Food corporations and government rethinking food waste reduction strategies in Johannesburg City

by

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DECLARATION

I declare that this proposal titled ‘Food corporations and government rethinking food waste reduction strategies in Johannesburg City’ is my own original work. I have acknowledged and referenced all sources that I have used and quoted. I hereby submit it in partial fulfilment of the requirements of the degree of Master of Arts (Development Studies) in the University of the South Africa, Pretoria. I have not submitted this report before for any other degree or examination to any other institution.

Bokang Pheto
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- My precious family and friends who have always been there from day one. I hope I have made you proud.
Global nations are awakening to the realisation and manifestation of actual food insecurity. Voices which advocate for food security have always been there but were overshadowed by corporate ignorance and overpopulation. Corporate food waste plays a major role in contributing to food insecurity although the spotlight is hardly put on them. As the economic hub of South Africa, the City of Johannesburg (CoJ) must take the lead in rethinking food waste reduction strategies in food corporations selling fruits and vegetables where the most waste occurs in the country. The level of fruit and vegetable wastage should decline in order to counter the adverse effects of food waste.

The aim of this study is to establish strategic ways to decrease fruit and vegetable wastage at corporate level in the CoJ. This is achieved by determining contributing factors to food waste including improving food waste reduction models with the intervention and collaboration of food and wholesale stores as well as government.

Face-to-face interviews, online surveys and a case study were methods used to answer the study objective. Responses from the field work show that many fruit and vegetable customers opt for conventional or ‘ordinary’ looking foods than ‘wonky’ looking ones. Also, many of the food stores do not have food waste reduction models to guide them, leading to a lot of food being dumped. Furthermore, the food health and safety criteria seem to be a leading contributor to food waste. These results indicate that food waste reduction is also important at pre-consumer stages.

On this basis, it is recommended that a solid partnership between food corporations and Johannesburg city is formed in solidarity against food waste. Serious measures must be put in place in order to minimise fruit and vegetable wastage on both sides. These changes have potential to have an immense impact on the economy, environment and society. Further research should be undertaken to identify other factors that could be helpful in the quest to limit food waste in food corporations.
KEY TERMS

Fruit and vegetables, food corporate waste, CoJ, food corporations, retail and wholesale, food waste reduction, food security, food waste management, food waste measurement, landfill, policy, indigenous knowledge, strategies, benefits, wonky foods, reverse supply chain
LIST OF ACRONYMS & ABBREVIATIONS

AfDB.................................African Development Bank
ANC.................................African National Congress
CoJ.................................City of Johannesburg
CPEG.................................Centre for Poverty, Employment and Growth
CSER.................................Corporate Social and Environmental Responsibility
DA.................................Democratic Alliance
DAFF.................................Department of Agriculture, Forestry and Fisheries
DARD.................................Department of Agriculture and Rural Development
DEA.................................Department of Environmental Affairs
DEAT.................................Department of Environmental Affairs and Tourism
DSD.................................Department of Social Development
DTI.................................Department of Trade and Industry
EFF.................................Economic Freedom Fighters
EPR.................................Extended Producer Responsibility
FAO.................................Food and Agriculture Organisation
HSRC.................................Human Sciences Research Council
IFSS.................................Integrated Food Security Strategy
IFPRI.................................International Food Policy Research Institution
IFAD.................................International Fund for Agricultural Development
MDG.................................Millennium Development Goals
LIST OF ACRONYMS & ABBREVIATIONS

MSW……………………………………Municipal Solid Waste
MWMS………………………………National Waste Management Strategy
NGO……………………………………Non-Governmental Organisation
NUMSA………………………………National Union of Metal Workers of South Africa
RSA…………………………………….Republic of South Africa
SA……………………………………….South Africa
SADC……………………………………Southern African Development Community
SAWIC………………………………….South African Waste Information Centre
SDG……………………………………...Sustainable Development Goals
SPSS…………………………………….Statistical Package for the Social Sciences
UN……………………………………….United Nations
UNICEF………………………………….United Nations Children’s Fund
UNDP……………………………………United Nations Development Programme
USDA……………………………………US Department of Agriculture
WHO…………………………………….World Health Organisation
WIS………………………………………Waste Information System
WWF…………………………………….World Wide Fund
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CHAPTER 1: INTRODUCTION TO THE RESEARCH

1.1 Introduction


Globally, one of the key concerns in food security is food waste (United Nations, UN 2015). Ironically, from being food aid dependent for many years, it may be inconceivable for developing nations to have a challenge of food waste. The coordinator of the UN Food and Agriculture Organisation’s Save Food Programme, Robert van Otterdijk, thinks otherwise. Van Otterdijk argues that food wastage is ‘virtually non-existent’ in the developing world. Van Otterdijk further argues that food loss occurs due to poor management of production, transportation and distribution (Food and Agriculture Organisation, FAO 2011).

Nonetheless, food wastage is a contemporary issue in third world countries, with the Republic of South Africa (RSA) being one of them. This is notwithstanding the various conditions leading to this predicament. Even so, in the end, the best chance to food security is to rethink food waste reduction strategies that are inefficient. By undertaking this, it will strengthen food security generally. Subsequently, the obstacle at present is to attempt to alleviate the amount of fruit and vegetable wastage in retail and wholesale stores. This study subsequently correlates with the latest research which dubbed ‘fruits and vegetables’ as the most wasted consumable commodity in South Africa (SA), occurring mostly in the ‘processing and distribution’ phase in the value chain (Nahman & de Lange 2013; Oelofse 2013). Consequently, this paper will focus on food waste (fruits and vegetables) that occur in retail and wholesaling. The CoJ, in the Gauteng province is where the research will take place.

On that note, this introductory chapter will present the problem statement, background to the study, objectives, research questions, scope of the study, and its limitations.

In brief, the entire paper aims to attempt to establish new and innovative ways to lessen food waste occurring in retail and wholesale stores. This could be accomplished by rethinking current strategies and forging collaborations between local government and food corporations in Johannesburg.
1.2 Background to the research

1.2.1 South Africa’s stance on food security measures

The rising global population has increased concerns about food security, with predictions of close to 8.5 billion people occupying the planet by the year 2030 (UN 2015). Whereas the 2017 CoJ population forecast is said to be standing at 9.8 million. Its population density is about 2,900 people per square meter (7,400/square mile). The City’s population growth projection for 2030 is 11.5 million (UN 2014).

This growth projection underlines concerns raised in the 2011 National Waste Management Strategy (NWMS) report, from the Department of Environmental Affairs (DEA) which states that the growing population and economy will put immense pressure on waste management facilities which are already in short supply (SA, Department of Environmental Affairs, DEA 2011). This poses a particular challenge for the CoJ municipality since the City is running out of landfill space (Infrastructure News 2013). Similarly, in the Western Cape, the City of Cape Town landfills could reach capacity in less than a year (Tswana 2018).

As much as the NWMS places emphasis on “the unnecessary use of raw materials and the need to support sustainable product design, resource efficiency and waste prevention”, its scope does not seem to cover food waste that occurs in the retail sector (SA, DEA 2011). Of course, the NWMS does mention that conquering waste as a whole may not be possible. Even so, it is imperative to refer to the latest research on waste. In this case, fruits and vegetable waste, since it is the most wasted food commodity in the land according to the Council for Scientific and Industrial Research’s (CSIR) recent report (Olofse 2013). As such, a commitment to tackle that section of waste is vital to the advancement of food security.

In this regard, the NWMS is committed to ensuring sustainable development in South Africa by means of “re-using products where possible and recovering value from products when they reach their life span through recycling, composting or energy recovery” (SA, DEA 2011). The latter is the preferred options to execute the NWMS strategy, including treatment undertaking on landfills. Quite frankly, when it comes to food security initiatives, the spotlight mainly shines on agriculture, household waste, hunger alleviation, nutrition and landfill matters. This leaves retail and wholesale waste to be disregarded or last on the priority list. This is incited by government, international organisations, academics and researchers.
Consequently, the above challenge poses an opportunity for food corporations to intervene and relieve the government’s ‘burden’ of dealing with waste; particularly food waste. A strategic alliance between the government and food corporations could bring about more positive change in the food industry in SA with regards to retail and wholesale food waste reduction. Ultimately, reducing food wastage will generally improve food security.

Inevitably, as the population of people increase, so do food corporations as they have to meet the hunger demands of these urban dwellers. Fortunately, as many city folks are able to afford fast foods, restaurant dining, and to buy large amounts of groceries; food corporations in the cities are able to meet this high demand for food through restaurant franchises and supermarket expansions.

Although it is good that food corporations are doing well business wise, they are unfortunately leading contributors in food waste. In fact, it has been highlighted by Lundqvist, de Fraiture and Molden (2008) that approximately “half of all food grown is lost or wasted before and after it reaches the consumer”. Ventour (2008) adds by claiming that 81% of the loss is edible food that was mismanaged, and not distributed and prepared in the proper manner. Also, Parfitt, Bartel and Macnaughton (2010:3065-3081) confirm that it is a common challenge in developing countries where food waste is caused by harvest system limitations, technical challenges in storage and cooling facilities, infrastructure, packing, and marketing systems. Food waste occurs throughout different stages of the Food Supply Chain which begins from production, storage, transportation and processing to discarding at retail, restaurants and households (Lundqvist et al 2008).

Hassen and Olsen (2008), and Ettrup and Bauer (2002) declare retail and wholesale industries as the biggest contributors to food waste globally with approximately 7% of all produced food being sold disposed as waste. In support of this claim, Nahman and de Lange (2013: 2493–2500) and the CSIR report (Oelofse 2013) reveal that in 2012, a total cost of food waste in South Africa is R61.5 billion per annum, that 13% of that wastage comes from fruit and vegetable processing. Understanding the food system, particularly food waste is one of the biggest challenges to date for food security in South Africa (Pereira 2014). Although there are initiatives such as Corporate Social and Environmental Responsibility (CSER) by South African retailers in relation to environmental awareness and sustainable development (Pereira 2014: Pereira et al:1234-1255 2013), and the CoJ having its own waste management programmes; there is however no apparent collaboration between different entities on tackling
food waste, specifically fruits and vegetables. Therefore, it is imperative that current food systems and food waste reduction systems are carefully reviewed for the sake of food security, not only in Johannesburg City, but nationwide.

1.2.2 Fruits and vegetables seen as second-rated dumped

It is no secret that one of the biggest reasons why freshly picked and edible fruits and vegetables get disposed of is outrageous standards set by the food producers, retailers/wholesalers and customers (Stenmarck, Hansson, Silvennoinen, Katajajuuri & Werge 2011). For example, peculiar or ‘wonky’ looking fruits and vegetables are not bought by customers and therefore thrown away (Andersson et al 2010; Naturvårdsverket 2008). Other causes of food wastage are handling food incorrectly (Andersson et al 2010; Stuart 2009), not ordering fresh food at the right time (Naturvårdsverket 2008), over stocking (Andersson et al 2010; Naturvårdsverket 2008; Stuart 2009; Thurn 2010), et cetera. As insignificant as it may sound, these behaviours contribute to one of the biggest challenges facing this country; food insecurity.

1.2.3 Food waste through corporate eyes: ignorance or lack of knowledge

“45% of all fruits and vegetables are wasted by suppliers, retailers, and consumers annually worldwide” - FAO (2011).

The CEO of Tesco, an international grocery store chain and chairman of Champions 12.3, which precedes the UN Sustainable Development Goals 12.3, Dave Lewis, made a bold statement at the World Resource Institute (WRI) press conference and said, “But to speak candidly, there are still too many inside business and government who are unaware or unsure of the impact they can have by reducing waste, and who are not doing enough to help tackle it” (Anzilotti 2017). This proclamation affirms the need for partnerships in order to attain food security. This involves the private sector and government cohesively working towards a common goal; which is to be strategic and efficient in reducing fruit and vegetable waste occurring in retail and wholesale stores.

Nevertheless, props should be given to global corporations, countries, stakeholders and civil society who play their part in reducing food wastage worldwide. These include intergovernmental Non-Governmental Organisation (NGO) giants such as the Food and Agriculture Organisation (FAO) and United Nations (UN) agencies, local and international retail and wholesale stores, local government municipalities and social movements.
Lack of knowledge, research and insight might be one of the biggest causes for food waste prevalence in South Africa. This is due to the fact that food insecurity in South Africa is likely to be associated with rural areas, agriculture, household as well as giving retail and wholesale stores less attention in this regard. Conversely, urban hunger is a large and growing pandemic (Battersby 2012:141–159; Maxwell 1999: 1939-1953). This is especially more so because more than 60% of South Africans live in urban areas (Frayne et al 2009). A large number of people are migrating towards the city.

To “unsugar” coat the food waste crisis, South Africa alone has one in five households deemed food insecure. To paint an even bigger picture, “70% of fruits, vegetables and cereals combined are lost in the food supply chain before it even reaches your basket” (Ecolution 2017). This predicament does not only affect the food sector, it concerns the energy and water wastage that occurs throughout the process of food production; from agriculture, transport, packaging, refrigeration and storage. Apparently, all the energy that is wasted from food that is never consumed annually is enough to power the CoJ for nearly 3 months (Ecolution 2017). Anyone would consider this a thought provoking fact. More especially that South Africa is dealing with challenges of electricity supply and the politics surrounding it, draught, economic unrest, et cetera.

Worst of all, South Africa has “no specific and accepted way of measuring food security” (Alton, Hart & Jacobs 2009). This makes way for food insecurity to thrive through the food sustainability loop holes. Unfortunately, this will only create a setback to what the country and the SDG seek to achieve by 2030. Also, there is currently no regularised way of monitoring it (Alton et al 2009). Living in the overpopulated 21st century, this cannot be acceptable, more so for a country that is economically unstable, 13 million South Africans go to bed on an empty stomach while R60 billion worth of edible food is tossed in the rubbish bin (Oliver 2015).

1.2.4 Food planning: co-ordinate and administrate for better results

To detour on retail and wholesale food wastage, while still on the food security subject matter, Sheryl Hendriks, a Professor at the University of Pretoria stressed that food insecurity continues to exist due to lack co-ordination and maladministration of resources in government programmes, which result mostly in duplication. These programmes according to Prof Hendriks were initiated to reduce the plague of food insecurity, but instead seem to cultivate it. “There are more than 60 national programmes aimed at improving food security, but with little evidence to demonstrate any effect” said Prof Hendriks in substantiating her claim (Ensor
Prof Hendriks also announced at the food security and safety workshop which took place on the 2nd of February 2016, that South Africa is one of 12 countries which performed poorly as “the rate of stunting had increased rather than decline during the period of implementation of the Millennium Development Goals” (Ensor 2016). Regrettably, this demonstrates the severity of undernutrition taking place, especially with toddlers. More than that, it is a red flag, highlighting the severity and stance on food insecurity in the country as a whole.

The above is merely a tip of the iceberg with regards to the state of food (in)security in the country. In conclusion, Prof Hendriks stressed the need for a coherent strategy and a single institutional body which will coordinate and oversee the running of food security programmes in the country, all which should be prioritised (Ensor 2016). As such, being a food security policy specialist with extensive experience in food policy analysis, programme design and monitoring and evaluation, Prof Hendriks’s input on the issue matters. It is imperative therefore to involve experts in the field of food security and food planning in the development of efficient strategies that might improve food waste reduction in the CoJ.

**1.2.5 Rapid urbanisation in food security planning**

A new development trend is taking place in both developing and developed nations. These are highly complex developments referred to as ‘Rapid urbanisation’. This is when cities are conscious about how they feed themselves given the circumstance of food insecurity (Morgan & Sonnino, 2010). Sure, South Africa is involved in sustainable projects and programmes relating to waste management, however Prof Hendriks maintains, there is little proof to validate the efficiency of the programmes (Ensor 2016). Be that as it may, the Department of Agriculture, Forestry and Fisheries (DAFF) and the Department of Social Development (DSD) released a collaborated report pledging to increase spending and improve target public spending on social programmes which impact on food security (SA, DAFF & DSD 2013). Needless to say, their efforts are unnoticeable or trivial rather.

One may ask, who exactly is responsible for the planning of food security in the country. As simple as this question may seem, it is not so in the development planning field. For instance, in Almere, a Dutch city, where an inaugural conference for the ‘Sustainable Food Planning Group’ took place to discuss the implications of food planning theory, policy and practice in October 2009, attendees concurred with the notion that food policy planners were defined as “anyone who is working in, or engaged with, the food system with the aim of rendering it more
sustainable with respect to its social, economic and ecological effects” (Morgan & Sonnino 2010).

With that said, South Africans participating in food security could also identify themselves as food planners, particularly the key participants such as food corporations and government (CoJ) in this context. The reason being, the core objective which is parallel to that in Almere is to promote sustainable practices within the CoJ with regards to social, economic and ecological impact. It is by that definition, that it includes all professions and industries with a particular interest and link to food. This includes NGOs that focus on food security, ecological causes, public health, et cetera. They could all partake in strategizing for food waste reduction and food policy making as they all strive to make food policy making a more open and democratic process (Lang, Barling & Caraher 2009).

1.2.6 Reviewing the current linear food supply chain processes
One of the ways to reduce the rate of food waste is to review the current linear food supply chain processes and execute the reverse supply chain strategy. Researchers are finding the reverse supply chain concept appealing, efficient, sustainable and value adding. This way, food supply chain operators save money which trickles back to the economy, environment and society. To put it in plain words, the benefits that could be derived from the reverse supply chain system is poverty and hunger alleviation, economic growth through value addition and ecological urban management (Lee-Smith 2010: 496). However, these advantages are one sided, supply chain companies have their own challenges such as; loss of control and unexpected costs, such as labour costs.

1.3 Problem statement
The issue at hand is the wastage of food, specifically fruits and vegetables by food corporations in the CoJ.

Globally, food security is a great concern, more especially with high population growth anticipated in the coming years (UN 2015). Likewise, Africa has seen an increase in urban migration, food productivity and access also increased to meet the demands of the millions of hungry city dwellers. For a developing country, statistically, the value of food seems to be undermined and overlooked. The amount of food waste from food corporations exposes loopholes within food industry systems and policies. Also, there is minimal co-operation and
engagement between the private and public sectors regarding food waste reduction strategies, efficient ones that is.

Johannesburg, dubbed as the economic hub of Africa, has opened opportunities for supermarket, hospitality, café and restaurant expansions. However, these developments are contributing to extreme wastage of edible food that could be put to good use. It is quite disturbing and unacceptable that a commodity of essence such as food can be left wasted in old traditional food systems that fail to complement the contemporary needs of the economy, environment and society. More especially since retail and wholesale industries are labelled as the biggest contributors to food waste globally, and in South Africa fruits and vegetables are the most wasted food commodity group according to the CSIR research. It is of utmost importance that this matter is attended to urgently.

For many years the thought of good edible food being thrown away from restaurants, wholesalers and food stores has been disconcerting. More particularly if there is a high need for food by the most vulnerable members of society. It is for this reason that this study will focus on the pre-consumer stage of fruits and vegetables, how to strategically reduce the amount of fruit and vegetable waste at food corporations with the intervention and collaboration of food and wholesale stores as well as government in the CoJ.

1.4 Research objective
The main objective of the research is to analyse food waste reduction strategies of food corporations and government in the CoJ in order to identify food waste reduction factors that need improving.

