

HOUSEHOLD FOOD WASTE: A CASE STUDY IN KIMBERLEY, SOUTH AFRICA

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ABSTRACT

Food waste relates to three major world problems: food security, greenhouse gas emissions in the food supply chain, and waste disposal. One of the key ways to achieving sustainable food security globally, is to reduce food waste. In a country such as South Africa where between 12 to 14 million people are food insecure, the reduction of the R61.5 billion worth of food waste, could play a major role in this. In order to minimise household food waste, or consumer-related food waste, it is imperative to have an understanding of the factors influencing waste-related behaviour. The study focused mainly on the reasons for and behaviour when discarding food, consequently causing food waste. Subsequent to this, the researchers also determined what type of food was wasted most. This paper reports on the results of a survey conducted in Kimberley, in the Northern Cape of South Africa. A total of 100 questionnaires were distributed and completed, from which data were analysed. Although consumers indicated that they do not waste much food (the majority wasting approximately 5%), a significant proportion indicated that excess leftover food was discarded. A lack of planning for meals was found to be prevalent. Purchasing in bulk and purchasing the incorrect products were also found to contribute significantly to food waste. In this study it has been found that bananas and apples are the fruit that were most often wasted, and tomatoes and potatoes were the most wasted vegetables. Furthermore, leftover food was identified as one of the main sources of discarded food. Alternatives for the re-use of leftover food could aid consumer reduction of food waste. Alternative practices need to be developed to educate consumers about what to do with this food. A more thorough knowledge of factors influencing behaviour and attitudes towards food waste needs to be established. Thus, culture-specific and localised interventions should be synthesised, implemented and evaluated.

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INTRODUCTION

Food waste is the common denominator that relates to three major problems: food security, greenhouse gas emissions in the food supply chain and waste disposal (Oelofse & Nahman 2013). The challenge is to meet the world's growing demand for food, in an environmentally sustainable way, ensuring food security. This has been the topic of many research endeavours. Through the years there has been an evolution in the definition of food security. In fact, it has been suggested that sustainability, especially its environmental aspect, should be considered the fifth dimension of food security. It should underpin the other dimensions, namely availability, accessibility, utilization and stability (Shafiee-Jood & Cai 2016).

One of the keys to achieve sustainable food security globally, is to reduce food waste (FAO 2011; Lebersorger & Schneider 2011; Quested et al. 2013; Göbel et al. 2015). Some researchers feel that the reduction of food waste could reduce the number of food insecure people. This could be difficult to achieve, due to the complex food systems involved (Painter et al. 2016). Reducing food waste would also free up other resources such as water and land use, it would diminish environmental risks (unnecessary greenhouse emissions and diminished natural ecosystems) and avoid financial losses (farmers' incomes and consumers' expenses) (Lipinski et al. 2013; Jörissen et al. 2015). Furthermore, food loss reduces the overall productivity of our food system, resulting in increased pressure on the poor (Schuster & Torero 2016).

The literature claims that as much as 25% of food is wasted (Gibson 2012; Jörissen et al. 2015; Stancu et al. 2016). Some even estimate it as high as 32% in certain areas of the world. These figures include all stages of food production, processing and consumption. However, several studies undertaken on different continents amongst developed and developing populations indicate that households are the main contributors to food waste (Schmidt 2016). The amount of waste at household level varies tremendously across countries, depending mainly on income, industrialisation and developmental levels in communities (Chalak et al. 2016). There are limited studies that explore the reasons why food gets wasted, yet an understanding of these reasons is

needed for designing waste reduction measures that target specific behavioural elements (Painter et al. 2016). It is suggested that most of the food is wasted as a result of cooking, preparing or serving in excess; food not being consumed in time; or over-shopping. Over-shopping is generally the result of poor planning or impulse and/or bulk purchasing (Chalak et al. 2016). Globally, it is estimated that 1.3 billion tons of all food produced is wasted, amounting to US\$ 750 million (Painter et al. 2016). This is enough to lift one eighth of the global population out of under-nourishment (Chalak et al. 2016).

