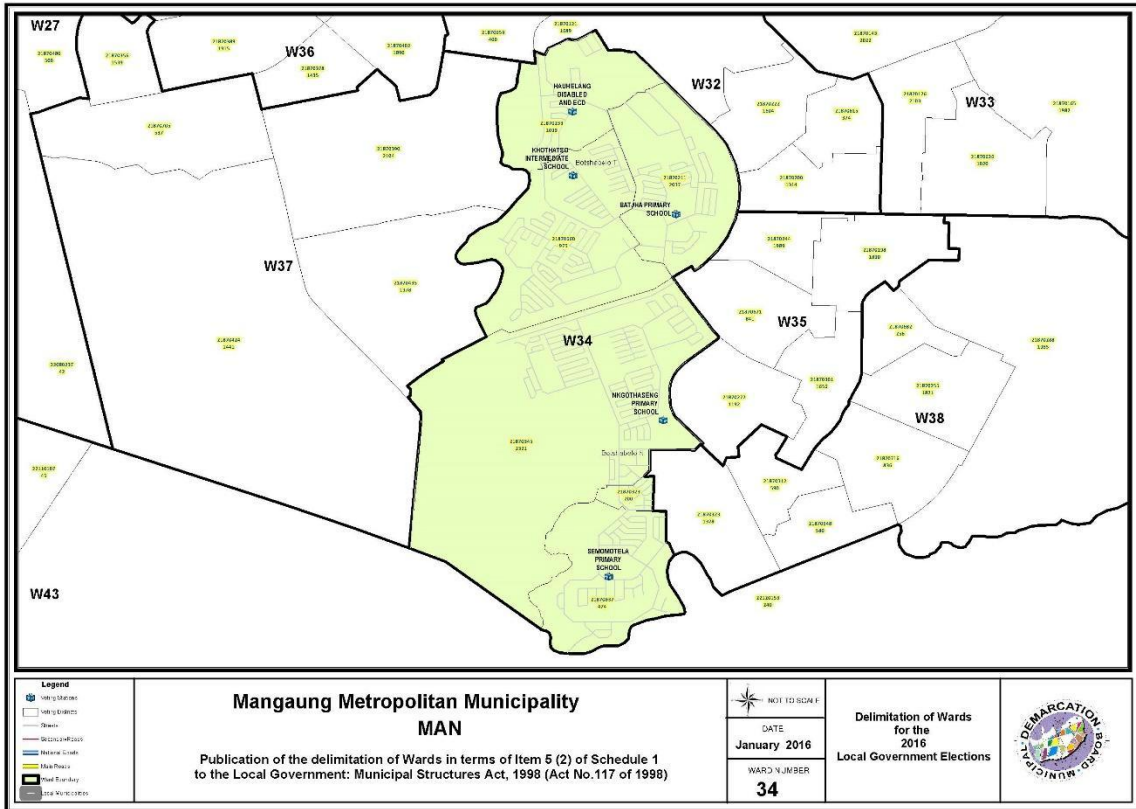


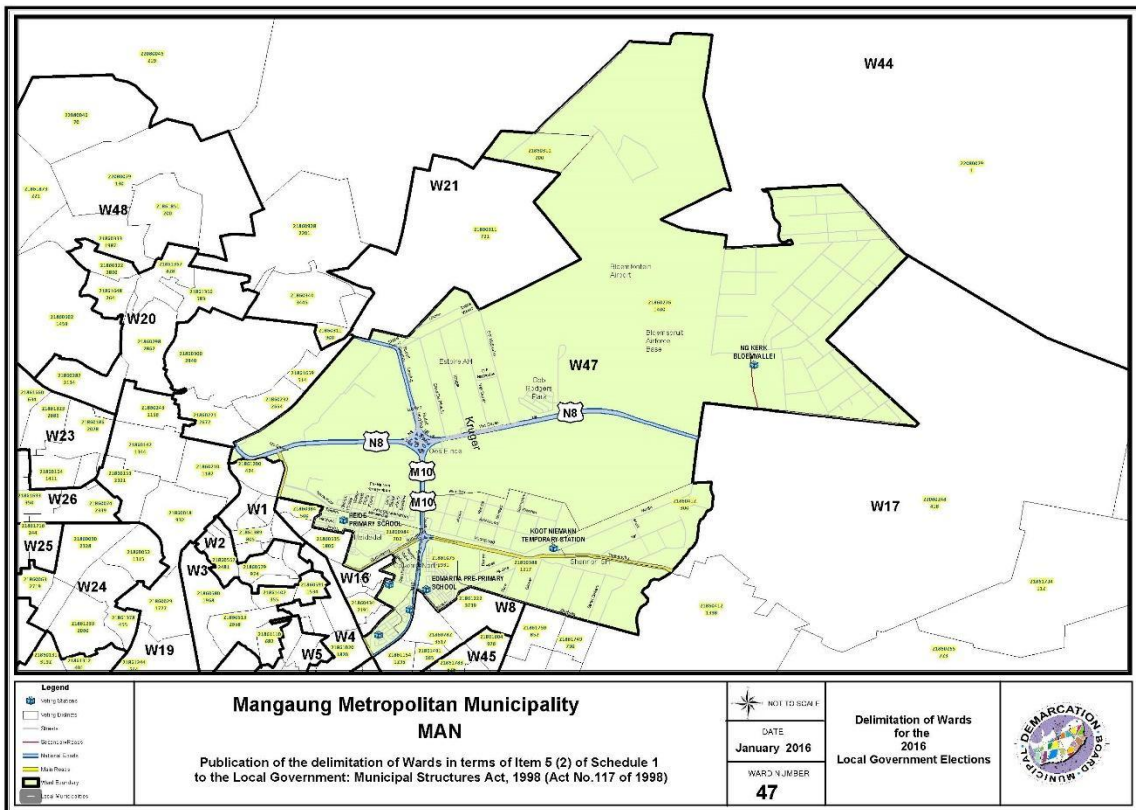
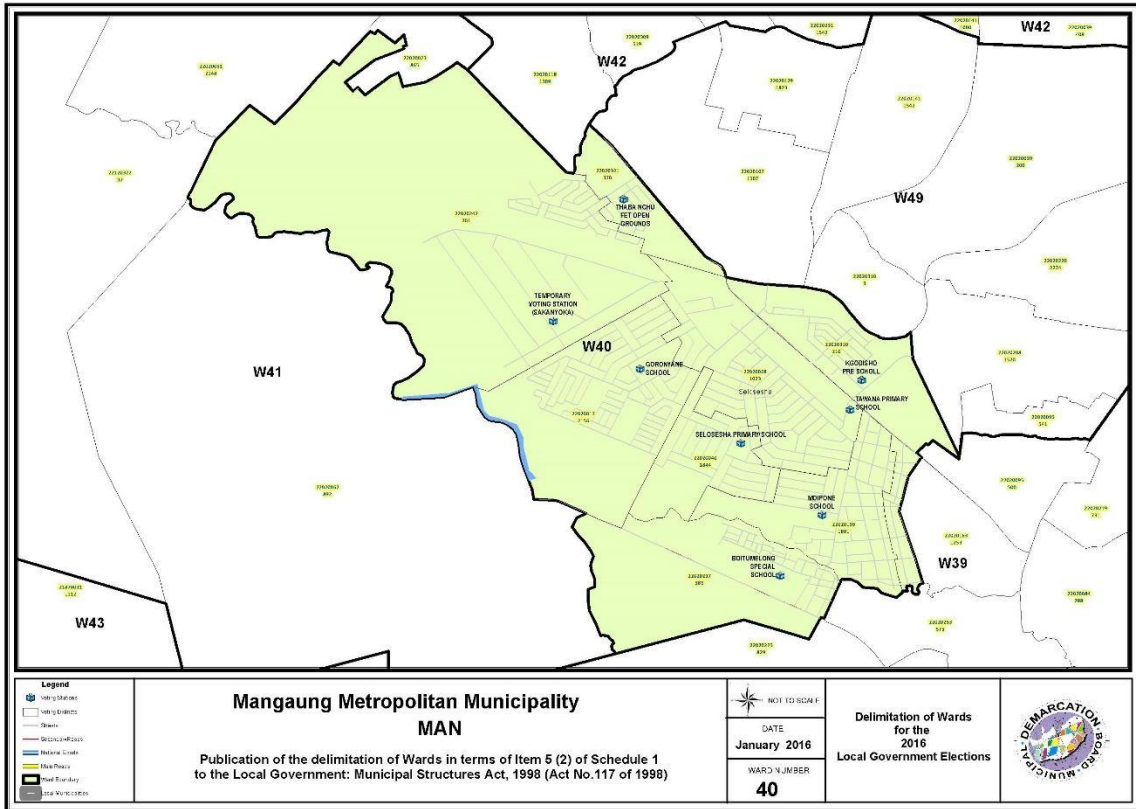