1.4.1 Research objectives
• To determine how food waste affects food security in Johannesburg
• To investigate the causes of food waste in food corporations
• To determine whether food waste can be measured in food corporations
• To explore food waste reduction procedures by food corporations
• To review the government’s approach to food waste reduction in Johannesburg City
• To establish strategic measures that food corporations and government can do to reduce food waste in the CoJ
1.5 Research question
How can food corporations and government improve on their food waste reduction strategies in the CoJ?

1.5.1 Research questions
- How does food waste affect food security in Johannesburg City?
- What are the causes of food waste in food corporations?
- Does food waste get measured in food corporations in Johannesburg City?
- What sort of actions are food corporations taking towards food waste reduction?
- What is the government’s approach to food waste reduction in Johannesburg City?
- What are the strategic measures that food corporations and government can take to reduce food waste in the CoJ?

1.6 Brief description of research methods
The research methodology used in this study will be discussed in detail in Chapter 3. Till then, a brief summary is as follows:

This evaluation used a mixed methods approach. It encompasses both qualitative and quantitative data. Data collection tools are in a form of online surveys, face-to-face interviews and a case study. Online surveys have quantitative and qualitative elements, meaning that questions will are open and closed ended. While face-to-face interviews and the case study have a qualitative orientation. As such, primary research was conducted by means of surveys and a case study. Document reviewing constitutes secondary research.

The CoJ Metropolitan Municipality was the only focus area for the study and communities in the CoJ the primary sample frame. There were six different key informants participating in this research. They are; government officials, store managers, donation distribution organisations, supply chain managers, fruit and vegetable consumers and food security researchers/specialists. All of which completed the online survey.

1.7 Scope of study
This study only covered the CoJ and not the whole of South Africa. Also, fruits and vegetables were the main focus, and no other foods. The CoJ was selected for this research due to its convenience, because it is close to the researcher and due to its cosmopolitan nature. It is an advantage to the research as it also brings diversity. CoJ being a popular place, it has attracted people from all over the continent and world. Thus, there are numerous fruit and vegetable
stores and wholesalers in the region. Another reason is that recently, the new mayor of Johannesburg, Herman Mashaba, stressed the fact that the city is running out of landfill space to accommodate waste from this area. It therefore makes sense for this city to be the main focus of this research.

The study seeks to inform the government and food corporations of the shortfalls of current initiatives and policies regarding food waste reduction in the CoJ. Following the research, these institutions could get insights and recommendations on how best to improve current systems in place, how they could be reviewed and improved for better efficiency in line with 2030 Sustainable Development Goals.

Additionally, the study did not focus on other foods except fruits and vegetables. More importantly, only formal food and vegetable retailers were considered for the study.

The language to be used in this study was English as it is the common medium of instruction in a region where there are many spoken languages.

1.8 Limitations
The main limitation is that this research relates to the scope of work that can be done within the assigned thesis period. Unfortunately, this study was only conducted in one city even though the phenomenon of food wastage occurs throughout the whole of South Africa. Perhaps, at the end of the study, recommendations might be considered and implemented in other regions of the state.

Another restriction is not having the exact number of fruit and vegetable stores and wholesalers. The reason being that not all food stores are registered in the Joburg Market database. This gives grounds to selecting food stores only found in the Joburg Market database, others cannot be found online for many reasons. Moreover, online surveys were not completed on time or at all by targeted participants. This caused a delay in this research.

1.9 Chapter layout
The research report will be divided into five chapters, with each chapter dealing with and detailing specific aspects of the study as follows:
Chapter 1: Introduction and background
It captures the introduction and background to the study, outlines the problem statement and aims of the study, gives a brief description to the research design and methodology as well as outlines contents of the six chapters.

Chapter 2: Literature review and theoretical framework
This chapter provides details of the literature review, focusing on the theoretical framework that informs the study and related concepts.

Chapter 3: Research methodology and ethical considerations
It outlines the research design and techniques used to conduct the research and discuss methods used to gather, refine and analyse data that was collected and how ethical considerations were handled.

Chapter 4: Research results:
In detail, the results emanating from primary and secondary research conducted will be analysed, interpreted and discussed.

Chapter 5: Conclusions of findings and recommendations:
This section gives a summarised version of the entire research conducted and conclusion based on the results of the study. Recommendations will be based on the research findings and conclusion of the study. Ideally these recommendations will be directed to key participants of this study; food corporations (fruits and vegetable retail and wholesalers) and the government.

1.10 Conclusion
Chapter 1 introduced the introduction and background to the study, stated the research problem, presented the research objectives and questions, gave a description of the research methods, highlighted the scope of the study, discussed the limitations of the research and finally outlined the chapter layout. The following chapter provides the literature reviewed in relation to food waste causes and food waste reduction strategies.
CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

“Hunger is not a natural phenomenon. It is a man-made tragedy. People do not go hungry because there is not enough food to eat. They go hungry because the system which delivers food from the fields to our plates is broken” - Archbishop Emeritus Desmond Tutu (2011).

The literature gives a review of two parts; mainly on existing body of literature and gaps in the scientific knowledge. This encompasses food security in the 21st century, the neglect of urban food security, prioritising food waste management, food waste reduction strategies, current food waste management initiatives in South Africa, and the theoretical framework.

2.2 Food security in the 21st century

According to Bajagai (2013:2) there are more than 200 definitions and 450 indicators of food security. It has since been widely established that this concept is more complex due to the ever evolving technical and policy challenges involved (FAO 2003). Although, the most commonly used definition is one approved by at the 1996 World Food Summit, which describes food security fundamentally as when all people at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life (FAO 1996). This description according to Madziakapita (2008), is important as it encompasses all the elements of food security and also includes the two different ways of gaining access to the food people need; physically and economically. Another underlying food security challenge is being able to meet the global demand for food, particularly with continued population and consumption growth (Godfray, Beddington, Crute, Haddad, Lawrence, Muir, Pretty, Robinson, Thomas, & Toulmin 2010).

Food security is linked to food waste in a sense that food security is fundamentally dependent on the reduction and usage of food waste for positive long-term food security, through the efficient use of resources. On the other hand, short-term food security, particularly food availability relies on food waste interventions (Tielens & Candel 2014).

In relation to food waste occurring in the 21st century, the table below will highlight statistics on food waste in various regions around the world. It will indicate the production volume, total per capita food waste and loss, and total per capita food waste source in retail in kilograms per annum and in percentage.
Table 1: Facts on food waste by Global Region

<table>
<thead>
<tr>
<th>Global Region</th>
<th>Production volumes (million tons)</th>
<th>Total Per Capita Food Waste and Loss</th>
<th>Total Per Capita Food Waste Source</th>
<th>Production through retail levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Weight (Kg/annum)</td>
<td>Weight(Kg/annum)</td>
<td>%</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>490</td>
<td>170</td>
<td>165</td>
<td>97</td>
</tr>
<tr>
<td>Europe</td>
<td>1100</td>
<td>280</td>
<td>190</td>
<td>68</td>
</tr>
<tr>
<td>North Africa, West &amp; Central Asia</td>
<td>335</td>
<td>220</td>
<td>190</td>
<td>86</td>
</tr>
<tr>
<td>Latin America</td>
<td>805</td>
<td>230</td>
<td>200</td>
<td>87</td>
</tr>
<tr>
<td>South &amp; South-East Asia</td>
<td>1380</td>
<td>120</td>
<td>115</td>
<td>96</td>
</tr>
<tr>
<td>Industrialised Asia</td>
<td>1530</td>
<td>240</td>
<td>168</td>
<td>70</td>
</tr>
<tr>
<td>North America and Oceania</td>
<td>880</td>
<td>300</td>
<td>190</td>
<td>63</td>
</tr>
</tbody>
</table>

Source: (FAO 2011).

It can be seen from Table 1 above that compared to the rest of the world, Sub-Saharan Africa produced the most food waste at retail level with 165 million tons of food lost or wasted per year. While developed regions of the world such as Europe and North America and Oceania rank low with food loss and waste taking place in retail with a low percentage of 63-68%. Compared to the developing world, South and South-East Asia and Sub-Saharan Africa are standing at 96-97% respectively on retail level food loss and waste. This table reflects the different issues that occur in different regions in the world in relation to food loss and waste.

The low amount of food loss and waste occurring in retail in developed countries is attributed to consumers buying more food than they need and farmers holding on to harvests when market conditions are unfavourable (FAO 2011; Gunders 2012 & Betz, Buchli, Grobel & Muller 2015). In fact, the European Commission (2010) reported that about 5.5% of all European Union food waste is attributed to the retail and wholesale sector. On the other hand, poor managerial skills, technical difficulties, and old harvesting techniques, storage and cooling facilities, infrastructure, packaging and marketing systems are the causes of food loss and waste in developing countries (Parfitt et al 2010).

Through this analysis, it is easier to comprehend where food waste reduction interventions at retail level would be better placed (FAO 2011). Evidently, the developing nations face higher food waste challenges in retail although the overall food waste production per annum is lower than of its counterparts. For instance, Europe and North America and Oceania have yearly
food wastage of 300-280 kg per capita. While North Africa, West and Central Asia and Sub-Saharan Africa have a food waste production combination of 290 kg per capita (FAO 2011).

2.3 The neglect of urban food security

For many years, global talks revolved around alleviating world hunger, more urgently so in third world countries. Africa, being at the forefront of receiving food aid is supported by a number of international organisations such as, United Nations Children’s Fund (UNICEF), World Health Organisation (WHO), United Nations Development Programme (UNDP), International Fund for Agricultural Development (IFAD), United Nations Organisation, et cetera. Ironically, the challenge in urban areas of developing countries currently is food waste.

According to the US Department of Agriculture (USDA), third world countries are facing a challenge of an increasing number of urban hunger than rural hunger (WWF 2017). “From the outset, however, food security tended to mean rural food security and poverty meant rural poverty” (Crush and Frayne 2010). Crush and Frayne (2010) stress that there has only been a focus on rural food security and sustainable food projects focusing on rural areas only, while urban poverty is neglected. In support of that notion, the UN Habitat report also reveals that urban food insecurity is increasingly recognised as a key developmental challenge in sub-Saharan Africa. The world’s population is now predominantly urban, and sub-Saharan Africa is the most rapidly urbanising region (UN-Habitat 2009:25). In fact, it has been revealed by the World Bank survey that about two-thirds of the South African population resides in urban areas (South African Institute of Race Relations 2013).

2.4 Prioritising food waste management

“Waste prevention has been assigned the highest priority under the European waste management law”- Salhofer, Obersteiner, Schneider and Lebersorger (2008).

There is a global call for all nations to reduce food waste and loss by 50%. This urgent statement, amongst others, is aimed at realising the Sustainable Development Goals (SDG) set for 2030 (Lipinski, O’Connor & Hanson 2016). Target SDG 12, which made it on the list, focuses on ‘Responsible Consumption and Production’. This target is said to be achievable at “the retail and consumer levels, and reduce food losses along production and supply chain, including post-harvest losses” (UN 2017).

Similar to the former statement, Lipinski et al (2016) and World Wide Fund (WWF) (2017) assert that not only will food waste and loss reduction sustain more people, it will reduce costs
for farmers, companies, and households, it will improve climate intensity, water usage and land resources.

As much as South African cities exhibit a good economic development model and effective urban institutional framework, Muzenda, Ntuli and Pilusa (2012:151) believe that majority of these cities are now struggling to provide effective systems for solid waste management. They deduce that, “the increase in affluence [due to the increase in the African Middle class] has increased the amount of waste generated and has also led to more complex waste flows” (Muzenda, Ntuli & Pilusa 2012:151). That view can be supported by the current state in the CoJ where landfill space is nearly reaching its capacity (Infrastructure News 2013).

Hence, it is a given that it is urgent to formulate and implement effectual waste management strategies that will aid in the creation of a functional municipal solid waste management system and strategy in contemporary South Africa (Dlamini & Simatele 2016).

Simatele, Dlamini and Kubanza (2017:23) concur that “in order to attain an operative and sustainable municipal solid waste management system, there is need to rethink the current model of municipal solid waste management in sub-Saharan African countries”.

Furthermore, Simelane and Mohee (2015) mention that in many African cities, waste is dumped on open space and is seldom collected. A recent practical example of neglect in urban cities in Africa is that only 15% of solid waste was collected in Lusaka, 17% in Dar es Salaam and 13 % in Kinshasa due to poor infrastructure and sufficient refuse trucks. Naturally, these cities reek in decaying, diseased and infectious waste material since municipal trucks cannot access these waste dumps as roads leading to them too are not serviced (Simatele & Etambakonga, 2015; Simelane & Mohee 2015).

In addition, Simatele and Etambakonga (2015) think that lack of financial resources is the biggest cause for local government not managing solid waste. On the contrary, Prof Hendricks from the University of Pretoria is certain that it is not the lack of funds that prevent proper waste management; it is the mismanagement of resources (Ensor 2015). Although Prof Hendricks might have been specifically referring to organic food waste mismanagement in government initiatives. Hence, with the ambiguity of the former, it is not certain whether to conclude that many government projects in relation to food waste reduction, food waste management or organic waste in general are mismanaging resources.
2.4.1 How first world nations are dealing with food waste at retail and wholesale level

“Food production is over producing food by one-and-a-half times what is required for seven billion people on Earth” - Farmer’s Weekly (2016).

New production techniques and the expansion of arable land have steadily increased in the last 50 years. Today, four billion tons of food is produced annually. This is 50% more than what is needed to feed seven billion people on the planet. In fact, that amount is sufficient to feed the predicted global population in the year 2057. Despite this, 869 million people go hungry on Earth. The majority live in developing regions: 578 million South-East Asia, 239 million in Sub-Saharan Africa, and 53 million in Latin America. While Europe and North America have a very low density of hungry people with a combined population of 14,6 million interestingly, the quantity of food wasted annually is more than enough to feed the poor and hungry of the world (Farmer’s Weekly 2016).

Food, although there is a great abundance of it, it is a valuable commodity to the human race. Unfortunately, FAO’s report reveals that about 1, 3 billion tonnes of food, or a third of the world’s food produced is lost within the food chain (Institute for Mechanical Engineers 2013). Thus, food around the world is ultimately treated as a disposable commodity.

Ceili McGeever (2016:1) declares that France has made a policy against food waste by supermarkets, making it illegal to throw away unwanted foods. As of February 2016, supermarkets are obliged to send their unsought food to food banks or charities. Failing to do so, supermarkets will be fined to up to €75 000 (R1 364 234, 64). This decision came after a lot of pressure from anti-poverty organisations (McGeever 2016:2). Concerned, McGeever (2016) finds it fit for SA to adopt this law by banning supermarket waste. Perhaps this is one of the directions SA could take to address food waste reduction. On the other hand, policy implementation and coordination has proved to be a challenge to the SA government.

The term “ecodevelopment approach” is a concept that encompasses an ecological sustainability approach which encourages environmental conservation and discourages environmental degradation. It is a term coined by then Food-Energy Nexus director, Ignacy Sachs of the United Nations University in the 1980’s (Sach & Silk 1988). Many of the research lately also emphasise the idea of creating a holistic food waste reduction solution that will touch on environmental, social and economic factors. Dumping waste at a landfill is an old technique to deal with waste, but it can still be of good use and cannot be made redundant. Also, it is
likely that it is a sustainable approach to waste management even though the environment is compromised to accommodate landfills.

In the United States, it was announced that public and private initiatives have developed a couple of tools that helps users to identify effective reduction methods (Food Service Solutions 2012) that might lessen food waste and prevent food from ending up in landfills (Waste and Resources Action Programme, WRAP 2013; Feeding America 2014), also to identify new developments in generating waste (EPA 2014b). The goal is to get a comprehensive understanding of food waste drivers and the “cost components of merchandising to provide product buyers and store managers with the flexibility to design targeted food waste reduction strategies” (Killeen 2010). Despite the fact that this strategy centres around product buyers and store managers, the essence remains ‘food waste reduction strategies’, regardless of the vantage point food insecurity is tackled at.

In the USA, thinking above their capitalist values; private organisations combined forces with social organisations to create a way that might reduce food waste in America. This collaboration approach is what many food security researchers preach about and recommend to SA government and food corporations. Collaboration by these parties is said to unveil food waste reduction insights that may bring positive change to food security in the developing world. These sentiments were brought upon by the failing colonial food systems set in urban regions in SA many decades ago, and are still in practice in the so called ‘new democratic’ state. As if carved in stone, these old food policies seem not to budge therefore, giving way to hunger, poverty, fiscal hindrance, environmental harm and so forth.

Although an American academic, during Killeen’s (2010) studies on ‘retail food waste’, found that there is no existing literature which examines the management and merchandising costs that can be allocated to food waste at retail. This is an opportunity to infiltrate and explore this vacant area of research. Perhaps SA researchers may be the first to tap into this gap of knowledge since retail waste is a greater issue here. Also, this may cover the food management methods and the measurement of food waste in retail and wholesale stores in the country.

In developing regions such as Sub-Saharan Africa, a huge portion of food losses occur near the production process with about 39% of food loss (FAO 2011). Unlike developed regions such as North America and Oceania, a bulk of their food losses transpires during the consumption phase with 61% of food loss (FAO 2011).
South Africa stands as the most food secure country in the African continent. The country currently produces enough food for its population of approximately 58 million (Department of Economic and Social Affairs, Population Division 2017). Although, due to the 1989 and 1993 drought; production has slowed down. It has since recovered drastically to the point that it produces more food than the Southern African Development Community (SADC). Contradictory to the progress, 12 million South Africans sleep on an empty stomach, have one meal a day or spend the entire day without food (Farmer’s Weekly 2016).

The magnitude of food waste in South Africa in 2012 stood at 9.04 million tonnes per annum from local production, equating to 31.4% of the annual production. While food waste from local production including imports and exports equated to 10.2 million tonnes per annum (Oelofse 2013).

Data reveals that the total cost of the food waste across the food value chain in South Africa was estimated to be R61.5 billion per annum, equivalent to 2.1% of South Africa’s annual gross domestic product. From the research, it is highlighted that most of the waste occurs from the processing and distribution stages of fruit and vegetables value chain, as well as agricultural production and distribution stages of meat value chain (Nahman & de Lange 2013).

Furthermore, research from both Nahman and de Lange (2012), and Oelofse (2013) in the CSIR report, discloses that fruits and vegetables are the most wasted consumables throughout the value chain, more so during the course of processing, packaging and distribution. Furthermore, Oelofse (2013) disclosed in the CSIR report that in segmented commodity groups; fruits and vegetables account for 44% of waste and cost 36% of potential losses of earnings in South Africa.

Literature also mentions that post-harvest is likely to be referred to as food “losses” and “spoilage”. Food loss refers to the decrease in food quality or quantity (FAO 2014), making it inedible for humans (Grolleaud 2002). It is only at a later stage in the Food Supply Chain that the term food waste is applied and generally links to behavioural issues (Parfitt, et al 2010).

In this light, in Europe, the new proposed updated definition of food waste is “any food and inedible parts of food, removed from the food supply chain to be recovered or disposed (including-composed, crops ploughed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)” (FUSIONS 2016). This definition was compiled by members of the Food Used for Social
Innovation by Optimising Waste Prevention Strategies (FUSIONS 2016), a multi-stakeholder platform and the external Expert Advisory Board. It is based on a range of definitions used to date as well as on expert consultations.