In South Africa, the Council for Scientific and Industrial Research (CSIR) has undertaken research to estimate the amount of food waste. The research was based on local food production statistics and typical proportions of food loss ratios through the supply chain for sub-Saharan Africa. The research showed that the amount of food wasted in South Africa is between 9 and 10 million tons per annum. The overall food waste on a per capita basis was estimated at 177kg/capita/annum in 2007. The food wasted at household level was 7kg/capita/annum in 2007. Based on the representative prices associated with each food commodity at every stage of the value chain, the cost of food waste to the South African economy was R61.5 billion in 2012 (Nahman & De Lange 2013). Oliveira (2013) reported that a third of the food produced in South Africa, is wasted. This annual waste is equal to the country's gross domestic product of 2%, amounting to R60 million (Oliveira 2013).

According to Oelofse (2015) the amount of food waste in South Africa from local production is 9.04 million tons per annum, at a 31.4% average annual production. The food wasted from local production and the imports minus the exports are 10.2 million tons per annum. If the food ends up as waste, the water, energy and mineral resources used for food production are wasted. The greenhouse gas releases across the food supply chain range on average between 2.8 and 4.14 tons carbon dioxide per equivalent/ton of food (Nahman & De Lange 2013).

High levels of food insecurity in South Africa contribute to concerns of food waste being raised. Foodbank South Africa estimated that between 12 and 14 million people where food insecure in 2012 (McKenzie 2012). There are also environmental concerns about food waste

that is landfilled. According to Oelofse (2015) the main problem with sending organic waste to landfill is that the waste decomposes. Methane (a greenhouse gas) and leachate are generated in landfills because of this decomposition process. Leachate has the potential to contaminate ground water. The contribution to global warming is substantial because methane is 21 times more harmful as a greenhouse gas than carbon dioxide (Richardson 2014).

To reduce food waste, Food bank South Africa provided a platform where the food near the expiry date can be donated to those in need. The food donated to Foodbank South Africa varies from producers, manufacturers, retailers, government agencies and individuals. Food bank South Africa served approximately 3348 tons of food during 2016, which is more than 11 000 000 meals. This vast amount of food is referred to as “rescued” food, in other words, food that otherwise would have been landfilled (Food Bank SA 2016).

In order to minimise household food waste, or consumer-related food waste, it is imperative to have an understanding of the factors influencing the waste-related behaviour (Aschemann-Witzel et al. 2015). Williams and fellow researchers (2012) found that approximately 40% of household food wasted in the UK occurred because there was more food cooked, prepared and served than could be consumed. More than half of the food was wasted because the household could not use it on time. Cox and Downing (2007) found that behaviour such as lack of planning, change of plans, initial purchasing of too much food, not liking to eat leftovers and not knowing what to do with leftovers also contributed to household food waste. This was confirmed by Aschemann-Witzel and fellow researchers (2015). Furthermore, studies found that consumers do not carelessly waste food, but that food waste is rather a product of socially-determined practices in food and eating (Aschemann-Witzel et al. 2015).

Many researchers have looked at the causes of household food waste on other continents, yet the picture in South Africa is not very clear. There is a lack of research regarding the attitudes and behaviour of South Africans toward food waste. Furthermore, it is not generally known what food is wasted in South African households. It was thus the aim of this

study to explore the reasons for discarding food at household level and some behavioural aspects of consumers toward it. Subsequent to this, it is also the aim of the researchers to determine what type of food was wasted most. This information is needed to draw up culture-specific and localised interventions to educate consumers on wasting less food.

METHODOLOGY

Study design

An exploratory cross-sectional survey was undertaken in the Kimberley area during September and October 2016.

Sample

According to the South African National Census of 2011, the urban population of Kimberley was 225 155. The minimum sample size to represent this population is 83, based on the 90% level of significance, 80% power, 50% defects (which gives the maximum sample size) and a 0.07 margin of error (<http://www.wessa.net>). To compensate for incomplete or non-usable questionnaires, a total of 100 was required. Stratified sampling was undertaken according to the ethnic composition of Kimberley, namely 41,5% African, 36,7% Coloured, 2,3% Indian/Asian, 18,4% white and 1,1% other. A paper-and-pencil self-administered questionnaire (generated by Evasys© software) was administered to adults that did not have access to computers, with a fieldworker facilitating the process. The target population was the respondents responsible for food purchases in households, regardless of status (male or female; young or old). The questionnaire consisted of questions on demographics, food waste, and leftovers. No incentives for completing the questionnaires were provided. The participation was entirely voluntary.