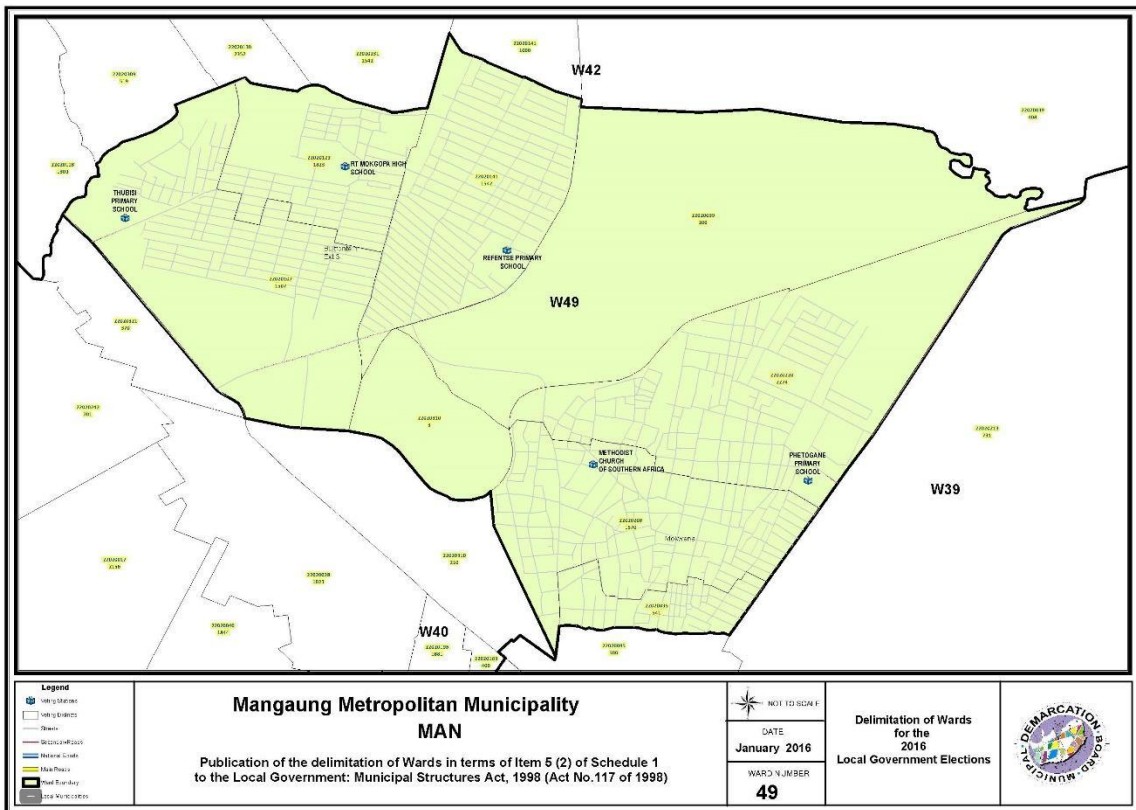
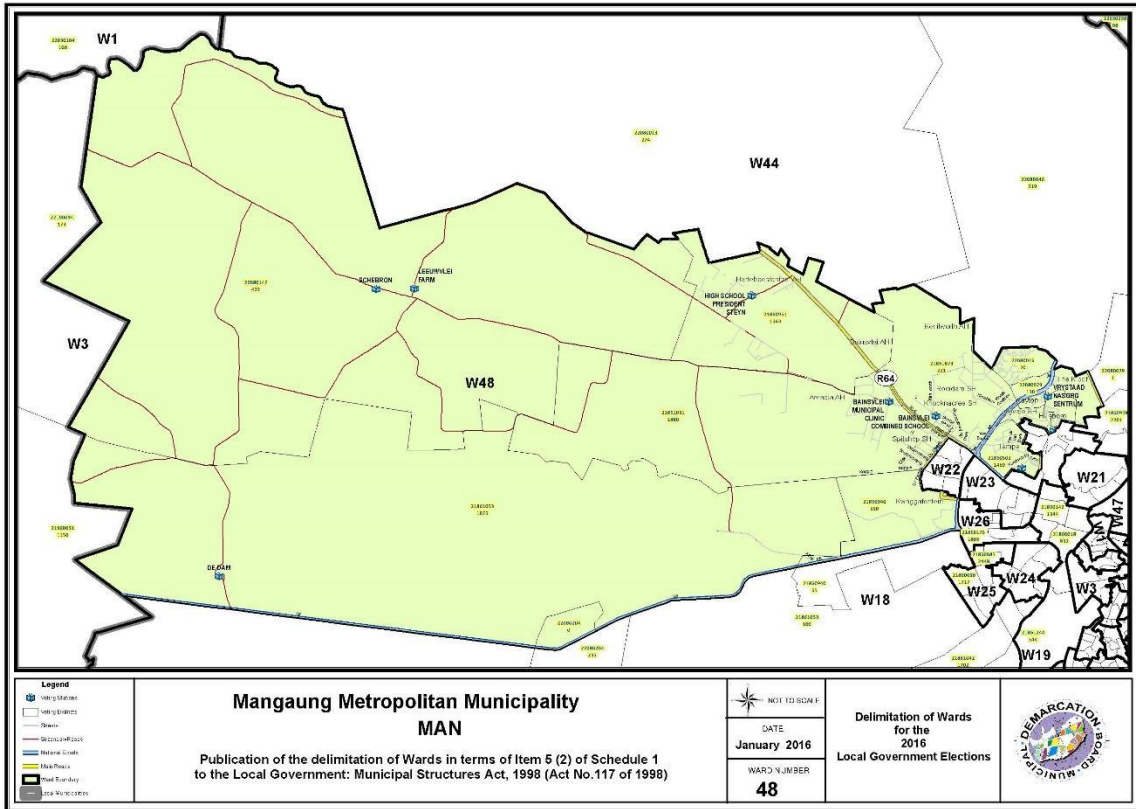












Appendix B - Questionnaire

EvaSys	Household Food Waste in Mangaung	Electric Paper <small>QUALITY SYSTEMS</small>
University of the Free State	MSc Consumer Science	
Consumer Science	Household Food Waste	

Mark as shown: Please use a ball-point pen or a thin felt tip. This form will be processed automatically.
 Correction: Please follow the examples shown on the left hand side to help optimize the reading results.

1. Demographics

- 1.1 What is the predominant language (Mother tongue) spoken in the household
- | | | |
|------------------------------------|------------------------------------|--|
| <input type="checkbox"/> Afrikaans | <input type="checkbox"/> English | <input type="checkbox"/> IsiNdebele |
| <input type="checkbox"/> IsiXhosa | <input type="checkbox"/> IsiZulu | <input type="checkbox"/> Sepedi |
| <input type="checkbox"/> Sesotho | <input type="checkbox"/> Setswana | <input type="checkbox"/> Sign language |
| <input type="checkbox"/> Siswati | <input type="checkbox"/> Tshivenda | <input type="checkbox"/> Xitsonga |
| <input type="checkbox"/> Other | | |
- 1.2 How many people are currently living in this household (sleeping here 5 nights a week)
- | | | |
|------------------------------------|------------------------------|------------------------------|
| <input type="checkbox"/> 1 | <input type="checkbox"/> 2-4 | <input type="checkbox"/> 5-6 |
| <input type="checkbox"/> 7 or more | | |
- 1.3 How many household members are
- | | | |
|---|--------------------------------------|--------------------------------------|
| <input type="checkbox"/> 0-1 year | <input type="checkbox"/> 2-5 years | <input type="checkbox"/> 6-13 years |
| <input type="checkbox"/> 14-18 years | <input type="checkbox"/> 19-24 years | <input type="checkbox"/> 25-64 years |
| <input type="checkbox"/> 65 years and older | | |
- 1.4 Please estimate your household's combined monthly income
- | | | |
|--|--|--|
| <input type="checkbox"/> No income | <input type="checkbox"/> R1 - R4 800 | <input type="checkbox"/> R4 801 - R9 600 |
| <input type="checkbox"/> R9 601 - R19 600 | <input type="checkbox"/> R19 601 - R38 200 | <input type="checkbox"/> R38 201 - R76 400 |
| <input type="checkbox"/> R76 401 - R153 800 | <input type="checkbox"/> R153 801 - R307 600 | <input type="checkbox"/> R307 601 - R614 600 |
| <input type="checkbox"/> R614 601 - R1 228 800 | <input type="checkbox"/> R1 228 801 - R2 457 600 | <input type="checkbox"/> R1 228 801 - R2 457 600 |
| <input type="checkbox"/> More than R2 457 601 | <input type="checkbox"/> I don't want to disclose our household's income | |
- 1.5 What is the source of energy that you use for your cooking
- | | | |
|--------------------------------------|------------------------------------|--------------------------------------|
| <input type="checkbox"/> Animal dung | <input type="checkbox"/> Coal | <input type="checkbox"/> Electricity |
| <input type="checkbox"/> Gas | <input type="checkbox"/> Open Fire | <input type="checkbox"/> Paraffin |
| <input type="checkbox"/> Wood | <input type="checkbox"/> Other | |
- 1.6 If other, please specify
-
- 1.7 Does your household own any of the following goods and services in a working order
- | | | |
|------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> Cellphone | <input type="checkbox"/> Computer | <input type="checkbox"/> Electric or gas stove |
| <input type="checkbox"/> Motor car | <input type="checkbox"/> Refrigerator | |
- 1.8 What is the highest education of the person doing the food shopping for the household
- | | | |
|--|---|--|
| <input type="checkbox"/> No Schooling | <input type="checkbox"/> ABET | <input type="checkbox"/> Primary School up to Grade 7 |
| <input type="checkbox"/> Secondary schooling up to but excluding Matric | <input type="checkbox"/> Matric/Grade 12 or equivalent | <input type="checkbox"/> Post-school diploma/certificate |
| <input type="checkbox"/> Bachelor Degree / Honours Degree / Advanced Diploma | <input type="checkbox"/> Post graduate degree (Masters/PhD) | |
- 1.9 What is the employment status of the person taking responsibility for most of the food shopping
- | | | |
|--|--|--|
| <input type="checkbox"/> Still in school | <input type="checkbox"/> Student | <input type="checkbox"/> Formally employed full-time |
| <input type="checkbox"/> Formally employed part-time | <input type="checkbox"/> Self-employed | <input type="checkbox"/> Unemployed |
| <input type="checkbox"/> Retired | <input type="checkbox"/> Other | |
- 1.10 If employed, what are the working hours of the person doing most of the food shopping in the household
- | | | |
|--|--|--|
| <input type="checkbox"/> Office hours between 8:00 - 17:00 | <input type="checkbox"/> Shifts between 7:00 and 19:00 | <input type="checkbox"/> Shifts between 19:00 - 7:00 |
| <input type="checkbox"/> Flexible working hours | | |
- 1.11 When does the person doing the shopping usually go to the shops to buy food
- | | | |
|---|---|---|
| <input type="checkbox"/> Before 8:00 in the morning | <input type="checkbox"/> Between 8:00 and 12:00 | <input type="checkbox"/> After 12:00 but before 14:00 |
| <input type="checkbox"/> After 14:00 but before 17:00 | <input type="checkbox"/> After 17:00 | |