![Most wasted food commodity in SA](image)

**Figure 1: Most wasted food commodity in SA**

Sources: Nahman and de Lange (2013).

As seen from Figure 1 above, by a rather large percentage, fruits and vegetables take the lead as the highest food to be thrown away, contributing 44% of all food waste weight in SA. Oddly, the more expensive food commodity, meat and dairy are placed second. These foods contain healthy nutrients required for growth and strength but are unfortunately discarded in astonishing volumes.

### 2.4.2 Food waste vs food loss

“For every crumb of food produced and wasted, the stored nutrients, energy, water, capital, labour and other resources are also wasted. This only worsens the food insecurity experienced across the world” - Notten (2014); Spiker, Hizam, Siddiqi and Neff (2017).

Debatable, the European Commission (2010) defines food waste as composed of raw or cooked food materials and includes food waste before, during and after meal preparation in the household, as well as food losses in the process of food manufacturing, distribution, retail and food service activities. A similar description was given in 1981 by the UN’s FAO who defined
“food waste as part of ‘food loss’ and refers discarding or alternative (non-food) use of food that is safe and nutritious for human consumption along the entire food supply chain, from primary production to end household consumer level” (FAO 2014). On the other hand, ‘food loss’ is defined as, “the decrease in quantity or quality of food” (FAO 2014). Nonetheless, ‘food waste’ is the term this study will use in relevance to the research question. On that note, it is important to mention that each legal jurisdiction of the Food Supply Chain has its own definition of what food waste is.

In consideration of the foregoing, food waste is categorised in two parts; edible food or unavoidable food and inedible food or avoidable food. Unavoidable food is classified as edible or potentially edible food. Avoidable food is food that is not edible to the human (i.e. peels and bones) (Ventour 2008). However, as this study centres around fruits and vegetable, the term food waste will indicate ‘edible’ food in that regard unless stated otherwise.

2.4.3 The food supply chain phase where food waste occurs the most

“Reducing food waste at the later stages at the supply chain can save 3 times the energy of cutting waste post-harvest” -WWF (2017).

In the broader sense, food supply chain is described as a sequence of processes and flows that aim to meet the customer requirements that occur within different stages of the chain, from production to final consumption (Hobbs, Cooney & Fulton 2000).

In more developed countries, food waste occurs due to consumers who tend to buy more food than they need while farmers retain harvests when markets conditions are not so favourable (Gustavsson, Cederberg, Sonesson, van Otterdijk & Meybeck 2011; Gunders 2012; Institution of Mechanical Engineers 2013; Betz et al 2015). Whereas developing countries, a bulk of their food is mainly wasted at the pre-consumption phase due to “financial, managerial and technical limitations in harvesting techniques, storage and cooling facilities (exacerbated by difficult climatic conditions), infrastructure, packaging and marketing systems” (Parfitt et al 2010). It is for the reasons above that this study will focus on the pre-consumption phase of the Food Supply Chain in relevance to context of this research.

With that being said, developed nations lose a huge portion of food during the consumption phase of the Food Supply Chain. This is a behavioural problem (Parfitt et al 2010) which is
more of a challenge since attempting to change human behaviour complex. On the under hand, it is uncommon for developing nations to be facing efficiency, effectiveness (Ingram 2011) and insufficiency situation as they economy is not strong enough to equip them with the advanced machines and the expertise and food handling methods are ancient to semi-modern (Ingram 2011). Despite the above challenges, all nations and food corporations have a duty to revisit and address food waste challenges occurring throughout the Food Supply Chain for the sake of humanity, the environment and the economy (Jensen, Munksgaard & Arlbjorn 2013; Strid, Eriksson, Lagerberg Fogelberg & Hernant 2013; VCMC 2012).

2.4.4 CSIR food waste report findings
Recent report findings from CSIR state that the largest costs of food waste occur in food distribution (R19,6bn), followed by processing and packaging (R15,6bn) and agriculture production (R12,5bn) (Oelofse 2013). Also, fruits and vegetables are revealed to be the most wasted food in the value chain more so during the processing and packaging phase. This commodity group contributes 44% of food waste generated in South Africa and 36% of potential earnings lost (Oelofse 2013).

In the 2017 report findings, one of the main obstacles identified is the lack of a common definition for food waste. This is an issue as SA might struggle to achieve the 2030 SDG Target 12.3 since it doesn’t even know how to appropriately describe food waste. Moreover, there is a lack of data on food waste at all stages through the value chain in terms of quantities, reasons for waste and management. Also, waste generation estimations are flawed, resulting in unreliable conclusions. The fact that there is insufficient data to have a clear strategy to reduce waste in the food supply chain is a cause for concern (Oelofse 2017). Needless to say, the data that is needed tends to be expensive and time consuming, it is however worth the effort as it will reveal primary causes, the extent of the problem and prompt effective migration strategies (WWF 2017).

Currently food waste is estimated at each stage of the value chain and calculations are based on Municipal Solid Waste (MSW) characterisation studies. Another challenge is that there are legal constraints to minimising food waste including the lack of a national strategy to address food waste (Oelofse 2017) even though the SA government, the Department of Environmental Affairs to be precise, committed to adopting the SDG Target 12.3 by championing to achieve its goal (WWF 2017). Thus, this research focuses on how to reduce perishable food (fruit and vegetable) waste at retail and wholesale sectors in the CoJ.
The following figure highlights food value chain stages in SA where food waste takes place:

![Waste occurring in the value chain](image)

**Figure 2: The value chain where food waste occurs in SA**


Food waste transpires throughout the food value chain, from agricultural production to consumption phase (Hobbs et al 2000). Even though there are more than four value chain stages, Figure 2 provides a simpler and summarised food value chain. These stages usually include elements of food production, food processing, storage, distribution and aggregation (Wilkins & Eames-Sheavly 2011; Grolleaud 2002).

An analysis of Figure 2 indicates that a quarter of food waste occurs in the last stages of the value chain which are distribution, packaging and consumer level. It might appear that the latter value chain stages are less of a priority compared to agriculture. However, according WWF (2017), cutting down on wastage in later value chain stages can save 3 times the energy of cutting waste post-harvest. That statement is sustained by this entire research paper. Current food waste initiatives in the CoJ should centre around late food supply chain stages which include lessening fruits and vegetable waste at retail and wholesale phases.
2.4.5 Reasons for disposal of food in retail

“At retail level, large quantities of food are wasted due to quality standards that over-emphasize appearance”- FAO (2011).

From conducted interviews in the IVL Swedish Environmental Research Institute report (Stenmarck et al 2011), the misconception leading to food waste generation is that food turns “unsaleable”. This means, when a product has turned “unsaleable”, it is rejected by customers and therefore not sold (Stenmarck et al 2011). Other reasons to food being wasted are:

- The demand for quality and freshness from customers, for fruits and vegetables and other perishables, there is no formal “best before date”, but the look of the product determines its purchase (Andersson et al 2010; Naturvårdsverket 2008). Also, there is a belief that it will be impossible to sell “wonky” fruits and vegetables. In Europe, the EU set standards and requirements on how food should look like. For example, the length of a banana, size of apple. To some extent, these requirements are not compulsory anymore (Stuart 2009).

- Customers expect full shelves throughout the opening period of the stores (Andersson et al 2010; Naturvårdsverket 2008; Stuart 2009; Taste the waste 2010). The stores are then compelled to fill up the shelves, thus causing over stocking and production than needed. For example:
  - Stores baking by 7% fresh bread than the expected sales are produced in order to meet the customer demands (Andersson et al 2010; Naturvårdsverket 2008).
  - Displaying fruits and vegetables in large piles, with the result that food in the middle or bottom of the pile gets easily damaged and must be thrown away. Also, if a fruit rots in the pile, the surrounding fruits have a high chance to being rejected than if displayed one by one (Salhofer et al 2008; Taste the waste 2010).
  - Best-before dates, Customers tend to choose goods with the longest shelf life even if it is intended to be eaten the same day (Andersson et al 2010; Hansen & Olsen 2008; Naturvårdsverket 2008).

Other causes are due to how the stores operate:

- Ordering stock at the right time, especially fresh or perishable food (Naturvårdsverket 2008).
- Food producers sometimes take back unsold products from the retail stores (Åhnberg & Strid 2010). Therefore, retailers feel no obligation to order more accurately.
The handling of food in store is also a reason:

- Handling food incorrectly, such as improper storage temperatures and lighting (Andersson et al 2010; Stuart 2009).
- Break-down of products due to wrong type of mechanic handling (Andersson et al 2010; Stuart 2009).

Suggestions for action against food waste in retail and whole sale:

- Cognical strategy- changing the customer’s behavior and demands with information campaigns in stores (Stenmarck et al 2011).
- Advocacy strategy- taking action against policy and regulations that might increase food waste in the retail sector. For example, ensuring optimal packaging rather than minimal.
- Food treatment strategy- taking action towards the best treatment of food. For instance, donating it to charity. It is not a food waste prevention plan, but it is the best treatment than disposal (Strid et al 2013).

Figure 3: Wonky tomatoes

2.4.6 Gaps in quantifying food waste

“...a first step to approach corrective and prevention measures for the food waste issue has to be related to the quantification in both industrialized and particularly developing countries because of the lack of food wastage management systems and legislative measures”- Thi et al (2015).

According to the Altman et al (2009) report for the Human Sciences Research Council (HSRC) and Oelofse (2017), there is no specific and accepted measure of food waste in South Africa, and currently there are no regularised ways of monitoring it. Similarly, the DEA reported that one of their biggest challenges is that they have “limited understanding of main waste flows and national waste balance because the submission of waste data is not obligatory and where available is often unreliable and contradictory” (DEA 2011).

Basically, understanding quantities of waste and waste production patterns is crucial to creating well suited strategies of tackling food wastage, yet there is still limited and comparative data on food waste quantities (Lebersorger & Schneider 2011; Nahman et al 2012). Essentially, Wilkie, Graunke and Cornejo (2015) setting up data systems that will capture food waste and patterns throughout the food supply chain could be a plausible start to quantifying and applying food waste management interventions that may lead to sustainable economic development. Likewise, Stenmarck et al (2011) stress the importance of every country to present actual amounts of food waste on a regular basis. Without these amounts, the true environmental impact and the best way to prevent it will be unknown.

On the contrary, Nahman and de Lange (2013) assessed the cost of edible food waste throughout the entire food chain, from agricultural production to consumption at the household level. Food waste was quantified in physical units (tones) throughout each stages of the food chain for various commodity groups. Then, prices were multiplied by the quantities and the resulting values were aggregated across the value chain for all commodity groups. With that said, if the above researchers were able to quantify the amount of edible food waste, so can the government and food corporations. This exposes the lack of collaborative efforts between the public and private sector to pursue a joint venture in food waste reduction. An integrated approach to curbing food waste by both entities could have a higher probability of success. Presently, food waste is estimated and calculated at MSW characterisation at each stage of the value chain.
On the other hand, insufficient and inconsistent data on food waste could be due to the fact that waste separation at source only became a legal requirement in South Africa in 2009 (Republic of South Africa 2008). This is where avoidable and unavoidable foods are separated from the food waste pile.

**2.4.7 The need to reduce food waste**

“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and health life”- FAO (2003).

Basically, the International Food Policy Research Institution (IFPRI) (1995) declared the three pillars in which food security is built on, see figure 3. They are as follows:

- Sufficient food quantities which are available on a consistent basis. This means food must always be enough to feed everyone, all the time, and every day.
- Access to food resources that is obtainable and appropriate for a nutritious diet. Nutrition must not be difficult to obtain so that people get healthy food.
- Appropriate use of food used as a source for nutrition. Food must not be misused and but utilised for nourishment and care.

![Three Food Security Pillars](image)

*Figure 4: The three pillars of food security*
Figure 4 illustrates the 3 pillars of food security by the IFPRI, however, SA has a National Policy for Food and Nutrition Security which identifies four pillars of food security of the country, that is; adequate availability of food, accessibility of food, utilisation and quality of food and stability of food supply. “The multidimensional nature of food security necessitates a public policy approach that requires the coordination of government departments in the various sectors. The National Policy on Food and Nutrition Security was approved by cabinet with the aim of providing a framework to streamline and harmonise the various initiatives by diverse government departments, civil society and the private sector. The policy was approved with the Household Food and Nutrition Security Strategy and the Fetsa Tlala Production Plan” (Nkwana 2015). SA as such has one extra pillar which caters to the context of the food security needs of the country compared to the three pillars of the IFPRI.

Imagine a year’s wasted food on Earth in one land area; it will be roughly the size of China and be the third largest emitter of greenhouse gasses in the world (Hanson & Mitchelle 2017). While on the subject of land, according to former executive mayor; Parks Tau and current executive mayor of Johannesburg, Herman Mashaba, the city is quickly running out of landfill sites and might start to export its waste to neighbouring cities or provinces (Infrastructure News 2013 & Seeth 2017). In light of this, food waste reduction strategies in Johannesburg City should be given priority. In a similar case, the Western Cape in the south end of the country is experiencing a waste problem crisis. Anton Bredell; MEC for environmental affairs informed the press that the province is running out of landfill space. According to the government, Western Cape accounted for about three million tonnes of waste in 2017 (Annie 2018).

With this being the case, benefits to reducing food waste and loss lead to a stronger economy, food security and a cleaner environment (Hanson & Mitchelle 2017). Thi et al (2015) concur by pointing out that sustainable development in developing countries will rise from opportunities in food waste reductions.

Furthermore, it is potentially an important factor in an effort to combat hunger and improve food security in poor countries (Gustavsson et al 2011). Similarly, the 2010 State of Food Insecurity in the World report (FAO 2010) underlined that there are about 925 million undernourished people in the world, 98% of them are from third world nations. Secondly, the problem relates to greenhouse gas emissions. To substantiate, Bakas (2010) states that throughout the food supply chain, greenhouse gas emissions range between 2.8 and 4.14 tonnes of carbon dioxide equivalent (tCO2e) per tonne of food on average. Lastly, the problem relates
to the disposal of waste. There are many landfills in South Africa and the ones situated in the CoJ are nearly full (Infrastructure News 2013).

2.4.8 Criteria for waste in retail and wholesale stores
The main reasons for the disposal of food in retail in no particular order is; over stock, expectation of perfect appearance, sell-by dates, damaged goods, outdated promotional merchandise, and unpopular items (Jacobs 2014). All these reasons for food waste in retail and wholesale are more or less linked to customer behaviour or the profit making mentality of the store owner which often leaves little room for prioritising food waste reduction or prevention (Stenmarck et al 2011).

There is a massive call for action related to food security and agricultural policies in South Africa (Hendricks 2014). On the contrary, it seems the hype is not as much for the food sector, specifically in retail and wholesale in South Africa. According to Stenmarck et al (2011) research findings, it might not be probable for authorities to develop regulations that directly interfere with the work being done in companies to limit food waste, although three types of actions are highly recommended; consumer awareness and advocacy on food waste in food corporations, actions towards regulations and politics that might increase the amount of food waste in the retail sector, better waste treatment and the least favourable one for developing countries is increasing the price of food in the hope of people not wasting food anymore.

2.5 Food waste reduction strategies
The staggering data on food waste has alarmed some nations and it has become a priority to reduce both food waste and loss. This will assist in improving resource optimisation and costs of reduction waste generation. The following literature scratches the surface to current and upcoming food waste reduction strategies in SA.

2.5.1 Target 12.3: a stepping stone to cutting 50% of retail and consumer level food waste
At the end of the 2015 SDG period, the United Nations General Assembly took a decision to prioritise food waste and loss. It is at this meeting that the legislative body which includes global nations; agreed with the new set of 17 SDGs and 169 targets. These goals form part of the 2030 Agenda for Sustainable Development which came into effect in January 2016. In summary, the overall global goals are to “end poverty and hunger, protect the planet, and ensure prosperity for all populations and generations” (UN 2016).
A set of global indicators will be used to monitor and review the SDGs. “These will be compiled in an Annual SDG Progress Report” (UN 2015). The compilation report will comprise of “data produced by national statistical systems and information collected at regional level. It is expected that the global reporting of progress on the 2030 Agenda will be based on global and regional aggregates of data on indicators as compiled by international agencies based on their respective existing mandates and/or expertise” (UN 2016).

In support of food waste and loss, the 12th SDG intends to “ensure sustainable consumption and production patterns”. The third subheading under this objective (Target 12.3) seeks to cut per capita global food waste at retail and consumer levels by 50%, and by 2030, reduce loss in food via production and supply chains (including post-harvest losses) (Lipinski, O’Connor & Hanson 2016). In relation to the former, target 12.3.1 suggests a ‘global food loss index’ (UN 2016). This may assist in keeping track of progress or shortfalls in the value chain post-harvest in participating countries in regards to food waste and loss reduction.

As a result of the proceeding SDG 12.3 target, the SA government boasting about being a Champion of the SDG, have made a commitment to half food waste by 2030. Subsequently, the government represented by the Department of Agriculture, Forestry and Fisheries is obligated to make the necessary provisions by creating the political and social environment conducive to achieving a sustainable food future (WWF 2017).

Prior to the 2030 SDGs, there were 8 Millennium Development Goals (MDG) which were conceived in 2000. The Millennium Declaration was signed by 189 country leaders. These targets were anticipated to be achieved in 15 years’ time, expiring in 2015 (Lipinski, Clowes, Goodwin, Hanson, Swannell & Mitchell 2017). Although, during that period; food waste and loss was not much of a priority to be included in the MDG agenda. Halving extreme poverty and reducing child mortality rates were the main concerns at the time. Fortunately, the MDG efforts paid off as extreme poverty was indeed cut by 50% (Lipinski et al 2017). Still, as much as there is a reason to celebrate reaching the goal, there is still a lot to be done, food loss and waste is still increasing at an alarming rate even though it is preventable (WWF 2017).

Nonetheless, as the world changes, so does its needs. The paradigm has shifted towards sustainability. The focal point centres on “building a sustainable world where environmental sustainability, social inclusion, and economic development are equally valued” (Lipinski et al 2017). Fortunately, the SA government joined the movement by proclaiming to adhere to the food waste reduction strategies to be attained 12 years from now.
2.5.2 The ‘invisible crisis’: an interdisciplinary approach to a solution to curb food waste

As we have seen, the latest review on literature has emerging information about the urban food (in)security crisis. This narrative acknowledged and highlighted new insights on food waste becoming a recurring issue in cities of developing nations across the globe. It is for this reason that innovative tactics be at the top of the agenda for tackling food wastage, fruits and vegetables in the context of this study.

Undoubtedly, it can be argued that government along with food corporates have failed to introduce comprehensive policies and technical knowledge in food waste reduction as they seem to have adopted a “know it all” mentality or worse; an invisible crisis attitude (Mudhoo, Mohee & Simelane 2015; Crush & Frayne 2010). It is these mind-sets that are costly to food security provision. In this manner, it has contributed to failing to act in devising appropriate strategies to lessen food waste (Mudhoo, Mohee & Simelane 2015).