Structure of the survey

The focus of the survey was on the type and amount of food waste generated by the participating households. Furthermore, the survey explored basic knowledge of preventative measures that could be taken to prevent food waste and ways in which food waste is discarded within households. The study only considered food waste that could be avoided. This included food products that were

still fit to be consumed at time of discarding or food products that would have been edible if eaten in time.

Data collection

Data were collected over a period of 2 months.

The questionnaire consisted of six sections, which took 20-25 minutes to complete. All questions were coded with nominal multiple choice options or yes-or-no questions.

Section 1 included basic demographic and psychographic information on age, gender, ethnicity, type of family and the number of members in the household. Section 2 focused on basic job information such as type of employment and hours worked per day. Section 3 contained of basic personal information related to shopping habits and the use of shopping lists. Section 4 explored the attitudes towards storage, including what should be stored. Section 5 contained questions about leftovers and the discarding thereof. Section 6, which formed the bulk of the questionnaire, determined which food products were wasted, the amount wasted and possible reasons for wastage.

The raw data was imported into the Statistical Package for Social Sciences (SPSS version 24), from which descriptive statistics were obtained.

RESULTS AND DISCUSSION

Some data collected in this research project are to be presented as part of an additional report. It forms part of an additional report.

Demographics and attitudes towards food waste

A significant proportion of the respondents were female (81%), whereas only 19% were male. One of the criteria was that the questionnaires were completed by the person primarily responsible for purchasing the household's food supply. Although the responsibility historically fell on women for food purchasing and preparation, gendered division of labour has declined over the last decades. This is mainly due to an increased number of women entering the work force to contribute towards the households finances (Flagg et al., 2013). Furthermore, one might also point out that in

South Africa 41.8% of households are female headed or females are the main breadwinners (Worldbank 2013). A vast majority of persons responsible for food purchases will therefore still be women. Family structures in South Africa can also be seen as a contributing factor to the aforementioned position. Only a third of households in this country can be considered "traditional" families, i.e. those with married parents and children. More than a quarter of households include grandmothers living with grandchildren, homosexual life partners and child-headed households (Stats SA 2011).

According to the results, a significant portion (70%) of the respondents did not plan their weekly meals. Of the 30% that indicated that they do plan their weekly meals, only 54% indicated that they adhered to their meal planning. Research suggests that the advance planning of meals and consequent shopping lists, reduces waste because excessive purchasing is thus limited (Parizeau et al. 2015). Just more than half of the respondents (52%) felt that they often bought more than what they actually needed, whereas 48% of the respondents felt that they only bought what was necessary. The reasons given for purchasing excess (in order of importance) were: additional items bought that were marked down/on special (68%); some were impulsively bought (15%); shopping lists were incomplete (14%) and a co-shopper influenced the purchase (3%).

When an excess of food was prepared, a considerable number (61%) of respondents indicated that they discarded the food. Although most people felt a certain sense of responsibility towards reducing food waste (Graham-Rowe et al. 2015; Parizeau et al. 2015), there were those that might not have felt the same way (Stancu et al. 2016). Research suggests that the lack of ideas on reducing food waste is a source of tension and this leads to negative attitudes (Thyberg & Tonjes 2016). This could also be considered a plausible explanation for many respondents in this study merely discarding food. A further breakdown indicated that 25% of the respondents froze the surplus food, 12% gave it away and 1% threw it on a compost pile, and 1% stored it in the fridge to be consumed the next day. Only 21% of the respondents indicated that they considered making additional meals from the leftover food, whereas 79% of the respondents did not consider additional meals.