1. Demographics [Continue]

To what extent does the person doing the food shopping have difficulty in doing any of the following

	No difficulty	Some difficulty	A lot of difficulty	Unable to do so	Don't know
1.12 Reading (Magazine/Newspaper article/Book) in any language	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.13 Writing their name	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.14 Filling in a form	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.15 Calculate change received when buying something	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Knowledge and Awareness of Food Waste

To what extent do you disagree/agree with the following statements, with 1 indicating that you strongly disagree and 5 that you strongly agree

	1 Strongly Disagree	2	3	4	5 Strongly Agree
2.1 Food waste is only a problem for wealthy households	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 There will be less hungry people in South Africa if every household throws out less food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3 There will be more water in South Africa if every household throws out less food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4 Food waste contributes to increased food production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5 The amount of food that households throw out contributes to climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6 The amount of food that households throw out makes it difficult for municipalities to remove the waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7 The agricultural sector wastes more food during production than all individual households in South Africa combined	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8 The amount of food that households throw out is negative for South Africa's economy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

To what extent do you consider it necessary to throw away the following items, with 1 indicating not at all, and 5 indicating that it is definitely necessary

	1 Not at all	2	3	4	5 Definitely
2.9 Food items that are past their use-by date	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.10 Vegetable or fruit peels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.11 Excess ingredients from a prepared meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.12 Meat trimmings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.13 Leftovers on a plate after a meal (scrapings)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.14 Leftovers still in the pot/serving dish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.15 Organs from animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.16 Food that fell on the floor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.17 Food that were not stored properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.18 The last bit of condiments(mayonnaise, tomato sauce) in the jar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



3. Attitude towards Food Waste

Please indicate the extent to which you disagree/agree with the following statements, with 1 indicating that you completely disagree and 5 indicating that you completely agree with the statement

	1	2	3	4	5
3.1 It is expected that you eat all the food on your plate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2 Having a well-stocked food cupboard is a sign of prosperity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3 You will become sick if you eat food that is past its use-by date	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4 Serving large amounts of food is a sign of affluence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5 Leftover food is still good to eat a day after it was made	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6 The amount of food that we throw out on a weekly basis is more or less similar to that of most families we know	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.7 Leftover food is still good to eat a week after it was made	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.8 Our household dislikes eating leftover food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9 I feel guilty that there are people that go hungry every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.10 I feel guilty when I throw out food items	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.11 We buy large amounts of food because there is not enough time to go to the shops regularly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.12 It is considered a sign of hospitality to serve an abundance of food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Practices regarding Food Waste

Food Purchasing Practices

4.1 How often would you buy food items for the household	<input type="checkbox"/> Daily	<input type="checkbox"/> Every 2-3 days	<input type="checkbox"/> Every 4-6 days
	<input type="checkbox"/> Weekly	<input type="checkbox"/> Monthly	<input type="checkbox"/> As needed
4.2 Where do you buy the majority of food consumed by the household	<input type="checkbox"/> Convenience supermarkets	<input type="checkbox"/> Hypermarkets	<input type="checkbox"/> Street vendors
	<input type="checkbox"/> Independent retailers	<input type="checkbox"/> On-line food stores that offer this service	<input type="checkbox"/> Spaza shops
	<input type="checkbox"/> Supermarket chains	<input type="checkbox"/> Upmarket chains	<input type="checkbox"/> Wholesalers
	<input type="checkbox"/> Other		
4.3 How often do you use a shopping list when buying groceries	<input type="checkbox"/> Always	<input type="checkbox"/> Often	<input type="checkbox"/> Regularly
	<input type="checkbox"/> Occasionally	<input type="checkbox"/> Seldom	<input type="checkbox"/> Never

Where do you store the majority of the following items

	Not applicable	Fridge	Kitchen Counter	Cupboard	Pantry (Inside)	Pantry (Outside)	Other
4.4 Whole fruit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.5 Root vegetables (i.e. sweet potato)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.6 Leafy vegetables (i.e. broccoli)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.7 Fresh Meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.8 Milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.9 Bread	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.10 Leftovers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



4. Practices regarding Food Waste [Continue]

When last did you buy any of the following items

	Never	In the past 2 days	In the past 3-6 days	A week ago	Longer than a week ago
Vegetables					
4.11 Beans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.12 Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.13 Cabbage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.14 Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.15 Cauliflower	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.16 Cucumber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.17 Lettuce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.18 Mushrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.19 Onions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.20 Peppers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.21 Potatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.22 Spinach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.23 Tomatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.24 Sweet Potato	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.25 Pumpkin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fruit					
4.26 Apples	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.27 Avocado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.28 Bananas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.29 Clementina	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.30 Grapes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.31 Melons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.32 Oranges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.33 Pears	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.34 Strawberries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.35 Berries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.36 Mango	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meat and Dairy					
4.37 Chicken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.38 Fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.39 Red meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.40 Cheese	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.41 Eggs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.42 Milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.43 Yoghurt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other					
4.44 Convenience Meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.45 Maize Meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.46 Samp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.47 Treat Items (i.e. chocolates)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.48 Take Away Meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



4. Practices regarding Food Waste [Continue]

Food storage practices

After buying the following items, when do you pack it away

	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not applicable	Immediately	Within 1-5 hours	Longer than 6 hours	Following day	After 2 days
4.49 Whole fruit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.50 Root vegetables (i.e. sweet potato)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.51 Leafy vegetables (i.e. broccoli)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.52 Fresh meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.53 Milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.54 Bread	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Eating habits/practices

4.55 Name the main meals that your family ate for the past 7 days

4.56 When do you eat the main meal of the day

- Breakfast Lunch Dinner
 We don't have a main meal Other

4.57 If other please specify

4.58 How often do you eat the main meal as a family where the majority of family members are present

- Never Occasionally Monthly
 Weekly Daily Other

4.59 If you have a weekly or daily main meal as a household, where is this meal eaten

- Always at home Mainly at home Partly at home and partly away from home (i.e. a restaurant)
 Mainly away from home Always away from home

With regards to the main meal of the day, how regularly do you

	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Never	Daily	Every 2-3 days	Every 4-6 days	Weekly	Twice a month
4.60 Plan for this meal at least a day in advance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.61 Go off-plan (deciding to eat a certain meal and then changing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.62 Try new recipes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.63 Have leftovers from a previous meal as this meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.64 Host gatherings of double the number of household members (i.e. dinner party)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



4. Practices regarding Food Waste [Continue]

When last did your family consume a meal with any of the following items

	Never	In the past 2 days	In the past 3-6 days	A week ago	Longer than a week ago
Vegetables					
4.65 Beans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.66 Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.67 Cabbage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.68 Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.69 Cauliflower	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.70 Cucumber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.71 Lettuce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.72 Mushrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.73 Onions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.74 Peppers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.75 Potatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.76 Spinach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.77 Tomatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.78 Sweet Potato	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.79 Pumpkin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fruit					
4.80 Apples	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.81 Avocado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.82 Bananas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.83 Berries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.84 Clementina	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.85 Grapes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.86 Mango	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.87 Melons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.88 Oranges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.89 Pears	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.90 Strawberries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meat and Dairy					
4.91 Chicken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.92 Fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.93 Red meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.94 Cheese	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.95 Eggs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.96 Milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.97 Yoghurt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other					
4.98 Convenience Meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.99 Maize Meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.100Samp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.101Treat Items (i.e. chocolates)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.102Take Away Meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