Simatele and Etambakonga (2015) and Samson (2009) believe that the fundamentals to understanding the solid waste management system as a whole is to critically examine current challenges faced by urban authorities in sub-Saharan Africa in waste management. According to them, the city is operating on colonial and out-dated development planning policies and techniques in which the urban authorities have limited capacity to innovate and improve on all waste management systems (Sentime 2014; Simatele & Etambakonga 2015).

2.5.3 Indigenous knowledge as a food waste management strategy

Indigenous knowledge or the ‘native ways of knowing as others may call it’ is the dynamic way in which residents of an area have learned to understand themselves as a people and their relationship with the natural environment. The people have come to apply their knowledge of nature into their everyday lives (Semali & Kincheloe 1999). In fact, scholars such as Semali and Kincheloe (1999) consider this knowledge “intellectually evocative” as they find it multi-dimensional and valuable for a variety of purposes.

Indigenous knowledge may be one aspect in which food waste could be curbed. As much as it has been proven to work in rural communities, it may also work in urban development in regards to food security systems. Indigenous knowledge is flexible and mobile, which makes it plausible to be placed anywhere. Therefore, it can be incorporated into scientific research or technology development (GNA 2015). African scientists with indigenous knowledge are capable of generating advanced technology that may lessen the amount of food waste that
currently occurs in all stages of the supply chain. In addition, productivity may be increased but with reduced food waste creating a sustainable food supply chain and food management system.

2.6. Current food waste management initiatives in South Africa

It is unfortunate that South Africa currently has a few waste treatment solutions (DEA 2011), as it continues to dump all waste in landfills, which has always been the economical solution. Likewise, de Lange and Nahman (2015) maintain that landfilling remains the predominant method to waste management in South Africa accounting for approximately 90% of all waste generated.

Recent changes in waste management legislation in South Africa, and the associated increased costs of landfill design and construction are in line with new legislated requirements (Oelofse 2013). Be that as it may, this new legislation is a mere remedy on the surface and not the root cause of wastage in the country. Subsequently accepting the new landfill legislation could imply that food waste is acceptable as long as there is enough land to discard it.

There was a call by the National Union of Metal Workers of South Africa (NUMSA) for government to impose strict requirements of food corporations across the entire food chains to tackle food waste and monitor progress to ensure absolute minimal wastage (Olivier 2015). According to NUMSA, the problem lies within the moral compass of the capitalist system where food corporations only value profits over caring for human beings (Olivier 2015).

In the attempt to curb fruit waste taking place in the fruit processing industry, researchers Khan, Roes-Hill, Welz, Grandin, Kudanga, van Dyk, Ohlhoff, van Zyl, and Pletschke (2015) found helpful information that identifies fruits as value-added products that may be used as feedstock in accordance with the characteristics and composition of each fruit type. Their research discovered that knowledge and use of fruit waste streams with regard to enzyme production as a value-added product hardly exists (Khan et al 2015). In brief, their research addresses the use of water waste from processed fruits and turning it into a value added product, notably biofuels and enzymes. This might be a prospective strategy to be implemented in the future food security system and might potentially address food waste.

In order for fruit waste to be considered useful, feasible feedstock product must be “produced in sufficient quantities (seasonality of the feedstock is an important consideration) and have sufficient potential for value-addition, which outcompetes that of the current disposal method”
(Khan et al 2015). After all, SA does produce a large number of fruits and instead of it ending up in the landfill to decompose; it could be brought to good use.

Noting the compelling nature of this interesting topic, the research concludes that benefits to adopting their integration system model that utilises fruit and olive oil waste streams, Khan et al 2015) trust it will be parallel to realising a bio-economy and a sustainable environmental management in SA. These objectives complement those of the SDG 12.3 for 2030 (Lipinski, Clowes, Goodwin, & Hanson 2017).

2.6.1 Waste management systems in Johannesburg

“The Gauteng province produces the highest amount of waste annually with 761 kg/per capita”-Fiehn and Ball (2005).

The national waste information system (WIS) can be accessed through the South African Waste Information Centre (SAWIC), “a tool developed to provide the public and government with the access to waste information in South Africa” (Department of Environmental Affairs and Tourism, DEAT 2005).

“The WIS is a tool that captures information on quantity and type of waste generated, reprocessed and disposed of in South Africa and exported from South Africa and is based on a system framework approved by the DEAT in June 2005” (DEAT 2005). However, this tool only focuses and records hazardous (SABS Class 1-9) and general waste (subcategories of glass, paper, plastic, etc.). Conversely, to a certain extent it is considered a bit of a challenge to measure wasted fruits and vegetables (organic food) as food waste from retail stores and restaurants, and is not always separated. Then again, it is possible to do so at every stage of the food supply chain per commodity group. Hence, the calculation of food waste is done so in South Africa based on production figures for each corresponding commodity group (DEA 2012).

During the first of four phases, the existing WIS tool was assessed in 2005; it was found that it was faulty in a way that it failed to consistently capture waste information. Given that, there is a high failure rate for the WIS generally. Nonetheless, it is acknowledged that it is a challenge to be accurate on general waste generation data (Godfrey 2008), and it is largely based on estimates. Since 2005, there is no record or update of an improved WIS. This proves that there is a need for an improved waste measurement tools in corporate and/or government. Unless
there is cohesion and collaboration amongst experts from food waste management researchers, government and other experts in related fields join forces in tackling wastage. More so as researchers; Nahman and de Lange (2013) claim to have managed to quantify food waste as cited above under ‘Gaps in quantifying food waste’.

In that regard, the South African Waste Information Centre (SAWIC) website has an Industry Waste Forum created to enable industry and government to partner towards the implementation of the Waste Act on this platform. Representatives of various industries get the chance to raise issues relating to the industry waste management and compliance with the Waste Act, best practices and relevant case studies can be shared, to ensure collaboration amongst role players, built capacity, and promote compliance with legislation (DEA 2016). Unfortunately, the initiation for this convergence on this website seems to be merely theoretical. As there is no substantial evidence that proves cohesive partnerships working towards implementation of food wastage reduction, particularly fruits and vegetables as the most wasted food. Professionals from other industries are virtually invited on this cyber platform to merely ‘raise an issue’. This raises questions of how these issues will be addressed, will they even be addressed? That’s the key question.

Following extensive research for food waste data, the results reveal that landfill site records, waste information databases, as well as municipal integrated waste management plans extracted from the South African waste information system (SAWIS) revealed sub-standard and unsatisfactory results. No more than four sites reported food waste data between 2007 and 2010. The data captured from the metropolitan municipalities’ landfill sites demonstrate that pre-consumer food waste was reported generally by municipalities, however, as a condition of a safe disposal certificate. Though, this data need not be mentioned (Oelofse & Nahman 2013).

The poor data results on food waste could be attributed to the fact that it was only in 2009 that it became a legal requirement for waste to be separated at source in South Africa (Republic of South Africa 2008). Whereas reporting to the SAWIS is still optional and not yet a prerequisite at this time in this regard. Although, by 2012 it is likely to be compulsory to report to the SAWIS (Baloyi, personal communication n.d).

Disappointingly, only two out of 112 of the reviewed waste management plans reported food waste figures. For this reason, accurate and representative statistical data on food waste cannot
be reported. Firstly, less than 2% of the waste management plans by municipalities made an effort to disclose statistics on food waste occurring in their respective regions.

In SA there are current initiatives taken by some food retailers to reduce food waste. These include donating to the FoodForward SA, Formerly FoodBank and charities, reducing in store food by half price, more so if the food passes its sell-by date (FoodForward SA 2018). Woolworths donates food that has passed the sell-by date and is sold at half price at the stores. Pick ’n Pay consistently donates to charity food that is within its code (use-by) dates. After all, it is illegal to give food outside of its code dates says Pick ’n Pay (Pick ’n Pay 2017). These food donation projects really go a long way as 4 000 000 kilograms of food is distributed to 600 beneficiary organisations thus making it possible for 17 600 00 million meals per year to be given to the most vulnerable (FoodForward 2018).

2.6.2 The reverse supply chain strategy
The reverse supply chain approach is believed to promote sustainability within the food supply chain system and it will operate in a way that will impact society, the environment and the economy positively in the long term (Carter & Rogers 2008; Hart & Milstein 2003). To achieve sustainability in the supply chain is to review the chain’s linear process and implement the cradle-to-cradle rather than the cradle-to-grave philosophy. Philosophically, the Reverse supply chain will not only be sustainable, but value-creating (Jensen et al 2013; Lehr et al 2013; Halldorsson et al 2009). This notion is also known as ‘extended producer responsibility’ (EPR), which intends to internalise the externalities of the supply chain during the design of the Reverse supply chain (Ji et al 2014; Lifset 1993). This concept aims to initiate the take-back practice or clause that requires the producer/supplier to organise recycling or reuse of the products returned to them; be it products that are near the expiry date, unsold or discarded (Atasu et al 2009; Scarlett 1999). Lifset et al. (1993) further explains that a company has the authority to design its RSC anyhow but it should have the four fundamentals for ‘extending’ responsibility:

- Facilitate and improve recycling and recovery
- Influence decisions on product design
- Create new capabilities
- Achieve financial benefits
Also, Robinson (2015) concurs and adds to Lifset et al (1993) previous points by stating that with the right technology set for the reverse logistic process management, shippers also stand to benefit from:

- Improved RSC visibility, increased productivity and greater responsiveness to customers
- A synchronised supply chain to now include forward traditional, inbound, and reverse logistics
- Transparency in supply chain operations across the network
- Automatic consolidation of data from partners and systems

2.6.3 Redundant food policies in South Africa

In 2013 HSRC released a report which stated that there has been lost of trust in the Integrated Food Security Strategy (IFSS) as it has been labelled a failure mainly due to the fact that food insecurity still prevails in modern society. Over 14 million people in South Africa are food insecure and there has been a slow progress in realisation of the MDG target of halving hunger by 2015. Indeed, the objectives of the government policies were and remain laudable, they somehow were not implemented into programmes across the Ministries and the lack of knowledge to be able to implement is one of the reasons for its failure (Chitiga-Mabuugu, Nhemachena, Karuaihe, Motala, Tsoanamatsie & Mashile 2013).

Basically, an appropriate institutional framework and functional coordination structure is non-existent which led to a fragmented response. The IFSS for SA provided a relevant and multi-sectoral framework for addressing food security. Instead, the framework remained just that, a plan, it was not implemented and coordinated as it promised. As a result, the potential for effective and substantial change is diminished. In the midst of these criticisms, “the key achievement is that Food Security has been made a national policy priority across all government departments and is reflected also in the fiscal contribution to food security programmes” (Chitiga-Mabuugu et al 2013).

2.7 Theoretical Framework

Post-development perspective became popular in the 20th century. Its theorists are critical of the Western models of development, condemning the unjust notion of development and stating that it never worked to begin with and stress that developing countries should not have to adapt
their models but rather find own pathways to development (Kippler 2010; Aiken & Moore 2016).

Post-development theory disputes the concept that development theory and the practice of post-World War II development projects aid in universal development. Contrary to that believe, post-development assures that development theory is a well-tailored model that merely measures the progress of the West and is not necessarily inclusive of other regions. Examples of failed interventions are demonstrated all over the world. In an effort to improve failures of development by development theorists, post-development theories maintain that amending it will not make the development agenda a success. According to them, the implementation of development is not the issue, but rather that development itself is a flawed concept which should be abolished from the human progress discourse (McGregor 2007; Karplus 2014).

Karplus’s (2014) description of post-development theorists is that “they do not call for a return of earlier ways of life or eschew the desirability of change for those who suffer in poverty”. Instead for Ahorro (2013), development is “understood as the invention of aid structures and practices that would lead to rising living standards, manifested in an increase in income, which in turn would render better health and nutrition”. Escobar (1995:215) summarised the four foundations underlying the post-development practice:

- No interest in development alternatives but in alternative development, thus rejecting the entire ‘development’ paradigm.
- Interest in indigenous knowledge.
- Critical towards established scientific discourses.
- Defends and promotes localised pluralistic grassroots movements.

The term development covers a wide range of ideologies, services and objectives. One of its development goals is food security. Unfortunately, food security is not appropriately addressed by the development discourse and practice in the opinion of post-development theorists. Case in point is that SA lacks a definition of ‘food insecurity’ and measures that apply to its context (WHO 2011). These sentiments are expressed by many food security experts who say that the country does not have a clear description of what food security is. Therefore, food insecurity cannot be appropriately identified, measured or addressed if there is no knowledge of what food security should be like. This may be that the Western definition of ‘food security’ does not relate with the SA narrative of what hunger or food shortage is.
What makes it even more complicated is the fact that there are more than 200 definitions and 450 indicators of food security in the world (Bajagai 2013:2). It has been found that this is mainly attributed to the ever evolving technical and policy challenges involved (FAO 2003). However, as previously stated in the literature above, the most commonly used definition is one approved by at the 1996 World Food Summit which describes food security fundamentally as when all people at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life (FAO 1996). Even so, this demonstrates the fact that the development definition of what food security is, is not a ‘one size fits all’ description, various regions across the globe may have to alter it or change it all together to fit the food security context of that area. Thus, it is of paramount importance that local people who possess indigenous knowledge that can ensure sufficient food, preserve food and protect the environment are recognised and involved in food security planning, coordination and implementation strategies.

The African continent for the longest time has been one of the recipients of Western food aid and in many instances has had what others may call the ‘dependency syndrome’, where many African countries were convinced that their hunger issues are solved whenever international food agencies handed them food. Not realising that it is not a sustainable way to address hunger and food shortage, but is rather a short-term solution to a bigger problem. Similarly, addressing food insecurity by a way of social grants may help alleviate food insecurity to a certain extent (Naicker 2015), but that is also just a short-term solution that does not tackle the real food security crisis. The answer to tackling food security is right there within communities; indigenous knowledge. There is no need to seek food aid abroad when all that is needed to do is to apply what they already know and not fall into hegemonic and imperialistic systems that may make the situation worse than it is.

Instead, Africa should create its own development model (Aiken & Moore 2016), one that has sustained them in pre-colonial Africa for thousands of years. For instance, Korten (1995) believes that development should be “people centered”, meaning that the people should be able to contribute to the development of their community by having a say in matters that affect them. Likewise, Sen (1987) argues that development is when people are allowed the independence so that they have real power and choice over their everyday situations, it shouldn’t be a hierarchy approach where orders from the west reach government and then trickle down to the people. After all, South Africa is operating under a system of democracy, which means that the people must govern and not be dictated to or disregarded. This development model can be
conceptualised by the community who hold indigenous knowledge which has the potential to holistically reduce food insecurity. Total food insecurity abolishment may not be possible as food loss and waste is probably inevitable in the food supply stages.

Escobar (1995, 2012:14) supports the post-development theory as he deems the development approach as an epic failure which made false promises to two-thirds of the world. According to him, “Instead of the kingdom of abundance promised by theorists and politicians in the 1950s, the discourse and strategy of development produced its opposite: massive underdevelopment and impoverishment, untold exploitation and oppression. The debt crisis, the Sahelian famine, increasing poverty, malnutrition and violence are the most pathetic signs of failure of forty years of development” (Escobar 1995, 2012:14).

Indigenous knowledge systems incorporated with post-development theory are one way of addressing food insecurity in developing nations such as Africa. The term ‘indigenous knowledge’ describes the knowledge systems developed by a community rather than scientific knowledge that is generally referred to as ‘modern’ knowledge (Ajibade 2003). This kind of knowledge passed on from generation to generation has enabled the survival of the local people for many years. It is how the locals contribute to decision-making at community level. Indigenous knowledge is value-adding for the culture in which it evolves but also for scientists and planners determined to improve conditions in rural areas.

Perhaps this indigenous knowledge may be incorporated in urban development and systems for food security. As statistics reveal, great amounts of food waste occur in the current food supply chain in all levels, more especially in the beginning stages. Hence integrating indigenous knowledge into policies can lead to the development of effective adaptation strategies that are cost-efficient, participatory and sustainable (Robinson & Herbert 2001).

For instance, African local farmers have developed complicated weather forecasting systems which involve gathering, predicting, interpreting and decision-making. A study in Nigeria shows that farmers are able to prepare for future weather such as rainfall, thunderstorms, windstorms and harmattan (a dry dusty wind that blows along North-West coast of Africa) by using their weather knowledge systems (Ajibade & Shokemi 2003). Furthermore, in many regions around Africa, local farmers are renowned for being able to conserve carbon in soils by using zero-tilling practices in cultivation, mulching, and other soil-management techniques (Dea & Scoones 2003). To conserve the moisture of the soil, natural mulches neutralise soil temperatures and extremes which suppresses diseases and harmful pests. The popular use of
indigenous plant materials such as agro-chemicals to combat typical pests that normally attack food crops has been reported among small-scale farmers (Gana 2003).

Below is an illustration of the Post-Development theory with key concepts which demonstrates food waste reduction strategies by food corporations and government at retail and wholesale level which may contribute to ensuring food security in the CoJ.

![Figure 5: The three pillars of food security](image)

**2.8 Conclusion**

The literature review puts a lot of emphasis on the astonishing amount of food waste the world produces in comparison to the total food production. It highlights that different regions around
the world contribute different food waste mass according to their development statues and conditions. According to majority of the research, one of the key contributors to food wastage occurring globally is that there is no common agreement on what the exact definition of ‘food waste’ or ‘food loss is’, hence the confusion on how to actually measure and address it.

Information on how other international countries address food waste is summed up by stating that other countries have taken up serious measures to dealing with wastage of food. For instance, in places such as Europe under the European waste management law, food waste management is considered the highest priority in the land.

In other news, the literature states that urban authorities are blamed for the lack of urban development with regards to food waste. Also, although a high amount of food waste occurs in the beginning of the food supply chain, a large chunk of it transpires in the retail phase. Retail and wholesale stores also play a part by placing ridiculous cosmetic standards to food, making it easier to dispose, as well not handling the food correctly. So much food is dumped that cannot be quantified to accurately track and estimate money and resources lost. Though, the CSIR claims to have created a formula that can produce the former.

Ironically, even though South Africa processes the highest amount of food compared to SADC countries combined, millions of its citizens still go hungry every day. Government food waste management initiatives have failed to implement and coordinate the food waste reduction framework into policies and projects. Some researchers reckon that by encompassing indigenous knowledge within the food security discourse, food waste reduction might be achieved in the CoJ. It is believed that this knowledge may be used to improve food policy, and food handling, management and technology.

The theoretical framework shows the relationship between concepts that fit within the post-development theory and how they all link towards the improvement of food security in Johannesburg City.

In conclusion, it seems as if the government does not prioritise food waste reduction management systems. They have not taken the necessary effort and measures to develop improved food waste reduction systems in the CoJ. As such, the above theoretical framework is designed to guide the relevant urban authorities and stakeholders into realising an improvement in food security in the urban landscape by lessening food waste.

The upcoming chapter discusses the research methodology that was used to conduct this study.
3.1 Introduction
Chapter 3 covers an overview of the tools and techniques used in this research. The discussion chapter is structured around the research design, population sampling, data collection and data analysis. Ethical considerations and measures to provide trustworthiness of the results are also discussed.