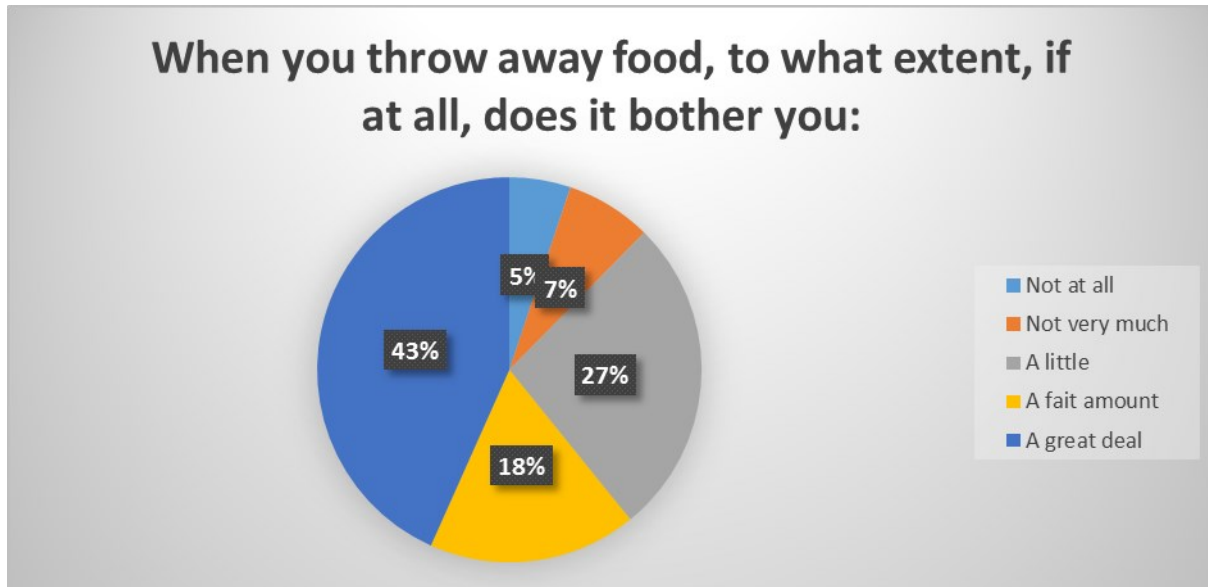


FIGURE 1: HOW MUCH ARE CONSUMERS BOTHERED IF FOOD IS DISCARDED?