4. Practices regarding Food Waste [Continue]

Throwing out of food

When last did you throw away the following items

	Not applicable	In the past 2 days	In the past 3-6 days	A week ago	Longer than a week ago
Vegetables					
4.103 Beans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.104 Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.105 Cabbage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.106 Carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.107 Cauliflower	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.108 Cucumber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.109 Lettuce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.110 Mushrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.111 Onions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.112 Peppers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.113 Potatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.114 Spinach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.115 Tomatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.116 Sweet Potato	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.117 Pumpkin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fruit					
4.118 Apples	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.119 Avocado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.120 Bananas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.121 Clementina	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.122 Grapes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.123 Melons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.124 Oranges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.125 Pears	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.126 Strawberries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.127 Berries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.128 Mango	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meat and Dairy					
4.129 Chicken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.130 Fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.131 Red meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.132 Cheese	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.133 Eggs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.134 Milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.135 Yoghurt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other					
4.136 Convenience Meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.137 Maize Meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.138 Samp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.139 Treat Items (i.e. chocolates)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.140 Take Away Meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



4. Practices regarding Food Waste [Continue]

How often do you throw out food for the following reasons

	1 Never	2	3	4	5 Always
4.141 Past use-by date	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.142 Bought more than needed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.143 Prepared more than needed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.144 Mouldy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.145 Slimy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.146 Appearance is not appealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.147 Smelled off	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.148 Did not like the taste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.149 To make space in the freezer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.150 To make space in the refrigerator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.151 To make space in the cupboard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.152 The item was already spoiled when I opened the bag/container	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.153 Health reasons	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.154 Accidents (food dropped on floor)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.155 Freezer failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.156 Could not store it properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.157 Prepared too much and did not want to save leftovers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.158 Prepared too much and could not save the leftovers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.159 Food was burnt/ ruined during the cooking/preparation process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

To what extent do you disagree/ agree that the following reasons for throwing out food applies to your household, with 1 indicating that you strongly disagree and 5 indicating that you strongly agree with the statement

	1 Strongly Disagree	2	3	4	5 Strongly Agree
4.160 We often buy more food than we can consume	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.161 Our household members' schedules are unpredictable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.162 We often cook more food than we can eat in a single meal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.163 Household members tend to dish up more than they can eat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.164 I have control over the amount of food that the household discards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.165 Which of the following garbage disposal methods do you use for your food waste (kitchen waste)

- | | | |
|---|--|---|
| <input type="checkbox"/> Removal by municipality/private company at least once a week | <input type="checkbox"/> Removal by municipality/private company less than once a week | <input type="checkbox"/> Communal refuse dump |
| <input type="checkbox"/> Own refuse dump | <input type="checkbox"/> Compost heap | <input type="checkbox"/> No rubbish disposal |
| <input type="checkbox"/> Other | | |



4. Practices regarding Food Waste [Continue]

How often do you do the following with food that you are throwing out

	1 Never	2	3 Sometimes	4	5 Always
4.166 Give still edible food away to someone else (i.e. a needy person)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.167 Separate food waste from other waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.168 Compost organic material	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.169 Pour liquid waste down the drain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.170 Give food to domestic animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.171 Freeze surplus food to decide what to do with it at a later stage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Strategies

To what extent do you use the following strategies when planning for meals and managing leftovers

	1 Always	2	3	4	5 Never
4.172 Plan meals for the household in advance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.173 Calculate the appropriate portions of food for the household	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.174 Use a system where no additional food is purchased until all the food currently in the kitchen is used/eaten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.175 Use clear containers to store food in the fridge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.176 Use leftovers to create new meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.177 Cook a number of meals simultaneously to consume later during the week	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Thank you for your time!



APPENDIX C – Open-ended question (subsection C)

Comments Report

1. Demographics

^{1.6)} If other, please specify

Solar

Solar

4. Practices regarding Food Waste

^{4.59)} Name the main meals that your family ate for the past 7 days

Tinned fish, rice
Tinned fish - Bread
Hake - chips
Bread - Tea

chicken livers Licken
Rice-vegetables - chicken
Pap - chicken

Pap - spinach
Samp, red meat
sheep ofal
red meat - pap

Bread, fish and chips
Pap - chicken

Pap - chicken x3
Pap - tomato - Potatoe Soup
Pap - russians
Pap - eggs

Pap - Fish

Pap - chicken livers
Bread - russians

Pasta - chicken - Vegetables
Bread - Hake - Chips
Pap - red meat - salads
rice - red meat - Vegetables

Pap + cabbage
Pap, sheep ofal
Pap + chips.
Pap + eggs
Rice, + chicken, tomato ~~and~~ gravy

Dumpling, red meat pumpkin

Pap, eggs, chips Rice, pumpkin, Beetroot, Salad

Pap, cabbage, onion Pap, fish, onion

Pap, chicken, onion, potatoes

Pap, wors, tomatoe, onion

Rice, potatoes, red meat.

Hamburger + chips.

Rice, chicken, tomato gravy

Pap + wors.

Pap, pork rashers, atchar

Bread, russians, chips

Samp, beef, oVPal

Pap + maas.

Bread, beans soup

Pap, chicken gizzards.

Chicken, rice, salads

Bread + eggs.

Pap, cabbage.

Pasta - mince - potatoes - carrots

Pap - mille.

Pap - eggs

Pap - Beef

Pap, eggs, atchar

Pap + milk

Pap + cabbage

Bread, tea.

Pap + spinach

Rice, red meat + salads.

Dumpling, chicken + potatoes.

Rice + Turkey

Bread + russians

Pap, cabbage twas

Pap, sheep ofed.

Pap, chicken stew

Pap + maas

Rice, vegetables + red meat.

Pap, beans soup
 Rice, chicken, vegetables
 Bread + eggs
 Pap, sheep liver
 Pap, chicken feet

Pap + cabbage
 Pap + milk.

Pap + cabbage
 Pap + milk
 Bread + milk
 Rice, chicken + salads.
 Rice, + pilbards

Fat cakes, pobny + atchar.

Pap + chicken
 Pap + milk
 Pap + wors
 Cabbage + pap
 Bread + tea.

Rice, vegetables + chicken
 Beef oufal + samp.

Dumpling + red meat
 Pap + chicken
 Rice, chicken stew
 Pap + milk
 Pap + chips

Rice, red meat + salads.

Rice, red meat, vegetables, pudding custard
 Mealie rice, vegetables, chicken
 Pap, beans soup
 Pap, wors, tomato gravy
 Pap, milk

Pap cabbage

Pap + spinach
 Pap + milk
 Fat cakes, salted sneek + atchar
 Pap + wors
 Pap + cabbage

Pumpling, beef stew + pumpkin

Rice, spinach, potatoes, onions, chicken

Fat, cakes, tea.

Pap + cabbage

Pap + potatoes

Pap + milk

Pap + cabbage

Pap + milk

Rice, beef stew, salads

Rice + chicken

Bread + eggs

Pap + corned meat

Rice - Cabbage, beet root, beef.

Fat cakes, polony

Bread - sheep head.

pap - cabbage

pap - spinach

pap + chicken

pap + milk.

Spagetti mince

Salad eggs

vegetables bread.

chicken

Oven-bake meals: chicken

Pan fried meals: Bacon, haloumi, patties for burgers.

Hoender rys

Maal vleis chips

Vark chops

Vis

Tiens

Boontjies

patats

Aartappels.

wartels.

gemengde groente

Rice, beef stew with vegetables x 2 days. / Hamburger
 Veg + meat
 Fish + chips
 Chicken salad
 Mac + cheese

Chicken with veg + baby potatoes
 Mornemad. beef and cheese hamburgers
 Tuna + rice casserole with mixed veg.
 Roasted chicken mayo sandwich with salad
 Mince and rice with veg.

Chicken Prego
 spaghetti Bolognaise
 Pasta (Alfredo)
 Chops and mash
 Pies with crauy

Take-away burgers
 Bracci.

Samp, chicken
 Bread, chicken, cabbage
 Pap, milk

Pap, tinned fish
 Rice, vegetables, chicken.
 Beef ofual, pap.
 Pap, cabbage.

Pap, chicken.

Samp, beef stew
 Rice, chicken, salads
 Pap, chicken
 Wors, pap, gravy

Samp, stew
 Pizza
 Pap, Beef
 Pap, wors, spinach

Rice, chicken, carrots, beans, cabbage

Fruit salad

Pap, milk

Rice, fish

Bread, russians

Pap, potatoes, atchaar

Pap, chicken

Rice, tomato

Pap only

Pap, chicken

Pap, cabbage

Pap, wors, tomato, onion Beef, rice

Pap, russian

Pap, atchaar

Pap, cabbage

" , chicken fat

Pap, spinach

" , pap

Pap, chicken stew

Chicken, pap

chips, pap

Spinach, pap

cabbage, pap

Pap, russian

Pap, milk

Pap, cabbage, carrots

Pap, mince, tomatoes, green pepper, onion

Rice, mince,

Samp, chicken

Pap, beans, potatoes

Pap, milk

Rice, chicken

Bread, russians, chips

Pap, milk

", cabbage

", bean soup

Bread and chicken

orange/apple/pear

Rice, chicken

Steamed bread

Pap, chicken

Pap, Spinach

Pap, cabbage

Pap, Veggie Stew

Rice, chicken, beetroot, carrots, cabbage

Pap, pork, mixed vegetable

fat cakes and snoek

Pap, beans

Pap, cabbage

Pap, milk

Pap, fish

rice, fish

Tripe, pap

Samp, red meat

Steamed bread, meat

Sheep liver, Pap

Rice, binned Fish, tomatoe

Bread, tea

Pap, cabbage, chicken.