3.2 Research design
The mixed method approach was used in the study, which involved both quantitative and qualitative methodologies. Soft data (i.e., words, sentences, photos, symbols) dictate qualitative research strategies, while hard data collection techniques (in numeric form) indicate quantitative research strategies (Neuman 2011).

Mixed methods are referred to by Teddlie and Tashakkori (2009) as a ‘third research community’ following the conventional qualitative and quantitative methods of research. It is also considered as the “third research paradigm” (Johnson & Onwuegbuzie 2004). In brief, this research approach is concerned with working and analysing both narrative and numeric data.

Online surveys consisting of close-ended and face-to-face interviews open-ended questions were used. Hence quantitative and qualitative research data will be collected. Then a case study consisting of qualitative and quantitative research will be conducted.

3.2.1 The target population, sample frame, sampling techniques and sample size
Walliman (2011) highlights that population in research is not restricted to a number of people as it is a collective term used to describe the total number of things (or cases) of the type which are the subject of study. For that reason, a population can describe people, objects, organisations or events.

The CoJ has a population estimate of 5 541 402 for the year of 2018 (Population City 2015). In the context of this study, the CoJ Metropolitan Municipality was the only focus area for the study. The communities in the urban Johannesburg City which has a population of 957 441 was the primary sample frame (StatsSA 2011). Other categories forming the sample frame are
government officials, food store managers, supply chain managers, food security specialists, food donation redistribution organisations and fruits and vegetable consumers.

A sample frame is a small set of cases a researcher selects from a large pool and generalises to the population (Neuman 2011). Since it is impossible to study every case of phenomena of interest, researcher will select a small set from a large pool and generalise it to the population (Neuman 2011).

Table 2: Key participants and the target sample number

<table>
<thead>
<tr>
<th>Key participants (Face-to-face Interview)</th>
<th>Target Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government officials (Municipal and Provincial)</td>
<td>5</td>
</tr>
<tr>
<td>Store managers or owners (All food stores and wholesalers registered on the 'Joburg Market' online database)</td>
<td>20</td>
</tr>
</tbody>
</table>

**Other informants**

<table>
<thead>
<tr>
<th>Other informants</th>
<th>Target Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food donation redistribution organisations</td>
<td>1</td>
</tr>
<tr>
<td>Supply chain managers in the fruit and vegetable industry</td>
<td>15</td>
</tr>
<tr>
<td>Food security specialists</td>
<td>8</td>
</tr>
</tbody>
</table>

**Online Survey (Survey monkey)**

| Fruits and vegetables consumers                                               | 212            |

**Total** 261

In accordance with general sampling principles, between 100 and 200 is a recommended sample size when one has no previous experience of surveys and no available survey data on the same subject. Although there is no available data on the same topic, a sample size of 212 is preferred for the customer survey. For the majority of surveys, the sample size is between 200 and 2000 (Audience Dialogue 2011).

Two separate surveys were conducted; one involving key participants (5 government officials, 20 store managers, 1 donation redistribution organizations, 15 Supply chain managers and 8 food security researchers) and the other involving 212 fruit and vegetable consumers.
respectively. The first five key participants received their survey links by email and consumers completed a survey questionnaire by a Survey Monkey link on a social media platform. The selected social media are LinkedIn and Facebook.

3.2.2 Sampling technique: probability and nonprobability sampling

3.2.2.1 Probability sampling

This study used probability as well as nonprobability sampling as it is said to be the most accurate and efficient sampling method in research (Neuman 2011; Teddlie & Tashakkori 2009). However, this sampling technique can be complex with several subtypes (Neuman 2011). To be more specific, a simple random sampling procedure was used to select the participants. This procedure is defined as a sample where units in a population are selected from a population in such a way that every unit has an equal chance of being selected (Neuman 2011) or as Teddlie and Tashakkori (2009) would say, “determinable”.

For a representative sample, food store managers, customers to food and wholesale stores, as well as food supply chain managers were selected for the study using random sampling.

3.2.2.1.1 Food store managers

20 Food store managers were selected for this study. They were selected from 20 randomly chosen stores that appear online after searching for ‘fruits and vegetable retail and wholesale stores’ on the internet search engine. The selection criterion of the stores is:

- They must be based in the CoJ.
- Sell non-processed fruits and vegetables of any sort.

The only criterion for the food store managers is that they must either manage or own the food stores that operate in the CoJ using purposive sampling.

3.2.2.1.2 Supply Chain managers

The 15 Supply Chain managers were selected from one procurement portal; ‘Supply Chain Network’ which has a database of enlisted supply chain companies throughout SA. The criteria for the selection of the supply chain companies were:

- It must operate or deliver in the CoJ.
- It must deliver or supply fresh or non-processed fruits and vegetables of any sort.

This is a form of stratified sampling and 20 companies who meet the above criteria were selected for the study through random sampling.
3.2.2.1.3 Fruits and vegetable customers

Fruits and vegetable customers fell into the probability sampling category. A survey link was posted on two randomly selected social media platforms; LinkedIn and Facebook.

On Facebook, the survey link was posted only on groups that are joined by people living in Johannesburg. These groups were sought by typing the word ‘Johannesburg’ on the search tab, then a list of groups will appear. It is then that groups were randomly selected. Thereafter, the survey link was posted on the chosen groups for people to complete. The survey link was reposted for increased visibility. Posting was done three times a day. This is to increase the probability of other members of society seeing the survey link at different times so as to have a fair representation. The times for these postings were as follows:

- Mornings between 7-9am.
- Afternoons between 12-3pm.
- Evenings between 6-9pm.

Furthermore, on LinkedIn, the survey link was posted and reposted to increase its visibility similarly to the previous bullet point until 212 online surveys have been completed.

The online survey software; Survey Monkey, informed the researcher once the 212 target was met. Also, the researcher was able to view results graphically and in real-time.

As such, once the 212 surveys were completed, they formed part of the research analysis. The criterion for contributing to the study is that;

- The person should be living in the CoJ.
- The person buys fruits and vegetables from retail or wholesale stores. This may be a regular or non-regular customer.

Only persons over the age of 18 were allowed to participate. People of any age above 18, race, disability, culture, religion or gender were encouraged to fill in the online survey.

A contingency plan for the above was that the researcher handed out printed survey forms from outside or inside food and vegetable stores for customers to fill in before, during or after shopping in Johannesburg City. This contingency plan was meant to be implemented if 212 of the online surveys are not completed by a specific period of time.
3.2.2.2 Nonprobability sampling

Contrary to the above sampling technique, nonprobability sampling is the less accurate and favoured method in research. However, it is less of a hassle compared to probability sampling. There are eight types of nonprobability methods; convenience, quota, purposive, snowballs, deviant case, sequential, theoretical, and adaptive samples (Neuman 2011). The most suitable sampling method for the three categories identified (government officials, food security researchers, and food donation redistribution organisations) in the study is purposive. Also dubbed ‘judgmental sampling’, this method is said to be valuable for special situations (Neuman 2011). In addition, Babbie and Mouton (2011) describes this method as one which allows a researcher to select their sample on the basis of their own knowledge of the population which is based on the judgment and the purpose of the study.

For that reason, purposive sampling was used for the three categories; government officials, food security specialists, and food donation redistribution organisations. The purposive sampling method was selected on the basis that the chosen three categories are relevant for this particular study.

3.2.2.2.1 Government officials

5 Government officials from the CoJ Metropolitan Municipality, Provincial Department of Agriculture and Rural Development (DARD), Gauteng Department of Economic Development (DED), and National Department of Agriculture, Forestry and Fishery (DAFF) were interviewed and asked open ended questions only. The following participants were invited to participate in an interview via an email or telephone at a time preferred by the participant:

CoJ
- Environmental Impact Directorate
- Food Resilience Unit

Gauteng Provincial Department of Agriculture and Rural Development (DARD)
- Agricultural Economics Directorate
- Environmental Policy, Planning and Coordination Directorate

Gauteng Department of Economic Development
- Economic Research and Knowledge Management Unit
Contact details of the above were found on the participant’s websites and others were sought through referral from their colleagues.

3.2.2.2 Food security specialists
8 food security research specialists were selected to fill in the survey sent by email. Below are organisation names where participants work:

- CSIR Research Group Leader- Waste for Development
- University of Pretoria- Food Security Professor
- Postharvest Technology and Losses
- Co-Director at DST-NRF Centre of Excellence in Food Security
- Human Sciences Research Council- Executive Director of Centre for Poverty, Employment and Growth (CPEG)
- Director and Founder of Siyakhana
- University of Cape Town- Southern Africa Food Security Change Lab Steering Group
- African Development Bank (AfDB) President

3.2.2.3 Food donation redistribution organization
Only one Food distribution organisation; FoodForward SA participated in the study by means of an online survey questionnaire sent to them through email. Participants in the survey were the National Food Sourcing Manager; Wayne du Plessis. Their contacts were available on the FoodForward SA website.

3.2.3 Data-gathering procedures
This research comprised of primary and secondary data. Primary data is data that has been observed, experienced or recorded close to the event and are the nearest one to the truth (Walliman 2011). Whereas secondary data is data that derives from written sources that interpret or record primary data (Walliman 2011).

Qualitative and quantitative data from both online and email sent surveys was analysed by means of the Survey Monkey app. This survey app provides numeric and in-depth insights from survey results. In addition, the Statistical Package for the Social Sciences (SPSS); a statistical software system, Survey Monkey statistics and Atlas.ti; a computer programme, was used only examine the qualitative aspect of the research for an advance evaluation on the survey results.
3.2.3.1 **Online-surveys: Survey Monkey**

Data was collected through three procedures. Firstly, by means of online surveys (Primary data); this was conducted using ‘Survey Monkey. The survey app automatically stored results of all 236 online surveys (closed-ended questions) from the supply chain managers (n=15), food security specialists (n=8), food donation redistribution organisation (n=1) and fruits and vegetable consumers (n=212) and present them statistically in graph or/and table form. The results were exported to SPSS for further analysis.

3.2.3.2 **Interviews**

Remaining categories went through face-to-face interviews comprised only of open-ended questions specifically for government officials and food store managers. Their responses were manually written, typed down then exported to Atlas.ti for in-depth analysis.

Surveys were selected as a data gathering instrument for the following reasons:

- Cost effective
- Practical and flexible: require less time and energy to administer
- Prompt results, especially when using an online tool
- Scalability: information can be gathered from a large audience
- Protects the anonymity of the respondents

3.2.3.3 **Case study: Joburg City Fresh Market- City Deep**

Secondly, a case study (Primary data) was conducted where one food store was purposively selected to test whether its food waste reduction model actually works in the real world. The researcher visited a prominent retail store, Joburg City Fresh Market to:

- Observe their existing food waste reduction strategies or models (How food is stored, handled and how they deal with unsold and wasted food).
- Evaluate if the model is efficient and whether it can be improved.
- Identify if there are any food waste measurements.

During the visitation, all observations were recorded in writing and using pictures (using a camera). An appointment was made with the manager to book a visitation date by means of telephonic or email communication. The information gathered was important for triangulating the results to ensure validity of the study.
3.2.4 Data-analysis

Secondary data from the literature review was analysed through inductive and deductive data analysis logic. This was done through patterns, categories, identify themes, concepts and ideas, discover relationships, and develop explanations.

It is from secondary data that patterns or trends were analysed across the results to track periodic progress through time or to seek out repetition of certain results to build up a strong case (Walliman 2011).

Online surveys, telephonic interviews and a case study are all primary data and were analysed using SPSS and Atlas.ti. Survey results were exported to SPSS for quantitative and qualitative analysis. SPSS analysed the raw data and presented it through tables, charts (pie charts, line charts and histograms). Atlas.ti was used for qualitative analysis only. For online surveys, the researcher analysed the results further by means of measurements, comparisons, examine relationships, explanation, confirmation and validation. However, in the situation of the case study and telephonic interviews, it not only analyses frequencies, proportions and percentages, but also ideas, categories, identify themes, and develop explanations.

Recommendations made from findings were derived from the analysis of the online survey results. As Walliman (2011) states, primary data is new data collected by the researcher through observation, experience or records close to the events.

3.2.5 Demographic information

Demographic information of all 261 research participants is included in the analysis of the results. This includes, age, sex, marital status, education level and location of participants. The results are illustrated in table and pie graph form. The frequency, percentage, valid percentage and cumulative percentage statistics are included in the tables.

3.2.6 Validity and reliability

When collecting data from a source, it is imperative to ensure that the data is reliable and sufficiently comprehensive and suitable for the research (Walliman 2011). For example, an important factor is the reputation of the organisation supplying the data. In brief, reliability refers to reliability or consistency (Neuman 2011). “Validity is an overused term which is sometimes used to mean “true” or “correct” (Neuman 2011). To clarify the term, an indicator is classified as valid for a specific purpose and definition. Be that as it may, it is more of a
challenge to achieve validity than reliability (Neuman 2011). On that note, there is no absolute confidence in validity, but some measures are more accurate than others (Neuman 2011).

Likewise, credibility of data refers to freedom from errors or bias (Walliman 2011). Therefore, to ensure that the data collected is credible, the data will need to be free from any error or bias. As such, where possible, data will be collected from well-established and reputable organisations, websites and people. Data was extracted from; government statistics and reports, reputable organizations, established researchers in the food waste industry, recent and updated statistics and relevant participants to the phenomenon.

3.2.7 Pilot testing of data-gathering instruments
The online survey was pre-tested for possible errors. It was tested by a representative sample, or tested by people who are at least relevant (Babbie & Mouton 2011). The few participants who will participate will not be included in the actual study (Teddlie & Tashakkori 2009). Therefore, this pilot survey was tested on people similar to the sample units; customers, government officials, logistics and supply chain managers and companies benefiting from food donations and the questionnaires were adjusted accordingly.

3.3 Ethical considerations
Ethical considerations for this research ensured that; confidentiality is maintained throughout the research and ensured that confidential information is protected. Sensitive information is protected to ensure integrity of the research with consideration of long-term use of the information in line with Miller and Salkind’s (2002) proposition. Neuman (2011) emphasises that participants have the choice of being acknowledged and mentioned by name when quoting them or be kept nameless or anonymous. This protects their identity and ensures they remain anonymous. This is called, anonymity.

Furthermore, all research findings will be disseminated and reflect the true results free of omission, bias or sensationalisation (Walliman 2011). Therefore, participants will receive a copy of the final results when they request it. Also, research participants were given the right to privacy, voluntary participation, withdraw, informed consent and not to be harmed. This was explained to them before participating in the study.

What’s more, scientific honesty is regarded as a very important ethical responsibility when conducting research; for that reason, the researcher tried to avoid any form of dishonesty by
recording truthful answers from the surveys. Also, information about the researcher was provided in the event of further questions or complaints. In addition, ethical clearance from the University of South Africa was obtained before embarking on the field work as well as permission from Joburg City Fresh Market, government officials (CoJ Metropolitan Municipality, the National Department of Agriculture Forestry and Fisheries (DAFF), Gauteng Department of Economic Development (DED), Gauteng Department of Agriculture and Rural Development (DARD) and the food donation redistribution organisation was granted before research could commence. Participants received consent form to read through and were given a chance to give their consent to partake in the study.

3.3.1 Ethical procedures on the fieldwork

Only persons over the age of 18 were allowed to participate in the study. People of any age above 18, race, disability, culture, religion or gender were encouraged to partake in the study.

A pilot study was conducted to test the online survey. 10 people answered the survey questions to pilot the survey which resulted in positive results as the survey was working efficiently. This means that people understood the questions and answered all questions effortlessly.

All interview participants were presented with an informed consent form in which they have to read and sign if they wanted to. They had an option to give verbal consent or sign the consent form. Those who participated in the survey were informed of the main consent guidelines before they could proceed with the survey.

If the intended government official was not available for the interview other recommended officials were interviewed if they are the relevant personnel and the questions relate to their area of expertise.

3.4 Conclusion

This research gathered qualitative and quantitative data by means of a mixed methods approach. Primary data was collected from online surveys, face-to-face interviews and a case study. Online surveys included closed-ended questions (quantitative data), face-to-face interviews comprised of open-ended questions (qualitative data) while the case study involved observation and included both qualitative and quantitative data.

To achieve triangulation, three research methodologies were chosen; online surveys, face-to-face interviews and a case study.
The focus area for this study was the CoJ, in Gauteng, South Africa. Key participants were government officials, food store managers, supply chain managers, food security researchers, food donation redistribution organisations and fruits and vegetable consumers. The total sample size was 261 participants.

Permission was obtained from the CoJ Metropolitan Municipality, the Gauteng Office of the Premier, and the Gauteng Department of Agriculture and Rural Development. Consent was obtained by means of a form from the participants themselves as no under 18 year olds were allowed to partake in this study. Anonymity, self-determination and confidentiality were ensured in the surveys and report writing. To ensure validity and reliability, the survey was pretested.

In closing, this chapter described the research methods and design, the population, sample size, data gathering instruments and plans to adhere to ethical standards, validity and reliability of the study.
4.1 Introduction

Chapter 4 follows on the research methodology on the previous chapter. This chapter presents the research results. This chapter will begin with the characterisation of respondents followed by an analysis of the results from three research collection tools; face-to-face interviews, surveys and a case study. The results from the face-to-face interviews and case study are demonstrated through direct quotations, statements and pictures; while surveys were analysed using SPSS and Survey Monkey; the results of which are illustrated in pie chart and bar chart formats. These research results align with all six objectives stated in Chapter 1.

Table 3: Key population figures in research study

<table>
<thead>
<tr>
<th>Population</th>
<th>Number (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit and vegetable Customers</td>
<td>212</td>
</tr>
<tr>
<td>Supply Chain Managers</td>
<td>15</td>
</tr>
<tr>
<td>Food Store Managers</td>
<td>20</td>
</tr>
<tr>
<td>Government Officials City of Johannesburg (CoJ), Gauteng Department of Agriculture and Rural Development (DARD), National Department of Agriculture Forestry and Fisheries (DAFF), and Gauteng Department of Economic Development (DED)</td>
<td>5</td>
</tr>
<tr>
<td>Food Redistribution Organisation; FoodForwardSA</td>
<td>1</td>
</tr>
<tr>
<td>Food Security Specialists</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>261</strong></td>
</tr>
</tbody>
</table>
4.1.1 Demographic Information

The following demographic information derives from the statistical data about the characteristics of the research participants, which includes sex, age, marital status, education level and location within the population.

Table 4: Sex

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>Valid Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>141</td>
<td>54.0</td>
<td>54.0</td>
<td>54.0</td>
</tr>
<tr>
<td>Female</td>
<td>120</td>
<td>46.0</td>
<td>46.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>261</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Majority 54.0% (n=141) of people who participated in the study are males, and only 46.0% (n=120) were females. This could be due to the fact that males have more free time, making it easier for them to participate in the study than their female counterparts.

Table 5: Age

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Valid Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 to 25 years</td>
<td>112</td>
<td>43.0</td>
<td>43.0</td>
<td>42.9</td>
</tr>
<tr>
<td>26 to 35 years</td>
<td>84</td>
<td>32.1</td>
<td>32.1</td>
<td>75.1</td>
</tr>
<tr>
<td>36 to 50 years</td>
<td>65</td>
<td>24.9</td>
<td>24.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>261</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

In terms of age, the largest group was from people between the age of 18 and 25, which constituted 43% (n=112). This could be attributable to the fact that younger people are more actively engaged on social media and tend to use phones more compared to other age groups. This is followed by people between ages 26 and 35, which accounts for 32.1% (n=84), and the older group between ages 36 to 50 accounted for only 24.9% (n=65). The reason for this could be the fact that this group tends to be gainfully employed and in some instances occupy senior positions in organisations, as a result are busier than most and have very little time to participate in studies of this nature.
Table 6: Marital status

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>Valid Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>150</td>
<td>57.5</td>
<td>57.5</td>
<td>57.5</td>
</tr>
<tr>
<td>Married</td>
<td>57</td>
<td>21.9</td>
<td>21.9</td>
<td>79.3</td>
</tr>
<tr>
<td>Divorced/Separated</td>
<td>31</td>
<td>11.8</td>
<td>11.8</td>
<td>91.2</td>
</tr>
<tr>
<td>Widow/Widower</td>
<td>23</td>
<td>8.8</td>
<td>8.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>261</td>
<td>100.0</td>
<td></td>
<td>100.0</td>
</tr>
</tbody>
</table>

The largest group in this category were single people at 57.5% (n=150), and married people 21.9% (n=57). This explains the results in Table 6 which indicated that high participation by younger people who more than likely are not married yet. This is followed by people who are divorced or separated at 11.8% (n=31), and widow/widowers the lowest at 8.8% (n=23).

Table 7: Education level

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>Valid Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never went to school</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grade 11 and below</td>
<td>41</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
</tr>
<tr>
<td>Grade 12 (Matric)</td>
<td>79</td>
<td>30.3</td>
<td>30.3</td>
<td>46.0</td>
</tr>
<tr>
<td>Post graduate qualification</td>
<td>141</td>
<td>54.0</td>
<td>54.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>261</td>
<td>100.0</td>
<td></td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 7 above demonstrates that all of the participants are educated and clearly understood the questions they had to answer or reply to. 54.0% (n=141) hold post graduate qualifications, 30.3% (n=79) grade 12 and 15.7% (n=41) have a grade 11 and below.

4.1.2 Location of study participants

A total of 261 research participants disclosed where they reside within the CoJ Metropolitan Municipality. The illustration in figure 6 indicates that people from 10 different regions participated in this study.
Figure 6: Residential area of the study participants in CoJ

Figure 6 shows the highest number of participants came from region 2, 16% (n=41), followed by those coming from region 4, at 13% (n=34), region 3 had the same number at 13% (n=34). These areas are predominantly urban and house the young, middle aged and the working class, people who can afford to buy data to respond to an online survey. Fewer participants came from regions 7 and 10 both at 6% representing n=15 and n=17 respectively. Region 6 only had 3% (n=6).
4.2 Effect of food waste on food security in Johannesburg

On the online survey, customers (n=212) as shown on figure 7, answered the question to whether they think that food waste from food corporations contribute to food insecurity. This section corresponds with Chapter 1.2.3.

Figure 7: Customers thoughts on food security caused by food corporations

Figure 7 shows that 61% (n=130) of customers consider food corporations as huge contributors of food waste in the City. While almost a third 30% (n=63) of them are indecisive or indifferent about the topic. This indicates that many people do not think about waste occurring in food corporations or that many people simply do not care.

“I have never thought about food corporate waste until now. It’s just something that has never crossed my mind. It’s a different angle to approach food waste from.” - DARD official.

These results, particularly the 61% (n=130) of customers believing that food corporation are the largest contributors to food waste in the CoJ; correspond with the literature that states that long-term food security is dependent on mini smart choices on food waste reduction strategies. Food waste reduction interventions are the stepping stones in which food security may be achieved. Since food stores are part of large and mass corporates, they may be one of the biggest influencers of change in the food industry. On the contrary, Chapter 1.2.4 highlights
that the current food security interventions are ineffective and needs review from relevant parties. Chapter 2.2 of this paper shows the relationship and dependency of food waste to food security.

Food Loss and Waste: Facts and Futures- a latest report from WWF underlines the penalties that the CoJ and the whole South Africa might face if healthy, nutritious food is continuously wasted “in a country so starved and dry” (WWF 2017):

- About a third of all food never reaches the mouths of the consumers and end up in rubbish dumps instead.
- Approximately half of South Africans sleep hungry.
- Water and energy costs means food wastage comes at a very high price to the economy and environment.

![Figure 8: Buyers stocking fresh produce at Market](image)

Many customers, especially street vendors rush in the break of dawn to stock on fruits and vegetables at the Market on figure 8.

- Research states that for many years indigenous Knowledge has enabled farmers to utilise their knowledge to secure their produce and natural environment which
maintained food security. Do you think this knowledge merged with science might work in an urban setting like it does in rural environments?

The following responses derive from the face-to-face interviews with the five government officials from CoJ, DARD, DAFF, and Gauteng DED.

“Yes, indigenous knowledge is the basis of everything. Without basics we cannot achieve anything” - CoJ Official.

For instance, in rural areas little or no waste occurs. Any unusable produce goes to the animals or is used as fertilizer. If they can’t use the produce, they dry it up and use it during dry seasons.

“What can’t we use this system in urban areas where there is all the technology and resources?” - CoJ Official.

“The issue is attitude and behaviour. Corporates have the ‘I can afford to buy’ attitude and throw away anything and buy again. This is the attitude that stems from no accountability of food wastage by food corporates.” - CoJ Official.

Even though the government officials consent to introducing indigenous knowledge strategies in tackling food waste in the City, they also agree that the strategies must suite urban settings, which goes without saying.

“Good progress have been done in the western sides of Gauteng through Vertical farming and Agri Parks using Indigenous Knowledge practices” - DAFF Official.
Figure 9 shows crates of green peppers waiting to be bought by customers. The customers range from large retailers to ordinary citizens. The green peppers are sorted in three classes - class 1, 2 and 3.

A variety of vegetables are sold in one of shops at the Market on figure 10. The farmer delivers his produce to his shop where his agent sells off the produce on his behalf for a commission.
Will having an independent food security hub that overlooks all food security programmes, coordination implementation, monitoring and evaluation in the City or the country be a good idea?

Two officials disagree with initiating a single institutional body which will govern all food security programmes in the City, province and country. They believe it is best implemented as a multisector and multi-institutional programme. One thinks that one entity governing food waste is not a one size fits all solution, one body will never work due to the level of high corruption in this country. He reckons a multi-institutional approach is more convenient. He adds that the DARD, which is supposed to be handling such, but it is failing, mentioning that all the different departments, provincial and national don’t speak the same language although they have one goal.

“The Department of Agriculture speaks of agriculture but don’t have land, - someone else controls the land. So how does the Department of Agriculture champion the production of food when it doesn’t have land? Hence I say all these departments must have the same mandate or else we need to compress all these departments into one”-CoJ Official.

Whereas the other three officials support utilisation of indigenous knowledge and commented that government is not doing enough, adding that an institution that will specifically look at food security may help to eradicate food insecurity and hunger nationally.

“Depending on what the institutional mechanism will be; it could be done. A singular body at the right political, technocratic and civil society level could be workable. The best example of this would be Brazil under the presidency of Lula (Zero Hunger) got it right with Dr Graciano da Silva at the helm of the agency”-DAFF Official.

4.3 The causes of food waste in food corporations

The results of this topic are from the online survey where customers (n=212) answered the question of whether they buy odd looking fruits and vegetables. This may be on a regular or none regular basis.

Literature on Chapter 2.4.5 elaborates on the global standards of cosmetic and quality in the food industry which has created delusional idealistic expectations of how fruits and vegetables should look like. Which ultimately contributes to unnecessary extreme food waste.
Figure 11: Customers rejecting odd looking foods in stores

The above figure 11 shows odd looking fruits and vegetables seem not to be a favourite by customers as 71% (n=151) would rather buy cosmetic looking foods that are considered ‘normal’. About 29% (n=61) have no issue with buying them. These results are a reflection of the high, unnecessary and unrealistic standards that customers have when buying fruits and vegetables in store. These standards stem from how food corporations are particular and fussy with the type of fruits and vegetables they stock. Odd looking or unconventional fruits and vegetables are thrown away, as they do not mirror the cosmetic or ‘normal’ image and standards. Andersson et al (2010) and Naturvårdsverket (2008) highlight that unusually shaped and ‘wonky’ looking fruits and vegetables are frowned upon by customers in stores hence they are thrown away.

This contributes to high food wastage in a country that simply cannot afford to due to economic challenges facing this country. Perhaps if consumers were conditioned to buy these odd or ‘wonky’ looking foods, less food waste would take place and food corporations would save large amounts of money and profit would increase. Conditioning could be in different forms, such as advertising the odd looking foods on packaging and displays in stores using creative concepts and marketing strategies to convince customers to buy.
These peculiar shaped carrots on figure 12 are considered ‘unfit’ to be sold many conventional food stores around the world and end up dumped as rubbish waste.
• The main causes of fruit and vegetable wastage at food corporations

The question asked to food security specialists (n=8) and customers (n=212) on the online survey is to select the answer which best describes their thoughts to what might be the main cause of fruit and vegetable waste at food corporations. The results of the online survey are illustrated on figure 13.

Almost a quarter, 24% (n=52) of customers think that inappropriate storage facilities are the cause of food spoiling quickly, resulting in the discarding of the food which should have been prevented by having suitable storage. Around 20% (n=43) of customers indicate that high food prices are the cause of people not buying food. 12% (n=26) believe overstocking result in food being discarded. Only 9% (n=19) believe that customers are just picky and fussy about the food.

Customers are not necessarily at fault for being fussy. As explained in Figure 13, food corporations are the ones who influence the kinds of food that customers buy by the appearance of their displays on foods advertisements on the packaging. Consequentially, customers become conditioned to buy the ‘normal’ or ‘perfect’ looking kinds of foods. As stated in the literature review, Chapter 2.4.5.

Figure 13: Main causes of fruit and vegetable wastage in food corporations
A section in Chapter 1.2.1 exposes the percentage of perfectly edible food which results in food loss. Similarly, figure 13 demonstrates that inappropriate storage facilities are the most contributors of food waste in food stores at 24% (n=52). One can deduce that appropriate storage facilities can certainly assist in combating food waste at a greater scale in food stores. Improper storage equipment may be the main hindrance to food not being wasted in retail and wholesale stores. Moreover, Chapter 1.2.1 indicates the attributes leading to food waste.

![Image of a market scene with sacks of oranges ready to be discarded](image)

**Figure 14: Sacks of oranges ready to be dumped after closing hours of the market**

The figure above was taken on the day of the visit to the City Deep market for the case study research. The sacks of oranges are ready to be discarded at the dump site behind the market. These oranges have failed to meet the inspection requirements and will therefore be thrown away.
On figure 15 is a sight of discarded fruits and vegetables that do not meet the produce quality as assessed by the QAs are dumped in the waste bins behind City Deep’s buildings. The stench of the dumped produce is overwhelming upon arriving at the scene. City Deep’s waste site is prohibited to be seen by the public. All ‘unfit’ produce is thrown in the dumpster as shown on figure 15.
4.4 Determining whether food waste can be measured in food corporations

Figure 15 below represents a query answered by food store managers (n=20)- which questions whether their stores measure their wasted food. Also, responses from government officials enlightens the topic with government’s role within the subject matter.

![Figure 16: The number of food corporations that weigh food waste](image)

A small fraction of food stores, 15% (n=3) actually weigh their food waste before discarding it. While a large number, 55% (n=11) only scan and record and 30% (n=6) do not measure or scan and record the food. It is important to measure waste so that it can be tracked. Food corporations should be able to know the quantity of waste they contribute that goes to landfill sites, thereby knowing their contribution to food insecurity. Scanning and recording is useful as food corporations are able to see their loss. However, there should be statistics for environmental and economical affects caused from food wastage. The stats results will determine progress made with food waste reduction initiatives.

- **Measuring food corporations’ waste**

It was clarified by government that food corporations as private institutions should be the ones weighing the waste to see the amount of money they’re losing. Civilian’s tax cannot not be utilised to weigh food corporate waste. With that said, there is no such system in both government departments and the City municipality. The City merely collects food waste- Food waste weighing is not an area of competency nor a function.
“No, it’s not one of the priority programs at the moment. However, it is one of the projects that are interventions in line with managing impacts of climate change_ Department official.

Conversely, a government official affirmed that through the process of Department of Trade and Industry (DTI) and Consumer Goods Council, a methodology to measure food waste will be put in place, even though it’s unknown whether the CoJ will be included in this initiative.

According to literature in Chapter 1.2.3 there is no official food security measuring system in South. This is a risky pathway leading to food insecurity damaging the future of food sustainability in the country.

As such, since food waste is highly linked to food insecurity, it is of paramount priority that food waste is measured at food corporate level as they have primary contact with the produce. Data gathered from food waste measurements with create a blueprint for future researchers and generations to improve on current food security interventions. Although Chapter 2.4.6 states the challenges of waste flows and waste data.
4.5 Exploring food waste reduction procedures by food corporations

Supply Chain Managers (n=15) partook in the online survey where they selected an answer based on what is done with perfectly edible surplus food produce within the food supply chain on figure 18.

![Pie chart showing what the Supply Chain does with perfectly edible surplus food.](image)

**Figure 17: Supply Chain Managers dealing with food waste**

About 60% (n=9) of Supply Chain Managers state that they donate edible surplus food to charity, while a third, 33% (n=5) use the reverse supply chain method where the fresh produce is returned to its supplier. The reverse supply chain approach is believed to promote sustainability within the supply chain system. This may be proof that this is one of the efficient methods that could be used in curbing food waste in the supply chain system at a broader scale. Only 7% (n=1) Supply Managers use another method to deal with food waste and none, 0% (n=0) claimed that they throw the food away or share among employees, hence they do not reflect on figure 6. Throwing away perfectly edible food can be avoided if there are alternative options to deal with the surplus food. If not, it can quickly become an easy option to discard surplus food.

Even though literature in Chapter 2.6.2 agrees that the reverse supply chain being the most appropriate method that will impact society, the environment and the economy positively in the long term, figure 18 reflects food donation as the most favourable option to reuse perfectly edible foods in order to maintain sustainability within the food supply chain system.
4.6 Food waste reduction strategies in stores- Customer’s perceptions

The question to customers (n=212) on the online survey was what they think happens to “unfit” or unsold food at food stores. Otherwise, customers selected what they have witnessed happen to the food in stores. In addition, findings from face-to-face interviews with government officials, food store managers and the case study highlight the different food waste reduction interventions or lack thereof.

According to Chapter 2.4.8, businesses have a profit making model which takes a priority to food waste reduction or prevention.

![Food waste reduction strategies in stores - Customer's replies](image)

**Figure 18: Food waste reduction strategies in stores- customer’s perceptions**

Approximately 38% (n=80) of customers’ witness food stores having a sale or discounts on unsold fruits and vegetables. Although 31% (n=67) is the second lowest strategy chosen by customers, discarded waste is still a high number of produce that can be salvaged.

“With the health inspectorate, if one potato in a crate is rotten, the whole crate must be thrown away. But we can salvage a lot of food from that. How many people go to bed hungry? Out of 100 000 potatoes, if 1 is rotten the whole crate gets discarded” _DED Official._

Lastly similarly, the same percentage at 31% but fewer numbers (n=65), stores are seen donating surplus foods to the community, e.g. Charity organisations. As reflected in the
analysis under figure 6, if there were compulsory alternative methods to dumping food, tons of food could be saved for other uses; either charitable or economical contributions to the City.

As much as dropping food prices is a method of selling unsold food items, sale foods eventually do end up being thrown away if not bought. Alas, some percentage of food cannot be salvaged, thus it is inevitable that some food will unfortunately be discarded. But, it should not be a high percentage of waste as it reflects on figure 7, it should be lower. Chapter 2.4.8 lists the reasons for the disposal of food in retail.

Below are some of findings from the case study which were not options in the online survey;

- **No food waste reduction strategies/models**

  During the case study observation, the researcher noticed that there are no formal documented strategies or models for food waste reduction. Nonetheless, at the fresh produce market doing the case study, there is somewhat of an informal system where the farmer and the Quality Assurers (QA) determine produce discarding. This system is more or less applied across all market agent stores. Much like the 20 food stores in the City, stores do what they want to do with ‘unfit’ food. It is either reworked, donated or thrown away. Similarly, to SA’s counterparts in the food industry, a length of a banana is determined whether it gets thrown away or not, same goes for a peach which has a different orange hue or a sweet potato that is shaped in a peculiar way. Perhaps health and safety inspectors may be harsh food regulators.

- **Other alternatives to avoid food waste and make profit**

  Moreover, an interesting discovery is that many of the food stores do have a procedure which keeps the business running. When fruits and vegetables reach their sell-by-date or best-before, they are unwrapped and rewrapped again in new packaging and placed with a new sticker which has a new sell-by-date or best-before. Whether this system is permissible by the health inspectors or not, it is still used by some food stores.

  Another alternative is that the food that has passed their sell-by-date or best-before are reworked in the deli and sold as salads and relish such as fruit salad or the SA’s famous “chakalaka”.

- **Dumping cheaper than Return-To-Farmer**
There is loads of food wastage occurring at the City Fresh Produce market. QAs are present every day to inspect the produce quality and authorise sales and markdowns. Produce that fail to meet those qualities are discarded by being thrown in the waste bins behind City Deep’s buildings. Since dumping ‘unfit’ produce is an easier option for some farmers, it may be assumed that stores do not see the necessity of having a formalised food waste reduction models.

- **Donating to pig farmers than charity**

Food store managers confessed that it is easier to give wasted food to pig farmers than give to charity because there is little or no liability. Unlike handing food to charity, the store is likely to become responsible for any effects that the food come with. In other words, food corporations are afraid that people might get sick, or worse, die from food poisoning and be sued, ruining their reputation and businesses.

Based on chapter 2.4.8 literature, it might not be possible to interfere and regulate food waste in food corporations.
Reviewing the government’s approach to food waste reduction in Johannesburg City

Customers (n=212) were able to choose whether they know of any food waste reduction programmes in the CoJ on the online survey. Figure 20 below consists of ‘yes’ or ‘no’ answers from the customers only. Similarly, food store managers (n=20) were too presented with the question, however, their results are not in figure form but in qualitative form. Also, government officials (n=5) were also approached with a question which asks if they know of any food security projects or programmes implemented in the City.

Figure 19: Customers aware of food wastage reduction programmes in City

It appears few people know of the Food waste reduction programmes in the City, with only 15% (n=31) saying that they know some programmes in the City. Although, this statistic contradicts what the interviewees said. 100% (n=20) of food store managers are not aware of any food waste reduction programmes run by the City, while all five government officials confirm that they do not know any food security projects or programmes run by the CoJ. They however mentioned related projects that are either implemented by the provincial department or a certain district which are;

- Household food security programme, looking at supplying starter packs which include seeds, fertilizers and water reticulation systems and “Bontle ke Botho” which teaches people to grow their own food in their backyard.
The DARD also collaborates with other departments such as DSD to create Centre Based feeding like Early Child Development.

Quintile 1, 2, 3 schools are receiving National School Nutrition Scheme (school feeding schemes)

Nonetheless, the above projects still do not address food waste occurring in food corporations. This demonstrates that not only has the City overlooked corporate food waste, but the provincial and national government too.