Rice

Green beans

Carrots

~~for~~ Spinach salad

meat

Pumpkin

Vegetables, Salads, meat, rice, Pudding

Pomridge, meat, cabbage

- ① Pap and Green Beans
- ② Pap and Cabbage
- ③ Pap and chicken hearts
- ④ Pap and meat
- ⑤ Pap and herbs
- ⑥ Pap and rice
- ⑦ Pap and Nachipotato.

Pap. milk.

Bread and chicken.

Samp.

- ① Pap - milk
- ② Pap - Cabbage
- ③ Pap - mince
- ④ Rice - mince
- ⑤ Pap - Beans

Chicken and Mechanism pasta

- ① Pap - mince meat
- ② Pap - chicken skin
- ③ Pap - eggs
- ④ Pap - milk
- ⑤

Pap, beef
 Rice, chicken, pumpkin, beetroot.
 Samp tripe
 Bread tripe

Pap - rasion
 Rice - chicken, beetroot, pumpkin - carrots, beans.
 Pap - chicken
 Pap - eggs.

Samp, chicken necks.
 Rice, veg, chicken
 Samp, chicken
 Pap, pork chops.
 Pap, tinnet fish.

Pap, chicken
 Rice, salads, beef, gravy
 Park braai
 Pap, cabbage

Pasta, mince
 Pap, chicken livers

Chicken hearts, pap
 Samp, chicken, beet root
 Fat cakes, soup
 Pap milk.

Wors, pap
 Chicken, pap
 Bread, chicken, beetroot, cabbage
 Bread + tea

milk + pap.

Pap - potatoes
 Samp - potatoes
 pap - spinach
 Rice - chicken - cabbage.

Pap - rasion - chips.

Rice, beef, carrots, bean, mayonnaise, cabbage + green
 Bread, eggs, rashran
 Bread, cheese, rama.

Bread - soup
 Samp, bread, meat (Beef)
 Cabbage - chicken.

Red meat, veg, baked potatoes
 Rice, chicken, veg.
 Bread soup
 Burger
 soup, bread.

Pap, russian, eggs
 Pap, maas
 Rice, chicken
 Bread, russian, tea
 Paste, mince

Rice, red meat, vegetables.

Mince, pap,
 Red, meat, pap
 Braai, pap, salad
 Pap, tomatoes
 Russians pap

Red meat, pap, vegetables.

Pap - chicken
 Pap - cabbage
 Samp - chicken

Pap, milk
 Pap, spinach
 Pap, beans
 Carrots

Pap, cabbage
 Pap, chicken
 Pap, beef stew
 Pap, soup

pap, milk.
 Bread, tea.

Rice, chicken, pumpkin, beetroot, mash potatoes
 Pap, wors
 Pap, Spinach
 Pap, chips

Rice, Spinach, russians, beef
 Rice, spinach, Pumpkin, chicken
 Bread, eggs and tea
 Samp, beef

Pap, beef stew

Pap, mutton
 Samp, mutton
 Homemade bread

Pap, milk
 Pap, cabbage
 Pap, beans

Pap, chicken

Pap, wors, soup
 Rice, carrots, beetroot, potatoes, chicken
 Pap, milk

Wheet bix, milk

Pap, chips

Pap, wors
 " , milk
 " , ~~w~~cabbage
 " , russians

take aways

Pap, milk, pie
 Pie
 Rice, chicken, cabbage x3

Pap, beef
 " , chicken

Pap, bean soup
 Pap, tomatoes, chicken livers
 Rice, mince, potatoes

Pap, chips

Pap, bean soup
 Pap, chicken stew
 Pap, milk

Pap, cabbage
 Pap, mashed potatoes
 Pap, tinned fish

Pap, chicken, cabbage, potato
 Pap, woks
 Rice, pumpkin, beetroot, carrots, salad, beans

Pap, beef bones, potatoes + carrots

Pap, chicken
 Pap, milk
 Chicken, bread and soda.

Samp, beans, potatoes

Pap, milk
 Rice, chicken, pumpkin, potatoe
 Pap, cabbage

Pap, eggs
 " , chicken
 " , tinned fish
 " , chicken stew
 " , tomato gravy

Pap soup

Pap, vegetable stew
 Pap, eggs
 Pap, wafers

Pap, cabbage
 Rice, vegetables, chicken

Pap, chicken stew
 Chicken
 Red, meat, vegetables

Pap, soup
 Pap, chips, russians

Pap, cow feet Pap, milk
 Pap, tripe
 Rice, sweet potato, spinach, chicken

Pap, potatoe Fat cakes
 Rice, russians and tomatoe gravy
 Bread, tea
 Dumpling, bean soup

Pap, cabbage, chicken Bread, tea
 Pap, cabbage Pap, cabbage
 Pap, chicken

Bread, chips
 Pap, cabbage
 Pap, milk
 Fat, cakes

Rice, chicken, salad

Fish and chips
 chicken and chips
 Pap, milk
 Bread, vienna, russians

Pap, cabbage
 Chicken, rice, vegetables
 Salads

Bread, chips
 Pap, fish
 Bread, tea

Samp, cabbage
 Pap, chicken
 Fat cakes, atchar.

Pap - Milk
 Pap - fish - onion - Tomatoes - Potatoes
 Rice - chicken - mix veg
 Pap - milk
 Pap - Cabbage
 Pap - eggs

Pap, Beans, onions
 " , RUSSIANS

Pap, Rice, pumpkin, beetroot, chicken

Bread (homemade) - stew (mix veg - potatoes - onion)
 Rice - chicken - pumpkin - cabbage
 Bread - Russian
 Samp - beef stew - potatoes - mix veg
 Pap - chicken

Pap - Cabbage - potatoes
 Fat - cakes - French potato
 Chicken - rice - Beetroot
 Tomatoes - Pap

Pap, snout, baked beans Pap, snout
 Rice, chicken, cabbage, potatoes, onion, pumpkin
 chicken feet, pap, potatoes, onion
 Pap, achar

- Pap, Braai meat Pap, milk
 Take away
 Wors, pap, Onion and tomatoe gravy
 Russian, bread, chips
- Pap, Wors, cabbage Bread, tripe.
 Chicken, pap, cabbage, beetroot
 Bread, coffee
 Pap, spinach, chicken livers
- Pap, bone, cabbage, potatoes
 Pap, fish, mash potatoes
 " , Hake
 " chicken feet, potatoes
- Pap, cabbage
 " , tomato gravy
 " , salted snoek, tomatoes
 Breach tea
- Fat cake + coffee Bunny, chow
 Rice, chicken, cabbage, chakalaka, potatoes
 Bread, coffee
 Pap, mince meat
- (chicken, rice, salad Fat cakes, polony
 Pap, potatoes, (mash)
 Bean soup, pap
 Pap, chicken
- Hamburgers x2 mince cury + bread,
 Enchiladas
 Tomato + mince pasta
 Chicken cury + rice
 Chicken cury + potatoes

Braciwleis, potato bake, mielie tert.
 Chicken stir fry with spaghetti
 Mince, rice, mixed veg.
 Burger, chips.
 Home made pizza

Boerewors, potato with tomato
 gravy.
 Soup and bread

Steak with potatoes and spinach
 burger and chips.
 spaghetti Bolognaise
 Cume and vetkoek
 Chicken ala king

Pasta and bacon
 Pizza.

Braci, meat, vegetables, potatoes, stew, mac and cheese

Chicken, rice, veg.
 Red meat, pap + veg.
 Chicken stew
 Take out
 Red meat, potato chips.

Cabbage - pap
 Rice
 carrots
 Bread
 Homemade fat cakes
 Mabele soft fromage
 Chicken lettuce

Pap - chicken
 Rice - fish
 Bread
 Hereal - Milk
 Apple
 Banana
 Oranges

Rice meat, Cabbage, Carrots

Chicken and Vegetables

Fish and Vegetables

Red meat Stew

Tuna and Pasta

Pap-ducked

Rice - fish

Bread

Leroal - Milk

Apple

Banana

Chicken

Broccoli

rice

Potatoes

Chicken - Potatoes - rice - carrots

chips with sausages

Take aways

yoghurt + muesli

Bread - Salad - Fruit

cook every night 2 starch and a protein
with one vegetable or salad.

Pasta - chicken, Red meat - Vegetables
Rice - Potatoes.

Lasagne + Salad
chicken baked potatoes, pumpkin
Cauliflower + Broccoli Pasta
Mince and Mash sausage & Buns

chicken - Pasta - fish - Green Salad
Bread

Omelet Toasted sandwiches
Pizza Beef stew
chicken + Vegetables x2

Pizza Braai and salad
meat veggies
Toasted sandwich

Meat with vegetables.
Pasta with chicken
Sandwiches
Vegetables with fish

- ① Barbeque (meat, vegetables & bread) ⑥ Chicken curry
 ② Steak and stir fry. ⑦ Salad.
 ③ Alfredo pasta.
 ④ Steak and stir fry.
 ⑤ Mince and pasta

Spagetti Bolognese Salad
 Chicken Pie Stew.
 Mac + cheese
 Veggie bake

Chicken, gravy, rice, vegetables.
 Pork sausages, lentil soup.
 Meatballs, mash, vegetables.
 Pork chops, potatoes, vegetables.
 Bobotie, rice, vegetables.