During an interview, when asked whether government is involved in curbing food waste - “I’d say government is but it’s a losing battle”, said the City official. “The amount of trucks removing waste out of Tshwane is unbelievable, more than 300 000 tons a month”, he stressed. He emphasised that South Africa wastes a lot of food unnecessarily, stating that this amount of wasted food can feed a province for a whole month. “Unfortunately the legislation we have does not allow us to use that wasted food for other purposes”, he pointed out.

In his own words, the health system is ‘stupid’ as it allows a whole crate of potatoes to be discarded if one is rotten, instead other uninfect ed potatoes can be salvaged. To substantiate his argument, farmers use money to produce food, and asked how they will recover the money to produce more food in the future if it is all thrown away recklessly. “We are not going anywhere with that system. That’s why I say it’s stupid”, he added.

Although there are common sentiments that have been expressed in reducing food waste by both government and food corporations, there has been no relationship or partnership among these two parties in that regard until recently through a process started by DTI and Consumer Goods Council (July 2018), partnerships have started with a wide variety of stakeholders mostly at the end of the value chain said a DAFF official. Even though it is not yet known what the objectives of this partnerships are and what aspects of the value chain are to be addressed.

There is no proof to validate the efficiency of food security programmes as mentioned in chapter 1.2.5. However, the DAFF and the DSD reported on pledging to increase social programmes expenditure which impact on food security.
The City’s landfill near to capacity

The question of whether customers (n=212) are aware of the City’s landfill which is nearly full to capacity consisted of only a ‘yes’ or ‘no’ answer. A government official also raises an awareness on the filling landfill.

![Figure 20: Are customers aware that the City’s landfill is nearly full to capacity](image)

Just over half, 56% (n=119) of customers are oblivious to the information that the City’s landfill is nearly full to capacity and 44% (n=93) of customers are informed about it. Despite numerous headlines of full landfill sites in Johannesburg City and other Cities in the Western Cape, a large percentage of society is uninformed or ignorant of the crisis that looms the City. The City’s residents need to realise that landfill crisis is also their problem as it affects everyone in the City, not just the municipality or food corporations.

Then again, a government official disclosed that the City’s landfill is technically a dumpsite and not landfill because it does not meet the landfill criteria, and to turn it into one was a poor decision by government who has been ignoring the red flags for decades. Nevertheless, that is a topic for further research.

Parks Tau and Herman Mashaba, former and current executive mayors of the CoJ respectively, consent to the knowledge that the City is quickly running out of landfill sites on chapter 2.4.7.
4.7 Establishing strategic measures that food corporations and government can do to reduce food waste in the CoJ

Government officials (n=5) and food security specialists (n=8) had to state whether there is an official definition of ‘food waste’ in South Africa. The answers were obtained via face-to-face interviews and online survey respectively.

Figure 21: The existence and official definition of food waste in SA

About 62% (n=8) of government officials and food security specialists say that there is no official definition of food waste in SA, while 38% (n=5) believe it exists. It appears that there is no common understanding, consistency and unity among government departments. Majority of the officials whose departments are directly linked to food management are oblivious to the notion of an official definition of food security, nor do they know what it is. This indicates a need to first define the concept of food waste in the relevant context of SA, and then encourage it to be used consistently in all government departments that deal with food.

One of the main obstacles identified in chapter 2.4.4 is the lack of a common definition for food waste in SA and also lacks a definition of ‘food insecurity’ and measures that apply to its environment. As a unique country in its own right, the western definition of ‘food security’ does not relate with the SA narrative of what hunger or food shortage is. As such, the above results in figure 22 are parallel to literature as there is no uniformity in the definition of ‘food waste’ in SA.
Achieving efficiency with a collaboration between government and food corporations to tackle food waste in the City

In figure 23, food store managers (n=20) disclose if they have a working partnership with government against food waste in food corporations through the online survey. Input from government officials (n=5) also weighs in the topic.

Results in Figure 23 reveal that over half (n=11) of the 20 food stores in the City do not have a working relationship with food corporations. 25% (n=5) are uncertain whether there is a relationship between the two entities. During the interviews with the government officials, 100% (n=5) admitted that there is no relationship between government and food corporations. From these results, it can be assumed that there is a high need for food corporations and government to establish a partnership in order to address the food wastage that occurs in food corporations. This partnership could create an effective and more strategic alliance than working alone on the issue.

Chapter 1.2.1 explains how other initiatives were established in SA in relation to food sustainability. Likewise, the City has initiated waste management programmes but, there is no apparent coalition between food corporate and government to tackle food waste, specifically fruits and vegetables. The 55% (n=11) result from the online surveys demonstrate the reality of lack of partnership between government and food corporate to lessen food waste in the CoJ.
This highlights a key issue within the government and private business sector in prioritising food sustainability within the City.

- **Benefits from food waste reduction in the CoJ**

Food store managers (n=20) responded to the online survey which asked what they thought would be the benefits from food waste reduction in the City. Additionally, government officials (n=5) also shared some sentiments in regards to benefits from food waste reduction during a face-to-face interview.

![Benefits from food waste reduction](image)

**Figure 23: The positive effects of food waste reduction in the City**

There are 50% (n=10) of food store managers that believe that more people will have food to eat if food waste is curbed in the City and if food corporations decide to donate their perfectly edible foods to charity. Approximately 30% (n=6) think that the environment will be much cleaner and neater as there will be less waste at dumping sites and less pollution in the air and land. 10% (n=2) are certain that fruit and vegetable prices would drop and be cheaper, while the other 10% (n=2) say that there will be no difference in food waste reduction occurs thus the City will not benefit from that initiative.

Strong economic conditions may also be attributed to food waste reduction as stated in chapter 2.4.7. Moreover, other benefits are that sustainable development in developing countries will rise from opportunities in food waste reductions.
During an interview, a DAFF official stressed that reduction of food waste is critical in the bigger vision of Food Security. Reduction in food waste will greatly enhance the four pillars of Food Security in South Africa.

All options on figure 24 were selected during the face-to-face interviews even though hunger and poverty alleviation 50% (n=10) is the most voted option on the online survey. This goes to show that empathy towards human hunger and poverty takes a priority for the research participants.

The following are other replies deriving from face-to-face interviews with government officials;

- **Landfills and dumpsites**

  While conducting an interview with a City official, it shed some light about the City’s dumpsite that is supposedly a “landfill”. According to the official, there is only one or two actual landfills in the entire country- the rest are just dumpsites. The City, like many other metropolitans have inherited an old City plan from the apartheid era whether there were dumpsites that were not strategically planned. A piece of land was merely selected to be a dumping site.

  Upon inheriting this dumping structure, there were no improvements made to it as it has become a health hazard. It is poorly suited to hold large amounts of waste and rain water. When it rains, the water mixed with the waste forming toxic water which gets absorbed by the ground and flows to neighbouring areas. This then becomes a health threat, not only to the environment, but to humans as well.

  This landfill must be strategically designed to deal with rain and other natural and external factors which may cause problems of health and safety to the environment and community. The landfill must be sufficient enough to handle large capacities for decades to come. This is will be an appropriate investment by the government as a provision for the development of the City.

- **Legislation**

  All the officials do not know of any policies governing food waste in retail and wholesale store. As stated in the literature review, the main legislation is the National Environmental Waste Act and other regulatory frameworks which are in terms of products, standards and health. However, the National Environmental Waste Act do not stop the production of waste or putting
that food to waste, it simply regulates how to manage the waste you have. “*We don’t have any legislation that encourages people to save food because we still believe if you can afford food, you can waste as much as you want. It’s a serious challenge*”, said the City official.

Once again, there is no accountability by food corporations to food waste occurring in the City this is an issue especially since they are big contributors to food waste and filling the “landfill” to capacity.

- **Policy**

Indeed, there is no food waste reduction policies in SA that will regulate the generation of food waste in food corporations as declared in chapter 2.4.8. From observation of the food systems and feedback from food store managers, food waste is not a general concern. Their food waste reduction strategies were not at the centre of why they were developed. It seems the drive was to maximise business profits.
4.8 Opinions of Food Specialists

Food Security Specialists (n=8) shared their expertise and opinions based on the questions provided below in figure 25 and 26 on the online survey.

![Food Security Specialists Opinions](image)

In figure 25, urban food security is favoured over rural food security by 6/8 Food Security Specialists to be a priority in the City as urban poverty is at its highest stated in recent literature, also mentioned in Chapter 1.2.3. Urban hunger and poverty is on the rise according to chapter 1.2.3. With that in mind, the chapter also further explains how urban dwellers should be prioritised in terms of food sustainability. There is a growing number of migrants to cities and chapter 1.2.5 elaborates further on this topic.

Interestingly, all (n=8) of food security specialists maintain that food waste in food corporations is given little or no attention. This data is supported by government officials who said that they had not even thought about corporate food waste until the interview. This is evident that corporate food waste reduction has not been a priority in government provision and objectives. Also, 8/8 food security specialists affirm that food corporate waste is not given any or sufficient attention that it needs unlike agricultural and household waste.
Food waste measurement in stores is considered a significant factor in the goal to lessen food waste with all (n=8) specialists consenting. Likewise, all (n=8) specialists agree that an independent food security hub would do more to address the scourge of food waste in the City, and the country. Majority of Food Security Specialists; 6/8, support the notion of indigenous knowledge being incorporated to improve food security. In chapter 2.5.3, indigenous knowledge is described as an adaptable and modifiable concept depending on the context. These statistics paves a way for a food security hub to be introduced to overlook all food security programmes implemented in the CoJ.

4.9 Thoughts from the food redistribution organisation

FoodForward SA is the only food redistribution organisation (n=1) participating in this research study and partook in the online survey.

The food redistribution organisation, FoodForward SA reckon they play a major role in creating food security as they feed tens of thousands of homeless, vulnerable and poor people and children in the City. They urge more involvement of food corporations and government in curbing food waste by donating perfectly edible foods and other relevant items to their organisations. Though they feed thousands of hungry people, food is sometimes not sufficient to feed many others alike. As such, collaboration by all parties would really go a long way and the organisation will have a larger reach, resources and impact in the lives of many SA who depend on the good deeds of charity.
4.10 Conclusion

Chapter 4 presented findings from the research results in the form of direct quotations, statements, pictures, tables, bar charts and pie graphs. Literature sources are also incorporated to support the fieldwork results. Ethical considerations were taken into account before conducting fieldwork. The chapter that follows introduces the conclusion and recommendations.
CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 introduction
This chapter reports the conclusions and recommendations of the study based on the research methodologies applied to gather information. The conclusions summarise the face-to-face interviews, surveys and case study findings from Chapter 4.

The recommendations are developed to align with the key findings. These recommendations suggest specific interventions or strategies to address the specific research objectives as well as the overall research objective.

5.2 Objective 1: Determine how food waste affects food security in Johannesburg
This section concludes the results of how customers who took the online survey feel about food waste in CoJ affects food security. The conclusion was unanimous that indeed, food corporations are to be held liable for food insecurity in the City.

5.2.1 Food corporates contributing to food insecurity
A large percentage of customers are certain that food corporations definitely contribute to food insecurity.

Recommendations:
Food corporations must sign a declaration in which they pledge to take accountability for food waste reduction in their stores.

5.3 Objective 2: To investigate the causes of food waste in food corporations
This topic unravels the factors that lead to food waste in retail and wholesale stores in CoJ. This revelation is according to the customer online survey which exposes unusual looking fruits and vegetables as a leading contributor to food waste in food corporations.

5.3.1 Odd looking fruits and vegetables
The results of the customer online survey reveal that are large majority of people do not pick odd or peculiar looking foods. This may lead to food wastage if not bought, reworked at the deli or offered to charity.

It seems that the media and food corporations are influenced by international standards of how fruits and vegetables should typically look. Unconventional looking foods are frowned upon.
Perhaps they are associated with tasting different, but people are just sceptical about them. Although the survey did not go further to investigate the reasons why customers shy away from them, this is mere speculation at this stage which could possibly be true.

**Recommendations:**

Develop creative adverts and display odd looking fruits and vegetables in an effort to persuade customers to regularly buy them as they do other ‘normal or ordinary’ foods. A picture of the oddly shaped and coloured fruit and vegetable could be on the packaging to normalise these foods for consumers. SA as a developing country cannot afford to conform to international standards of food images and models, it is not yet at that phase yet economically, socio-economically, and otherwise.

**5.4 Objective 3: To determine whether food waste can be measured in food corporations**

Keeping track of all the discarded food is just as valuable as keeping track of all produced foods. This objective aims to demonstrate the prospect of food corporations in quantifying the amount of food waste they produce in their stores. Face-to-face interviews, online surveys, and the case study insights show that measuring food waste produced in stores is a positive system that may assist further research on this topic.

**5.4.1 Measuring food corporate waste**

Measuring food waste is a good way to keep track of the amount of food waste corporations generate and decrease. This will create insights that can be used in the development of future interventions and in the academic sphere.

**Recommendations:**

Food corporations should establish a food waste management system since they are responsible for their own waste. This system will weigh food wastage in stores and capture statistics to help regulate waste generation in the City.

**5.5 Objective 4: To explore food waste reduction procedures by food corporations**

This topic aims to assess existing food waste reduction models/strategies that may be implemented inside food corporate stores. However, findings show that there are no current procedures set in-house to ease food waste. It is recommended that there are systems and legislations in place that might relief the burden of food wastage in stores.
5.5.1 No food waste reduction strategies/models

There is no formal documented strategy or model for food waste reduction. Nonetheless, at the fresh produce market doing the case study, there is somewhat of an informal system where the farmer and the QAs determine produce for discarding. This system is applied more or less across all market agent stores. Much like the 20 food stores in the City, stores do what they want to do with ‘unfit’ food. It is either reworked, donated or thrown away. Similarly, to SA’s counterparts in the food industry, a length of a banana is determined whether it gets thrown away or not, same goes for a peach which has a different orange hue or a sweet potato that is shaped in a peculiar way. Perhaps health and safety inspectors may be harsh food regulators. Regrettably it appears that food industry standards for food are too strict and unrealistic and may actually be a huge contributing factor to global food waste.

Recommendations:

Amend the health and safety criteria so that perfectly edible foods do not get discarded for minor and unrealistic standards. These could be done for the blemishes, bruises, size (diameter and length) and colour criteria requirements. Yet, without compromising the consumer’s health and safely it could be done with great precaution and expertise.

5.5.2 Other alternatives to avoid food waste and make profit

If ‘unfit’ food can be reworked in the deli, surely other corporates can also purchase these foods and rework them to create secondary products. According to the fresh produce market QA, they are not allowed to sell the ‘unfit’ produce to anyone, even though they do this in a nearby juice factory. This will increase production and perhaps employment in the economy if ‘unfit’ foods can be reused and resold in another form.

To address this issue, food corporations must be encouraged to strategically advertise and display odd looking fruits in the stores in a creative way. This will normalise odd looking fruits and provide them as an option when customers are shopping for fruits and vegetables. As such, food store sales will increase and food waste will decrease.

Recommendation:

• Create a legislation which will enable other organisations to purchase these ‘unfit’ foods so that they can make secondary products such as jams, juice, etc.
• Permit sorting of foods by QAs, for example, instead of the whole crate of potatoes thrown away because of one rotten or discoloured one, sort them out and only get rid of the unfit food and sell or donate the perfectly edible ones.

5.5.3. Dumping cheaper than Return-To-Farmer
Dumping is actually the preferred option than returning the waste back to the farmers since returning it means labour, transport and time utilised in that process.

5.5.4 Donating to pig farmers than charity
Majority of the food store managers/owners admitted that it is easier to hand over their unfit food to pig farmers than to charity. However, a separation of fit and unfit food can be a method that can benefit both pigs and humans.

**Recommendation:**

Instead of pig farmers receiving perfectly edible food for human consumption, they should rather be given food that is unfit for humans but fit for swine. This might require sorting the two sorts of food by food corporations.

5.6 Objective 5: To review the government’s approach to food waste reduction in Johannesburg City
The government of the CoJ was put under the spotlight to examine their role and approach to food waste. Post interviews with government officials, it was acknowledged that government programmes are not as efficient as they were set out to be. The recommendations that follow, are blueprints that the government might consider to see through food waste reduction in the City.

5.6.1 Food waste programmes- ‘a losing battle’
All five government officials have confirmed that the City does not have any food waste reduction programmes as they have no knowledge of any programme of that is run in the City by the City. Known programmes are implemented by the provincial government or a local district. Though these projects do not address food corporate waste. This is a whole loop of food corporate waste that the City overlooks not only overlooks, but the provincial and national government too.
**Recommendations:**

- Develop and strengthen strategic long term partnerships between food corporations and government in the reduction food wastage in food corporations, the City, province and country wide.
- Engage and partner with food security researchers and indigenous knowledge practitioners to restore the loop holes within the food system by reducing the waste in food corporations. This may be achieved by establishing a food waste reduction hub administered by selected food security specialist and indigenous knowledge practitioners to oversee food waste reduction programmes in the City, province or nationally.
- Implement the partnership with the food redistribution organisation, FoodForwardSA to increase reach and mass of beneficiaries.

This partnership could create an effective and more strategic alliance than working alone on the issue.

5.7 Objective 6: To establish strategic measures that food corporations and government can do to reduce food waste in the CoJ

Ultimately, the goal is to set up a strategic alliance between government and food corporate to reduce food waste in the CoJ. Insights exposes the City’s landfill not well planned to handle the waste volume of an over populated City which is still growing. Following the face-to-face interviews with government officials, a consensus is that it is the responsibility of both parties to address this issue before it is too late.

5.7.1 Landfills and dumpsites

The City’s ‘landfill’ is said to be a dumpsite thus it is not designed to handle the waste load of the City. Also, since it is nearly full to capacity, an urgent plan should be put in place for the future.

**Recommendation:**

Purchase a piece of land that will be the City’s official landfill site. One that is strategically designed to hold the City’s waste for a long period of time even if the population increases immensely.
5.7.2 Law in SA- Legislation, and policy
There is no law or legislation and policy framework which regulates food waste caused by food corporations.

Recommendation:

Draft a policy that states that all food corporations should by law have and abide by a food waste reduction strategy or model which assists in reducing food waste which aligns with SDG 12.3 and the four pillars of Food Security. This will induce a culture of accountability in corporate and governance in the City and country as a whole.

5.7.3 Benefits of food waste reduction in the City
Achieve reduction in hunger, a cleaner environment, lower food prices and a stronger economy.

Recommendation:

Implement all initiatives aligned with SDG 12.3 and the four pillars of Food Security to meet set objectives.

5.8 Conclusion
In conclusion, the main objective was to study various ways in which food corporations and government could rethink food waste reduction strategies in the CoJ. The news headlines lately have highlighted the City’s landfill which is being nearing full capacity. This is an indication of a need to tackle food waste using approaches that have never been used before in tackling food corporate wastage. Much of the focus has been on household and agricultural food waste when big corporates also contribute to unnecessary food waste which can be salvaged for fiscal and socio-economic reasons, especially since SA generates huge amounts of food waste.

However, this study focuses on fruits and vegetables since they are the most wasted food category in the country. As such, this study aims to address some of the discrepancies within the food security system by using creative ways which include partnerships with food corporations, government and the City.

A summary of some of the key findings indicate that there is no formal documented strategy or model for food waste reduction in many of the food stores in the City, it appears that the stores are more business orientated than environmentally or food sustainability friendly. This means that the main focus is profit because it is the nature of business. On the other hand, there is no accountability from food stores regarding unnecessary food waste generation since there
is no law that limits or regulates it. Also, health and safety inspectors are harsh food regulators and huge contributors to food waste as their food standards criteria are unrealistic, superficial and not context friendly for the SA market. It means the industry standards for food are too strict and unrealistic, worsening global food waste.

Another interesting factor is that many consumers do not purchase odd or peculiar looking foods. This contributes to a lot of them being discarded. This corresponds to the literature review about reasons for disposal of fruits and vegetables in stores, which highlighted odd or peculiar looking foods as “unsaleable” because customers reject it. In addition, food store managers confessed that it is simpler to give wasted food to pig farmers than give to charity because there is little or no liability. Most importantly, food waste measuring is essential in tracking the amount of food waste that happens in food corporations. Policy and regulation of food waste will also assist in the management and prevention of food waste in food stores.

The conclusions drawn from this research is that food waste is a real issue which is not receiving the attention it needs in order to address it. Somehow, it is also not viewed by some of participants as an issue. In fact, some have been indifferent or oblivious to it, more particularly food wastage caused in food corporations.

Furthermore, as a result, the City’s “landfill” has been piling up quickly because the City has been reckless by not having a plan to reduce food waste using various approaches, particularly in food corporations. This realisation was confirmed during interviews with government officials who indicated that food waste was not a primary concern, majority of them knew very little about any strategies aimed at lessening food waste that is massively produced on a daily basis in the City. Yes, a landfill has a life span which eventually comes to an end when it gets full. However, it is important that awareness is created about the fact that full landfills are a consequence of neglect and ignorance by major stakeholders, in this case food corporations and government. It is their responsibility to put prevention measures in place as well as manage food waste strategically and efficiently. This may be achieved by tweaking and making small alterations to what already exists.

The essence of this study is to provide insights for researchers and practitioners as well as for future research on this development issue. As a developing nation, SA cannot afford to be reckless and ignorant about such a significant commodity, more especially in this scourging
economic and socio-economic climate. Urbanisation has overtaken rural areas as being the fastest place growing poverty. Ironically, there is an increasing number of urban hunger than rural hunger. This sets off alarm bells that tight food security provisions are essential in curbing food waste as the situation has gotten out of hand. Environmental and social responsibility by food corporations regarding food waste must be regulated by law and practices in order to gain control of the food security systems in the City and potentially nationwide. With that said, the City should commit to being proactive rather than reactive to development issues that could do much harm in society.

Recommendations for future research are that researchers should inspect the characteristics of a landfill and a dumpsite. An interesting insight during an interview with a City government official who stated that the so called landfill is in actual fact a dumpsite which has no safety and contingency plans for over flows and strong winds and rains.

Moreover, the food security projects and programmes that are allegedly run by the province and national government should be evaluated on the outcomes and impacts it has done. The results should be assessed on the potential outcome and impact that this study’s recommendations bring. In addition, food waste measurements in food corporations will provide important insights that could be used in the development of future initiatives and academic investigations.

In summary, food waste reduction strategies by food corporations would drastically make a positive difference as it would alleviate hunger and poverty in the City. Followed by a cleaner environment/less pollution, and lower food prices. With that said, this research study has the potential to change the scope of food security in the CoJ for the better. If only food corporations and government could work together with a vision of a food secured City in mind and a clear and realistic strategy that could be ground breaking in the development sphere.
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Appendix A: Interview questions for Government Officials

1. What is the government’s definition of food security?
2. What food security projects/programmes are running in the City?
3. Is government involved in curbing food corporate waste?
4. Are there policies that govern against food waste in retail or wholesale stores? Explain
5. Is there a partnership between government and food corporations in curbing food waste food stores?
6. If not, what factors affect the partnership between food corporations and government?
7. Do you currently measure food corporate food waste? If no, why not?
8. Research states that for many years Indigenous Knowledge has enabled farmers to utilise their knowledge to secure their produce and natural environment which maintained food security. Do you think this knowledge merged with science might work in an urban setting like it does in rural environments?
9. Would you consider a single institutional body which will coordinate and oversee the well running of food security programmes in the country? If yes or No elaborate
10. How can food waste reduction contribute to food security in the City of Johannesburg?
Appendix B: Interview questions for Food Store Managers

1. Does food waste commonly occur in store?
2. Which methods do you use to ensure that food does not get wasted?
3. Why do you think some foods are not sold?
4. What are the most wasted fruits and vegetables in store? Why?
5. What do you do with perfectly edible surplus food?
6. What can be improved in regards to food waste being reduced in the store?
7. Elaborate on how you currently measure food corporate food waste
8. What is your relationship with your company and government to reduce food waste?
9. How would you like to collaborate with the local government in achieving food security in the city?
10. How will City of Johannesburg benefit from food waste reduction?
Appendix C: Survey questions for Supply Chain Managers

Please tick your selection in box.

1. Do you think food waste reduction can be reduced within the supply chain?
   A. Yes [ ]
   B. No [ ]
   C. Only some phases of the supply chain [ ]

2. Which methods do you use to ensure that food does not get wasted?
   A. Use different methods (Better storage facilities, packaging and management, etc.) [ ]
   B. Reverse Supply Chain [ ]
   C. Direct selling to customers [ ]
   D. Faster distribution of food to retail and wholesalers [ ]
   E. Other [ ]

3. Do you think these methods need improvement?
   A. Yes [ ]
   B. No [ ]

4. What do you do with perfectly edible surplus food?
   F. Return to farmer (Reverse Supply Chain) [ ]
   A. Donate to charity [ ]
   B. Throw away [ ]
   C. Share amongst employees [ ]
   D. Other [ ]

5. Do you think the Reverse supply chain is effective in reducing food waste?
   A. Definitely [ ]
   B. I doubt [ ]
   C. Sometimes [ ]
6. From your knowledge, which phase of the food supply chain does food waste mostly occur?
   A. Agriculture
   B. Handling and processing
   C. Storage
   D. Distribution/Retail and wholesale
   E. Other

7. On a scale from 1 to 5 how often does food waste reduction occur in the food supply chain? 1 being never occurs and 5 being extreme food waste occurs.

   

   1 2 3 4 5

8. What are the main causes of food waste in the food supply chain?
   A. Improper handling
   B. Inappropriate packaging and processing
   C. Inadequate storage facilities
   D. Lack of market linkages
   E. All of the above
   F. Other

9. Do you currently measure food waste that occurs throughout the supply chain?
   A. Yes
   B. No
   C. Sometimes

10. Is there a partnership with your company and government to reduce food waste?
    A. Yes
    B. No
Appendix D: Survey questions for Food Security Specialists

Is there a common definition of food security in SA?
A. Yes ☐
B. No ☐
C. There shouldn’t be one, the definition should be relative and flexible ☐

1. Do you think urban food security should be given priority?
A. Absolutely, I support urbanisation ☐
B. I doubt, rural areas should be prioritised ☐

2. Do you know of any government food waste reduction programmes operating in the City of Johannesburg?
A. Yes ☐
B. No ☐

3. Do you think current government food waste reduction programmes are effective?
A. Certainly ☐
B. I doubt ☐
C. Some ☐

4. Do you think food waste occurring in food corporations is given enough attention?
A. Yes ☐
B. No ☐

5. Why do you think food waste occurs in food and wholesale stores?
A. Mismanagement of the food (Untidy set up, dirty looking food, etc) ☐
B. Over stock ☐
C. Not having the appropriate storage facilities ☐
D. High food prices ☐
E. Customers are just too picky ☐
F. All of the above ☐
6. Do you think that measuring food waste in food stores is important for food security research?
   A. Of course 
   B. I doubt 

7. Research states that for many years Indigenous Knowledge has enabled farmers to utilise their knowledge to secure their produce and natural environment which maintained food security. Do you think this knowledge merged with science might work in an urban setting like it does in rural environments?
   A. Likely 
   B. Unlikely 
   C. Maybe 

8. Will having an independent food security hub that overlooks all food security programmes, coordination implementation, monitoring and evaluation in the City or the country be a good idea?
   A. Yes, it will work 
   B. No, it will be a disaster 
   C. Perhaps 

9. Do you think government is taking your food security research recommendations seriously?
   A. Yes 
   B. No 
   C. Sometimes
Appendix E: Survey questions for the Food Donation Redistribution Organisation

1. How many food corporations donate fruits and vegetables to you?
   A. More than 10  
   B. Less than 10  

2. Are the foods in food condition and edible?
   A. Yes,  
   B. No  
   C. Sometimes  

3. Do you think your organisation contributes to food waste security?
   A. Definitely  
   B. I doubt  
   C. Partially  

4. Does government support your organisation?
   A. Yes  
   B. No  
   C. Occasionally  

5. Do you ever receive insufficient food to distribute?
   A. Yes  
   B. No  
   C. Sometimes  

6. What do you do with surplus food?
   A. There is never surplus food  
   B. Donate to unregistered NPOs  
   C. Give more food to registered NPOs  
   D. Keep for next time  
   E. Divide food amongst employees
7. What improvements would you recommend to help reduce food waste in food corporations or/and the City?
   A. Donate unsold food to charity  
   B. Improve management and food handling in store  
   C. Develop a food waste reduction policy for food corporations  
   D. Set food waste limit by measuring waste  
   E. A & C  
   F. Other  

8. Do you think that collaboration with government and food corporations would be more effective in tackling food waste in the City?
   A. Certainly, a partnership would produce more effective results  
   B. I doubt because the government would be invading private companies  

9. How does food waste affect food security in Johannesburg?
   A. Land pollution  
   B. Causes food insecurity (Increased hunger and poverty)  
   C. It doesn’t affect the City in anyway  
   D. A & B  
   E. Other  

10. How will City of Johannesburg benefit from food waste reduction?
    A. Cleaner environment  
    B. Reduced hunger and poverty  
    C. The City will not benefit from anything  
    D. A & B  
    E. Other  

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Appendix F: Survey questions for Fruit and Vegetable Customers

1. Do you buy odd looking fruits and vegetables in food stores?
   A. Definitely, I don’t care how they look, it’s about how they taste
   B. Never, I don’t trust funny looking fruits and vegetables
   C. Sometimes

2. What do you think are the main causes of fruit and vegetable wastage at food corporations?
   A. Mismanagement of the food (Untidy set up, dirty looking food, etc.)
   B. Over stock
   C. Not having the appropriate storage facilities
   D. High food prices
   E. Customers are just too picky
   F. All of the above

3. What food waste reduction methods do you see being implemented in food stores?
   A. The store donates food to the community
   B. There’s a big sale on unsold fruits and vegetables
   C. Food gets thrown away
   D. A & B
   E. I don’t see any

4. Do you think food waste occurring in food stores contribute to food insecurity?
   A. Yes
   B. No
   C. Not sure

5. What do you think should be done with surplus food in store?
   A. Donate it
   B. Huge discount price
   C. Throw away
   D. Return to the farmer
   E. All of the above
6. Do you know of any food waste reduction programmes implemented in the City?
   A. Yes [ ]
   B. No [ ]

7. Are you aware of the fact the City of Johannesburg’s landfill is nearly full to capacity?
   A. Yes, I’ve heard about it [ ]
   B. No, that’s news to me [ ]

8. What do you think should be done about this matter?
   A. Use space from other areas or provinces [ ]
   B. Just burn all the waste [ ]
   C. Reduce, reuse, recycle waste [ ]
   D. There’s no hope, we are doomed! [ ]
   E. Create a policy which limits food waste in retail and wholesale stores [ ]
   F. Get food security specialists to deal with this problem [ ]
   G. C, E and F [ ]
   H. I don’t care [ ]

9. What strategies would the government and food corporations do to curb food waste in the City?
   A. Create an independent food security hub that will overlook food waste reduction strategies across Johannesburg, province and country [ ]
   B. Government must create food waste reduction policies for food corporations [ ]
   C. Donate surplus food [ ]
   D. It is unfair for government to dictate food corporation practices [ ]

10. How does food waste affect the City of Johannesburg?
    A. Land pollution [ ]
    B. Causes food insecurity (Increased hunger and poverty) [ ]
    C. It doesn’t affect the City in any way [ ]
    D. All of the above [ ]
    E. Other [ ]
Appendix G: Case Study/Criteria: Joburg Fresh Market

1. Is there an existing food waste reduction model or strategy in store?
   A. Yes □
   B. No □

2. How is food stored and handled?

3. What is done to unsold food?

4. What happens to wasted food?

5. Does wasted food get measured (weighed or quantified)?
   A. Yes □
   B. No □

6. If yes, how?

7. Does the model work efficiently on the ground?
   A. Definitely □
   B. Absolutely Not □

8. Based on your observation, rate Checker’s food waste reduction strategy effectiveness from 1-10. 1 being poor and 10 excellent

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9. If not, can it be improved?

10. How?

11. If the model works on the ground, by how much does it lessen food waste?

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12. Remarks on the case study
Appendix H: Informed Consent Forms

INFORMED CONSENT FORM
PARTICIPANT INFORMATION SHEET

Ethics clearance reference number: 2017_DEVSTUD_Student_11
Research permission reference number (if applicable)
Date:

Title: Food corporations and government rethinking food waste reduction strategies in Johannesburg City

Dear Prospective Participant

Student research project

My name is Bokang Pheto and I am doing research with Mrs Anele Madzakapita, a senior lecturer in the Department of Development Studies towards a MA Development Studies degree at the University of South Africa. We are inviting you to participate in a study entitled 'Food corporations and government rethinking food waste reduction strategies in Johannesburg City'.

THE PURPOSE OF THE STUDY:
This study is expected to collect important information that could contribute valuable insight to how food waste (edible fruits and vegetables) could be strategically reduced with the collaboration of food corporations (retail and wholesale stores) and government in the City of Johannesburg.

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REASON TO PARTICIPATE:
You as the government play a vital role in this research to reduce food waste (fruits and vegetables) occurring in food corporations in Johannesburg City. Your contribution to the study will bring valuable insight to the study and possibly to the food waste reduction system.

Your contact details were obtained from either the institutional website, recommendations from an associate or have volunteered to fill in the online survey and filled in your contact details.

Since you are part of the target audience, you have been selected to participate in this research on a voluntary basis.

THE NATURE OF YOUR PARTICIPATION IN THIS STUDY:
Your role as a willing participant is to answer interview questions by means of telephone. The type of questions to be asked are about programmes, policy, and partnership with food corporations related questions. The expected duration of the telephone is between 10 -15 minutes.

YOU CAN WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE:
Participating in this study is voluntary and you are under no obligation to consent to participation. If you decide to take part you will be given this information sheet to keep and be asked to sign a written consent form. However, you may not withdraw if you chose to remain anonymous. However, those participants who choose to be identified in the study may withdraw before, during and after submission.

THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY:
There will not be any incentives given for participating in this survey. Nevertheless, you will be contributing to a great sum of research and knowledge to the social and scientific community that aims to reduce edible food waste within the City of Johannesburg, and possibly South Africa and the continent as whole.
ANY NEGATIVE CONSEQUENCES FOR YOU IF YOU PARTICIPATE IN THE RESEARCH PROJECT:
There are no risks linked to this research.

THE INFORMATION THAT YOU WILL CONVEY TO THE RESEARCHER AND YOUR IDENTITY BE KEPT CONFIDENTIAL IF REQUESTED:
You have the right to insist that your name will not be revealed anywhere and that no one, apart from the researcher and research supervisor, will know about your involvement in this research.

The researcher will have access to the data and will maintain confidentiality by signing a confidentiality agreement. Your answers may be reviewed by people responsible for making sure that research is done properly, including the research supervisor or members of the Research Ethics Review Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

As a participant, your anonymous data may be used for other purposes, such as a research report, journal articles and/or conference proceedings. Privacy will be protected in any publication of the information e.g. a report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.

HOW THE RESEARCHER WILL PROTECT THE SECURITY OF DATA:
Hard copies of your answers will be stored by the researcher for a minimum period of five years in a locked cupboard in Johannesburg, Gauteng for future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. If necessary, hard copies will be shreded and/or electronic copies will be permanently deleted from the hard drive of the computer through the use of a relevant software programme.
THE STUDY RECEIVED ETHICS APPROVAL:
This study has received written approval from the Research Ethics Review Committee of the Department of Development Studies at Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW YOU WILL BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH:
If you would like to be informed of the final research findings, please contact 'Bokang Pheto' on 0799 279 379 or bokangpheto@gmail.com. The findings are accessible for one year subsequent to the research. Should you require any further information or want to contact the researcher about any aspect of this study, please do so with the contacts above.

Should you have concerns about the way in which the research has been conducted, you may contact Anele Madzriakapita at +260 97 6455132 or amadzriakapita@gmail.com. Contact the research ethics chairperson of the Department of Development Studies Research Ethics Review Committee; Dr DA Kotze on 012 439 6592 or email kotzela@unisa.ac.za if you have any ethical concerns.

Thank you for taking time to read this information sheet and for participating in this study.

-------------------------------
Bokang Pheto
CONSENT TO PARTICIPATE IN THIS STUDY

I, ________________ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the 'online survey'.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname: __________________________________________

Participant Signature: ________________________________ Date: ___________

Researcher’s Name & Surname: ___________ Bolang Photo: ___________

Researcher’s signature: ________________________________ Date: ___________
Appendix I: Permission letter

PERMISSION LETTER

Request for permission to conduct research on: ..........................................................

“Food corporations and government rethinking food waste reduction strategies in Johannesburg City”

Date: ..............................................

Researcher: Bokang Photo
Department: Development Studies
Cellphone: 0799 279 379
Email: bokangphoto@gmail.com

Dear ..............................................................,

I, Bokang Photo am doing research with Mrs. Anle Madzikapira, a Post Graduate Supervisor in the Department of Development Studies towards a MA at the University of South Africa. We are inviting you to participate in a study entitled, ‘Food corporations and government rethinking food waste reduction strategies in Johannesburg City’.

The aim of the study is to......

Your company has been selected because....

The study will entail (Describe the nature and procedures briefly)...........

The benefits of this study are...........

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Potential risks are ..........  
Feedback procedure will entail ..........  

Yours sincerely  

..........................  
Bokang Pheto  
Researcher (MA Development Studies)
Appendix J: Turn It In: Submission Report
Appendix K: Turn It In: Similarity Report
Appendix L: Certification of proof of editing

27 December 2018

I hereby confirm that I have proof-read, formatted, and edited the style, layout, references, and language of the

Master of Arts dissertation
In the subject of Development Studies
to be submitted to

UNISA
by

Bokang Pheto
entitled

Food corporations and government rethinking food waste reduction strategies in
Johannesburg City

(126 pages, 31001 words)

Note: The edited work described here may not be identical to that submitted. The author, at its sole discretion, has the prerogative to accept, delete, or change amendments made by the editor before submission.

Margaret Dingulo
Associate Member
Membership number: DN001
Membership year: March 2018 to February 2019

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