Chicken fillets, brown rice, veg.
 Beef stir fry, spaghetti.

Pasta.
 Chicken with salad and vegetables
 Braai
 Pap en steak.

Mac + cheese
 Braai vleis + salads.
 Pizza
 Pasta
 Chicken, rice & vegs.

Wors, mash & carrots.
 Left overs.

Pap - meat (Braai)
 Pap - meat (Braai)
 Pap - milk.
 Bread - eggs
 Pap - mince meat or macaroni.

Rice - chicken - onion

Pap - milk

Pap - wors & tomatoes

Pap - chicken x2.

Pap - milk x2

Rice, pumpkin, chicken, potatoes.

Bread, soup (beans, bones, onion, potatoes)

Pap - eggs.

Pap - cabbage.

Pap, potatoes, chicken.

Pumpkin, potatoes, samp, braai, meat.

soet porridge - pap spinach

pap - chicken.

Rice, spinach, chicken, potatoes

Pap Beans

Pap - spinach potatoes

Pap milk

samp

Pap + milk

Bread, peas soup

Pap, chicken gizzards

Samp, chicken livers

Bread + chips

Pap + eggs

chicken, rice, salads.

Pap + cabbage

Pap + milk

Rice, beef stew, salads

Rice + chicken

Bread + eggs

Pap + corned meat

Rice - Cabbage, beet root, beef.
 Fat cakes, polony
 Bread - sheep head.
 pap - cabbage
 pap - spinach

pap + chicken
 pap + milk.

Pap + spinach
 Pap + milk
 Fat cakes, salted snook + atchar
 Pap + wors
 Pap + cabbage

Pumpling, beef stew + pumpkin

Rice, spinach, potatoes, onions, chicken
 Fat, cakes, tea.
 Pap + cabbage
 Pap + potatoes
 Pap + milk

Rice + Turkey
 Pap, cabbage, twas
 Pap, chicken stew
 Pap + maas
 Rice, vegetables + red meat.

Bread + russians
 Pap, sheep oval.

Rice, red meat, vegetables, pudding custard Pap cabbage
 Mealie rice, vegetables, chicken
 Pap, beans soup
 Pap, wors, tomato gravy
 Pap, milk

Pumpling + red meat
 Pap + chicken
 Rice, chicken stew
 Pap + milk
 Pap + chips

Rice, red meat + salads.

Samp. beef, ofal
 Bread, beans soup
 Chicken, rice, salads
 Bread + eggs.
 Pap, cabbage.

Pap + maas.
 Pap, chicken gizzards.

Pasta - mince - Potatoes - carrots
 Pap - milk.
 Pap - eggs
 Pap - Beef

Pap, eggs, chips Rice, pumpkin, Beetroot, Salad
 Pap, cabbage, onion Pap, fish, onion
 Pap, chicken, onion, potatoes
 Pap, wors, tomatoe, onion

Pap + cabbage Dumpling, red meat pumpkin
 Pap, sheep ofal
 Pap + chips.
 Pap + eggs
 Rice, + Chicken, tomato ~~gravy~~

Beef - Pap Pizza
 Wors - pap - gravy ofal - pap.
 Pap - ox liver - pumpkin
 Potatoe salad - rice - pumpkin - chicken
 Bread - chips - Russians

Pap - chicken livers Pasta - chicken - vegetables
 Bread - russians Bread - Hake - chips
 Pap - red meat - salads
 rice - red meat - vegetables

Pap - chicken X3
 Pap - tomato - Potatoe Soup
 Pap - russians
 Pap - eggs

Pap - fish

Pap - Spinach
 Samp, red meat
 sheep ofual
 red meat - pap

Bread, fish and chips

Pap - chicken.

Tinned fish, rice
 Tinned fish - bread
 Hake - chips
 Bread - Tea.

chicken ~~livers~~ Licken
 Rice-vegetables - chicken
 Pap - chicken

Bread - Bean soup
 Pap - chicken

Rice - mince

Dumplings - chicken
 Fat cakes, at chaar, salted snoek

Pap - mince.

Pap - milk
 Pap - tinned fish
 Samp - chicken
 Pap - cabbage

Pap - chips

Pap russians

Pap - chips
 Pap - maas
 Pap - spleen
 Pap - sheep liver

Pap - tinned fish

Pap - chicken soup pack

Pap - cabbage pap - cabbage
 Fat cakes
 mince - pap
 Pap - milk

Pap - Bones - Beans - Potatoes
 Pap - Eggs
 Pap - milk
 Potjiekos - carrots - cabbage - onion - Green Pepper

Pap and milk Pap, salted snoek, atchar
 Pap - eggs
 Pap - russians
 Pap - chicken

Pap - cabbage Pap - chips
 Pap - wars Pap - milk
 Pap - mince. Pap - russians.
 Pap - Pork

Pap - Bici meat
 Rice - green beans - red meat
 Bread, chips, Uennas
 Fat cakes, salted snoek fish.

Pap - tinned fish Pap - chips.
 Pap - tomato gravy
 Pap - cabbage
 Pap - chicken

Pap - Cabbage - Potatoes x2. Pap - milk.
 Pap - chicken skin - Potatoes
 Pap - Russian x2
 Pap - Chicken

 Pap - Bones - Beans - Potatoes
 Pap - eggs
 Pap - Milk
 Potjiekos - carrots - cabbage - onion - Green Peppers

 Fish and chips + Bread
 Mince meat, beans, potatoes, Bread
 Pap, chicken feet + tomatoes and onion gravy
 Bread and Bones
 Chicken, rice, tomatoe, spinach + pumpkin

 Pap - chicken - Potatoes Pap - Milk
 Pap - Pork head Pap - Eggs
 Pap - Pork head + Bread
 Pumpkin - Cabbage - rice - chicken - Beetroot x2.

 Pap - ox liver Steamed bread.
 Bread - tea
 Pap - Pork bones
 eggs - atchar - bread

 Fatcates, tea Pap, Bones, cabbage.
 cheese, macaroni + eggs with tomatoe.
 Pap milk
 rice, cabbage - Pork, Pumpkin

Pap - maas Rice - meat - Vegetables
 Steamed bread - Soup
 Fat cakes
 Samp

Steamed Bread Pap - mince
 Pap - milk
 Samp
 Fat cakes
 Pap - russians

chicken - rice - pumpkin
 Pap - maas Bread - russians
 Pap - chips
 Pap - cabbage

Braai (Pork) - chips Chicken - chips -
 Bread, russians, chips Bread.
 Rice - red - meat
 Ribs - chips

Pap - chicken Chips - pap
 Turkey - Pap Wors - pap
 Pork - pap mince - pap
 Beef stew - rice

Pap - cabbage chips - bread
 Pap - sheep liver Pap - milk
 Pap - tinned fish Pap - chicken.

Bread - Soup
 Bread, eggs
 Bread, tuna
 Rice - chicken

Pap - milk
 Pap - chicken

Fish
 liver
 chicken
 cow heels

Bread
 Pap
 rice

Spinach - Pap
 Pap - cabbage - chicken
 Rice - vegetables
 Steamed bread

Wors - cabbage - pap.

Pap - cabbage
 Pap - chips
 Pap - eggs
 Pap - chicken

Pap - tomatoes - onions
 Pap - Wors
 Pap - potatoes
 Pap - russians

Pap - eggs

Pap - chips

Pap - milk
 Pap - Wors
 Pap - mince meat
 Pap - milk

Pap - eggs

Pap - meat - carrots -

potatoes

mince meat - Pap
 chicken - Pap
 Pumpkin - Beetroot
 Bread

Pap - cabbage
 Pap - eggs
 Pap - milk
 Pap - soya mince

Pap - cabbage
 Pap - Tomatoe
 Pap - milk
 Bread - tea

mince meat - pap - Spinach
 Beef - Pap
 chicken - pap - carrots Spinach - Bread
 Bread - chicken

Pap - chicken feet Pap - Pork meat
 Pap - chips
 Pap - milk

Pap - chicken
 Pap - Wors# - tomato gravy
 Bread - milk

Mixed vegetables
 Pap - mince
 Pap - chicken
 chicken - spaghetti
 Pap - chicken livers
 Pap - chicken
 Bread - French polony
 Pap - russian
 Pap - Eggs
 Pap - milk
 Pap - cabbage
 Mash potatoes - cabbage
 rice - chicken - pumpkin - Beetroot
 Pap - milk
 Bread - chips
 Pap - tomato gravy - wors
 Chicken - pap - cabbage
 Fish - Bread - chips
 Russian - Bread
 Pap - wors - Salad
 Pizza
 Pasta - mince
 Rice - Vegetables - red meat
 Pap - maas
 Pap - chips - atchaar
 Dumplings - intestines
 Fat cakes - Salted snoek
 Dibeku - Snoek
 Fat cakes and salted
 snoek
 Pap - atchaar
 Bread - Eggs
 Pap - mince
 Pap - beef stew

Pap - cabbage Pap - Bones
 Pap - Tomatoe
 Pap - Pork Head
 Pap - Sheep Head

Dinner Breakfast.

Meat, vegetables + starch

Fish and chips Beef Stongohof Spaghetti + mince
 ribs chips + salad Sausage, eggs and toast
 green beans, potatoes, rice, chicken
 Burgers and chips

Chicken
 Potatoes
 Mince meat + spaghetti

Eggs, Bacon
 Spaghetti bolognaise
 Fish and chips
 chicken, rice, veggies

Steaks + veg.
Chicken + veg.

Lasagne + bread rolls
chicken, rice, spinach, pumpkin.
mince + vetkoek
Mince, r stirfry.

Braci vleis + Pap tert.

Braci vleis + Bread and Potatoe salad
Pumpkin rice beetroot and meat
Fish and chips spaghetti and mince
Pap wors and sauce Pizza

Chicken, veg & rice

Burgers
Braci vleis, veg & potato

Mince, veg + pasta.

Rice, beef stew with vegetables x 2 days. /Mamburger

Veg + meat

Fish + chips.

Chicken salad

Mac + cheese.

Chicken with veg + baby potatoes

Monemad beef and cheese hamburgers

Tuna + rice casserole with mixed veg.

Roasted chicken mayo sandwich with salad

Mince and rice with veg.

Chicken Piego
spaghetti Bolognaise

Pasta (Alfredo)

Chops and mash

Pies with cray

Take-away burgers

Braci.

Spagetti mince
 Salad eggs
 vegetables bread.
 chicken

Oven-bake meals: chicken

Pan fried meals: Bacon, haloumi, patties for burgers.

Pap, chicken
 Philchards
 Bread, milk
 Pap, cabbage

Pap, maas
 Fat cakes, tea.

Rice, chicken
 Pap, chips
 Rice, Philchard

Bread, tea Bread, eggs
 Pap, maas
 Pap, turkey wings

chicken, rice, cabbage Dumplings, tea
 Pap, eggs Pap, chicken rivers
 Pap, tinned fish
 Fat cakes

Beef ofal, pap Bread, tea
 Cabbage, pap Bread, russians
 Pap, maas
 Rice, chicken, vegetable.

Bread eggs Pap, chicken, sweet
 Rice, potatoes, chicken Potatoes
 Pap, pork, tomatoes,

Bread, chicken
 Rice, chicken, vegetables
 Pap, cabbage
 Pap, mince.

Pap, macis
 Pap, mince
 Samp and beans

Sandwiches
 Pap, Soup
 " , milk
 macaroni and mince

Fat cakes
 Pap, snout, atchoor, tomatoes

Pap, wors, cabbage
 Chicken, pap, cabbage, beetroot
 Bread, coffee
 Pap, spinach, chicken livers

Bread, tripe.
 Pap, Braai meat
 Pap, milk

Take away
 Wors, pap, onion and tomatoe gravy
 Russian, bread, chips

Pap, bones, potatoe, onion
 Rice, carrots, pumpkin, chicken x2
 Bread, tea
 " russians
 Pap, cabbage

Pap, chips
 " , Russians, tomato
 " , milk
 " , cabbage

Bread, tea

Cabbage, pap
 Fat cakes
 Chicken, rice, vegetables.

chicken Curry. Salad. Braai, vegetables and bread
 Steak and Stir fry
 Alfredo pasta
 mince and pasta.

Bread, wors
 chicken, rice, carrots, beans, chakalaka

Take away - Stadium inn

chicken Curry. Salad. Braai, vegetables and bread
 Steak and Stir fry
 Alfredo pasta
 mince and pasta.

Protiens

Carbs

chicken Curry. Salad. Braai, vegetables and bread
 Steak and Stir fry
 Alfredo pasta
 mince and pasta.

Fish and chips chicken Stir fry
 Brown pudding, veggies Vegetables and meat
 meat
 mac'n cheese Pap and wors
 Braai vleis and Greek salad.

Pap, pork, chakalaka
 Rice, mince, potatoe salad
 Rice, fish, onion, tomatoe, baked beans
 Bread, russian, coffee.

Spagetti bolonase	Veggie Bataf
Chicken Pie	Salads
macaroni and cheese	stew

Pap, pork, chakalaka
 Rice, mince, potatoe salad
 Rice, fish, onion, tomatoe, baked beans
 Bread, russian, coffee.

Pap, cabbage
 Pap, chicken, cabbage
 Pap, milk
 Pap, chips

Pap, eggs - Pap, chicken, Pap, eggs
 rice, chicken, carrots, beans, mayonnaise

Bread, fish	Pap, chips
Bread, fish	Pap, cabbage.
Pap, chicken	

Pap, chicken
 Pap, russian
 Pap, milk

Pap, cabbage

Pap, cabbage + onion
 Pap, chicken hearts
 Pap, chicken

Pap, mince

Pap, beef bones
 Pap, chicken
 Bread, chips, russian

Pap, spinach

Pap, cabbage + onion
 Pap, chicken hearts
 Pap, chicken

Pap, mince

Pap, wors, tomatoes
 Rice, chicken, carrots, cabbage
 Pap, salads

Pap, potatoe Fat cakes
 Rice, russians and tomatoe gravy
 Bread, tea
 Dumpling, bean soup

Bread, eggs Rice, chicken, salads Pap, cabbage
 Pap, milk Pap, Spinach
 Pap, red meat.

Bread, eggs Rice, chicken, salads Pap, cabbage
 Pap, milk Pap, Spinach
 Pap, red meat.

Rice, chicken Pap, cabbage Pap, chicken
 Bread, bean soup pap, eggs
 Pap, chicken

Pap, cabbage Fat cakes
 Pap, milk Rice, chicken, salads
 Pap, chicken, salads

Pap, chicken Pap, chips
 Pap, chicken, vegetables Pap, Spinach
 Pap, milk

Pap, spinach
 Rice, red meat, salads
 Bread, tea
 Pap, red meat

Bread, beans, soup
Pap, Spinach
Pap, Chicken vegetable

Pap, cabbage
Rice, chicken, vegetables

Pap, intestines (sheep)

Pap, milk

Pap, tinned fish

chips, pap

Rice, chicken
Pap, chicken

Fruit salad

Pap, milk

Rice, vegetables, wots

Fat cakes

Pap, Sheep intestines

Potatoes, pap

Spinach, Pap

Rice, vegetables, red meat

Bean soup, pap

Pap, tomatoe gravy

Pap, cabbage

Pap, milk

Pap, pork

noodles

" , chicken

Pap, eggs, russians

Pap, milk

" , chicken

" , tomatoes + potatoes

" , tinned fish

" , tomato gravy

Pap, milk
 " , Beans and potatoes
 Pap, chicken
 " spinach
 Pap, milk
 Bread, eggs
 Rice, chicken, carrots
 Bread, chips, cheese
 Pap, bean soup
 Pap, chips
 Pap, tomatoes, chicken livers
 Rice, mince, potatoes
 chicken, Pap
 Pap, russians and wors.
 mince, Pap, tomatoes, potatoes, mixed vegetables.
 Bread, chicken.
 Pap, chicken
 Potatoes, Pap x5
 Pap, milk x2.
 Pap, milk
 fish, Bread
 Pap, chicken
 Pap, cabbage

Pap, spinach
 Pap, milk
 Pap, chicken

Pap, pork meat

Pap, chips, russian
 Pap, cabbage
 Stamp, chicken
 Pap, chips

Bread, tea.

Pap, milk
 Pap, liver chicken
 Pap, chicken

~~Pap~~
 Rice, chicken, pumpkin
 Beetroot.

Bread, russian
 Pap, cabbage, russian
 Fat cakes
 Bread, butter, tea

Rice, vegetables,
 chicken

Fat cakes + Pap, wors + chicken, rice, salads

Bread, russians, - Pap, red meat

Pap, cabbage

Pap, cabbage
 " wors
 " mas

Rice, vegetable, chicken

" russian and tomatoe gravy

Fab cakes, salted shoek
 Bread, polony
 Rice, salads, chicken
 Bread, soup
 Pap, potatoes (mash)

pap, maas.

Ners, pap, gravy
 Samp, beef stew

Chips, russians, pap.

Chicken stew, vegetables, salads, rice
 Carrots, rice, chicken
 Bakels kake, tomatoes, bread

Pap, chicken.

Bread - cabbage - pumpkin

pap, milk.

Pap, milk

Rice, pumpkin, chicken

Chips, bread.

Pap - potatoes

Pap - rashian - chips.

Samp - potatoes

Pap - spinach

Rice - chicken - cabbage

Pap, milk

pap + chicken

Pap, eggs

Soft porridge.

Bread, tea

Pap + braai meat.

Samp, bread, beef

Cabbage, chicken.

Red meat, veg, baked potatoes
 Rice, chickens, veg.
 Bread soup
 Burger
 soup, bread.

- ① Soup - Pap - Bread
- ② Sechu - rice
- ③ Pap - milk
- ④ Ceehaeque Pap
- ⑤ Stendmic cheese

Rice and chicken
 Rice, chicken, mash potatoe
 Red meat, pap
 chips and Russians

Beef and pap
 Pork, pap

- ① Pap and chips
- ② Pap and chicken
- ③ Rice and chicken
- ④ Rice and chicken
- ⑤ Pap and chicken
- ⑥ Beef (can) and pap

Fish, bread
 Fat calves

Pap: milk
 " , Russian
 " , meat bones
 " , ~~for~~ cabbage

Pap, potatoe.
 Bread, Polony
 Samp, chicken livers

Chips, russians, bread
 Pap, russians, gravy
 Rice, chicken, vegetables
 Scambone (quarter bread, chips, polony)
 Pap, brotters russians, cheese, atchar

Pies

Rice, mince - Tinned ~~water~~ fish, pap
 Pap, cabbage, wors - Pap, chicken, gravy
 Pap, braai meat, salad

Pap, russian Pap, milk
 Pap, Gravy Steamed
 Chips, bread

Pap, chicken Rice, vegetables, chicken
 Pap, mads Pap, eggs
 Samp Pap, tomatoe gravy, russians
 Pap, wors

-chicken, pap
 Potatoes, pap
 Pap, chips
 Cabbage, pap
 Rice, chicken, cabbage, potatoes

Pap, sheep liver Rice, chicken, vegetable.
 Pap, russian
 " ; hake
 " ; ~~met~~ milk

Russians, bread
 Chips, Pap
 chicken, rice, vegetables
 Pap, milk
 Pap, potatoes
 Pap, chicken

Pap, chicken

Pap, milk

Pap, cabbage Pap fish

Pap, Spinach

Pap, milk

Bread, wors, coffee.
 Rice, carrots, cabbage, beef

Take away

Wors, chops, pap / fruits but not everyday.

Bread, russians Pap, chicken

" , bean soup

Pap, milk

Mash potatoe

Pasta Toasted ham

Ribs

Burgers

chicken strips

BBQ various meat

Proteins

Carbs.

Pap, bean soup
Samp and beans

Pap, atchar
Bread, chicken.

Pap, spinach
Rice, chicken
Pap, vegetable stew

Steamed bread
Pap, cabbage

Pap, chicken
" , tomato gravy
Rice, chicken, pumpkin

fat cakes, tea
Pap, cabbage
Dumplings tea.

Pap, milk
Pap, russians
Pap, eggs

Pap, ~~sa~~ spinach, potatoes

Pap, Hake
Rice, pumpkin, chicken, cabbage
Bread, margarine, polony
Pap, cabbage, salted snook

Pap, tinned fish
 Rice, Vegetables, chicken
 Beef ofaal, pap

Pap, chicken

Pap, sheep liver
 Pap, Cabbage
 Pap, russiaans
 Rice, red meat, vegetables, salads
 Bread, eggs
 Bread, avocado

Pap, chips
 Pap, chicken, potatoes
 Bread, polony
 Samp, red meat
 Rice, chicken, vegetables,

Pap, maas
 Fat calves, polony
 Pap, cabbage
 Dumplings, red meat

Rice, chicken

Rice, tomatoes, chicken, pumpkin, chakalaka,
 Pap - chicken
 Rastan - pap - Achar
 Pap - eggs
 Pap - livers, kabbage

Rice, chicken

pap, spinach.

Pap, milk

Pap, mash potato

Pap - cabbage Pap , beans
 Pap, russian
 Pap, eggs

Steamed bread ox intestines
 Pap, spinach pap, mince
 Pap, chicken
 Pap, Eggs
 Red meat, pap

Rice, tomatoes, chicken, pumpkin, chakalaka,
 Pap - chicken
 Rastaw - pap - a char
 Pap - eggs
 Pap - livers, kabbage

Rice, chicken pap, spinach.
 Pap, milk
 Pap, mash potato

Pap, maas Rice, chicken
 Fat calves, polony
 Pap, cabbage
 Dumplings, red meat

Pasta
 chicken with salad and vegetables
 Braai Pap and steak.

Chicken filets, brown rice, Vegetables
 Beef stir fry, spaghetti
 meatballs, mash, vegetables
 Pork chops, potatoes, vegetables
 Pork sausage, lentil soup
 Bobotie, rice, vegetables

Pap, cabbage
 ", tomato gravy
 ", Chicken
 Fat cakes, tea
 Dumplings tea.

Chicken Korma
 Chicken Tikka
 Mac + cheese
 Braai vleis.

Pap, Spinach
 Pap, cabbage
 Pap, chicken stew
 Bread, chips
 samp
 chicken, rice, vegetables

Pap Beans
 Pap - milk
 Pap - Chips
 Rice - chicken - cabbage.

Pap - fish - Potatoes
 Pap - Russians
 Pap - chicken
 Pap - chicken - carrots, cabbage + mayo
 oranges - apples

Pap - cabbage Pap, Beans.
 Pap, Russian
 Pap, eggs

Pap, mash potatoes Bean Soup, Pap
 Pap, chicken Pap, cabbage
 chicken soup, rice.

Pap - cabbage
 chicken, beetroot - pap
 Beans - Pap
 Rice - chicken - Beetroot - carrots - Potatoes
 Bean soup, Pap chicken, Pap Cabbage, Pap
 Pap, tomatoe gravy Vegetable, chicken, rice

Pap, red meat spinach
 Red meat, pap Vegetable, salads, samp, red meat
 Pap, sheep ofual
 chicken stew, pap

Mac & cheese Chicken, rice, eggs
 Braai with salads Wors, mash potatoes, carrots
 Pizza
 Pasta Leftovers.

Rice, Pumpkin, chicken, potatoes

Homemade bread

Russian, chips, eggs

Pap, Wors

Rice, stew, potatoes, onions

Tomatoes

Potjiekos, vegetables, Pap

Lasagne, beetroot

Baked cakes

Pap, fish

Rice, mince, potatoes

Onions

one fruit daily

Pap, chicken, cabbage, potatoes, onion

Rice, chicken, onions, potatoes, carrots, beetroot

Bread, Trip (Ofwal)

Pap, milk

Pap, tomatoe.

Soup, Pap, potatoes, carrots, beans

Pap, milk

Bread, coffee

Weetbix, milk

Rice, chicken, pump kin,

Potatoes.

Fruits everyday.

Corneal

Veggies

Chicken tiller

Yoghurt (Plain)

Soup, Pap, potatoes, carrots, beans

Pap, milk

Bread, coffee

Weetbix, milk

Rice, chicken, pump kin,

Potatoes.

Fruits everyday.

Meat, rice, Pumpkin, beetroot (Bean & carrot) salad
 Fat cake, French Polony
 Bread, tea
 Pap, tomatoe and onion fish
 Pap, cabbage, Einned

Pap, milk
 Pap, Spinach
 Pap, tinned fish
 Bread and tea
 Pap, Bean soup
 Rice, chicken

Pap, Spinach
 Pap, chicken feet + Potatoes
 Pap, Beef bones

Rice, potatoes, chicken
 Pap, milk
 Carb recall.

soup, Beans, carrots, potatoes.
 Rice, chicken, carrots
 Pap, milk
 Pap, eggs, cheese sandwich
 Pap, mince, potatoes
 chicken Rice
 Pap, Pork, Salads
 Rice, baked beans

Pasta, tinned fish
 Macaroni and cheese
 Chicken, Rice
 Bread, coffee

Bread chips
 Corned meat, eggs

Pap, red meat
 KFC

Pap, cabbage, bake
 Fat cakes

Chicken Curry, rice
 Bread, chicken curry

Red meat, rice

Beef stew, Spaghetti
 Beans soup
 Chicken vegetable
 Fat cakes, tea

Hamburger & chips
 Potjiekos
 Bread, eggs

Bread, chips
 fat cake and
 french Polony
 Bread chips.

Pap, wors, onion, tomatoes
 Rice redmeat, chakalaka, potatoes
 Cheese and tomatoe sandwich

Fat cakes, soup, potatoes, carrots
 Rice, beef, pumpkin

Pumpkin, Green Salad, Rice, Chicken
 Fish and Pasta

Rice
 Chicken
 Fish
 Red meat
 Vegetables
 Potjiekos
 Spagette & Mince

APPENDIX D – Ethical Approval



Faculty of Natural and Agricultural Sciences

17-Apr-2018

Dear Mrs Natasha Cronje

Ethics Clearance: **Food waste and sustainable consumption in Mangaung, Free State households.**

Principal Investigator: Mrs Natasha Cronje

Department: **Consumer Science (Bloemfontein Campus)**

APPLICATION APPROVED

This letter confirms that a research proposal with tracking number: **UFS-HSD2018/0165** and title: '**Food waste and sustainable consumption in Mangaung, Free State households.**' was given ethical clearance by the Ethics Committee.

Your ethical clearance number, to be used in all correspondence is: **UFS-HSD2018/0165**

Please ensure that the Ethics Committee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the Ethics Committee on completion of the research.

The purpose of this report is to indicate whether or not the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the Ethics Committee should be aware of.

Note:

1. This clearance is valid from the date on this letter to the time of completion of data collection.
2. Progress reports should be submitted annually unless otherwise specified.

Yours Sincerely

Prof. RR (Robert) Bragg

Chairperson: Ethics Committee

Faculty of Natural and Agricultural Sciences

Natural and Agricultural Sciences Research Ethics Committee

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APPENDIX E – Turnitin Report



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APPENDIX F – Editing Certificate

Michelle Woolley

WRITER EDITOR PROOFREADER TRANSLATOR

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CERTIFICATE OF EDITING

This letter certifies that I have edited the dissertation detailed below.

Title:

EXPLORING HOUSEHOLD BEHAVIOUR CONTRIBUTING TO FOOD
WASTE IN MANGAUNG, FREE STATE

Author:

Lize-Marie Mathee
2012082109

Regards
Michelle Woolley

Date: 28/04/2020

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