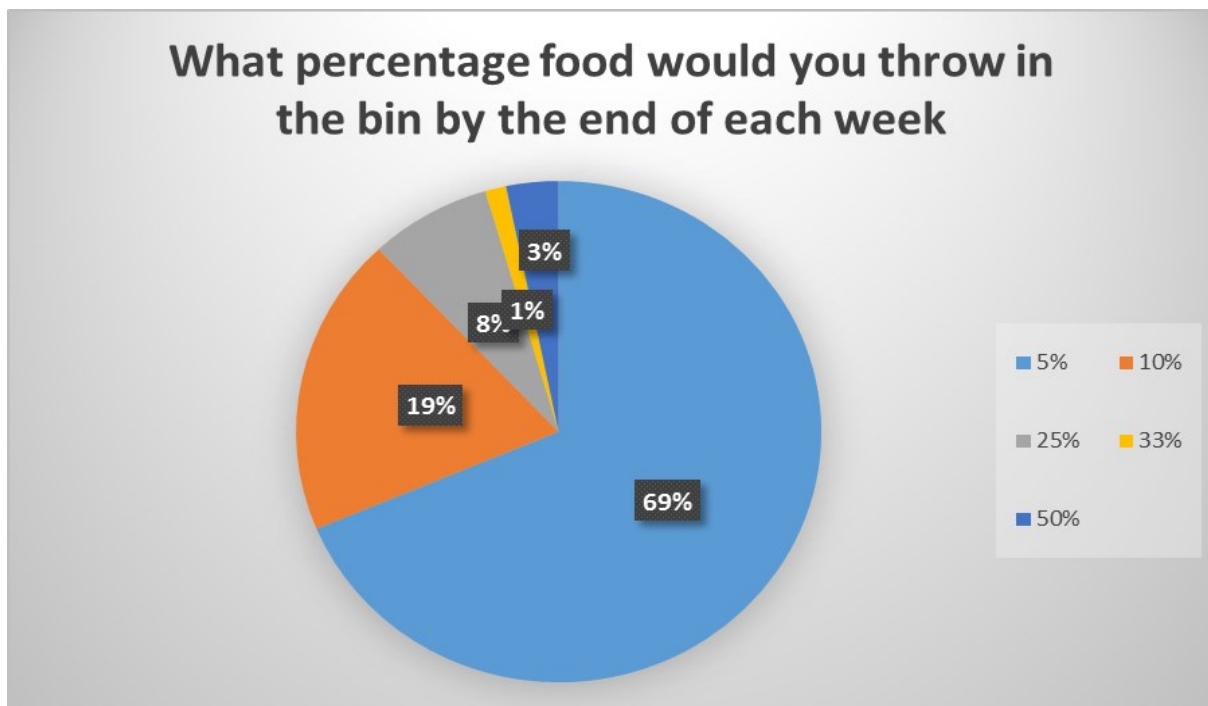


FIGURE 2: AMOUNT OF FOOD DISCARDED PER WEEK (%) AS INDICATED BY RESPONDENTS

Almost half (43%) of the respondents indicated that it bothered them a great deal when food is thrown away. 18% of the respondents were bothered "a fair amount", 27% were bothered "a little", 7% were "not very much bothered" and 5% were "not bothered at all" at the thought of throwing away food (Figure 1).

The respondents estimated that, in their view, 33% waste a small amount, 23% waste hardly any food, 15% waste a reasonable amount, 14% waste no food, 13% waste some food and 2% indicated that they waste a lot of food.

As shown in Figure 2 which indicates the breakdown, in percentages, more than two thirds (69%) of respondents only threw away 5%

TABLE 1: TYPE OF FOOD AND FOOD PRODUCTS WASTED IN DESCENDING ORDER (%)

Fruit	(%)	Vegetables	(%)	Other food products	(%)
Bananas	42%	Tomatoes	27%	Leftovers	34%
Apples	20%	Potatoes	17%	Milk and dairy products	30%
Avocado	8%	Cabbage	13%	Bread	25%
Oranges	5%	Lettuce	12%	Condiments	3%
Pears	4%	Carrots	9%	Ready to eat or convenience food	3%
Grapes	3%	Pumpkin	9%	Fresh meat, fish, poultry & eggs	2%
Lemons	3%	Cucumber	3%	Wine	2%
Peaches	3%	Spinach	3%	Porridge	1%
Pomegranate	3%	Beetroot	2%		
Pomelo	3%	Peppers	2%		
Strawberries	3%	Sweet Potatoes	2%		
Watermelon	3%	Green Beans	1%		

of the food. This correlates with the estimates in the preceding paragraph. Only 1% of the respondents indicated that they threw away a third (33%) of their food. Jörissen et al. (2015) reported that because the topic of food wastage is associated with moral and emotional judgement, respondents tend to underestimate the amount of food they waste. Furthermore, the utilisation of household surveys, although methodically simple, is subject to error because estimates are made from memory (Aschemann-Witzel et al. 2015). In a South-African context only 5% of food was wasted, which represents 9.04 million tons of food (Chetty 2016). The results obtained in this study indicate the same.

When items near their “best before” date, the vast majority (85%) of respondents use the products as soon as possible. This indicates good behaviour with regards to food waste. A mere 6% of the respondents discard the food. One can argue that respondents do not throw away food unnecessarily due to the high food prices. Furthermore, almost a third (32%) of the sample population earned a salary of less than R4000 per month, thus leading to the conclusion that food is an expensive commodity and therefore cannot be wasted. Some research suggests that lower income groups tend to waste less food (Grover & Singh, 2014), although then buying in bulk to save money can increase food waste (Porpino et al. 2015).

Type of food wasted

There is a considerable lack of research as to what type of food is most wasted in households. In this study it has been found that bananas and apples are the fruit that were most wasted, and tomatoes and potatoes were the most wasted vegetables (Table 1). In a study reported by Ronquest-Ross et al. (2015), a moderate escalation in fruit consumption of 6% was led by bananas, apples and grapefruit in South Africa, and tomatoes, potatoes and onions consumption rise moderately between 1994 and 2009. Therefore it was not unexpected that the most consumed fruit and vegetables are also the most wasted. Furthermore, Evans (2012) suggested that if there are children present in the homes, more waste of fruits and vegetables, especially potatoes, are wasted. Children are also very selective with regards to fruits and vegetables, subsequently adding to waste (Visschers et al. 2016). This coincides with findings in this study, as 34% of the households consisted of 2 or more children.

Leftovers were the most wasted food in households (34%), followed by 30% of milk and dairy products being wasted (Table 1). Bread (25%) was also wasted significantly more than other food products. Visschers et al. (2016) argue that it takes more effort to use meal leftovers and create a new or alternative meal. In their study, consumers indicated that it was easier to use bread for sandwiches instead of

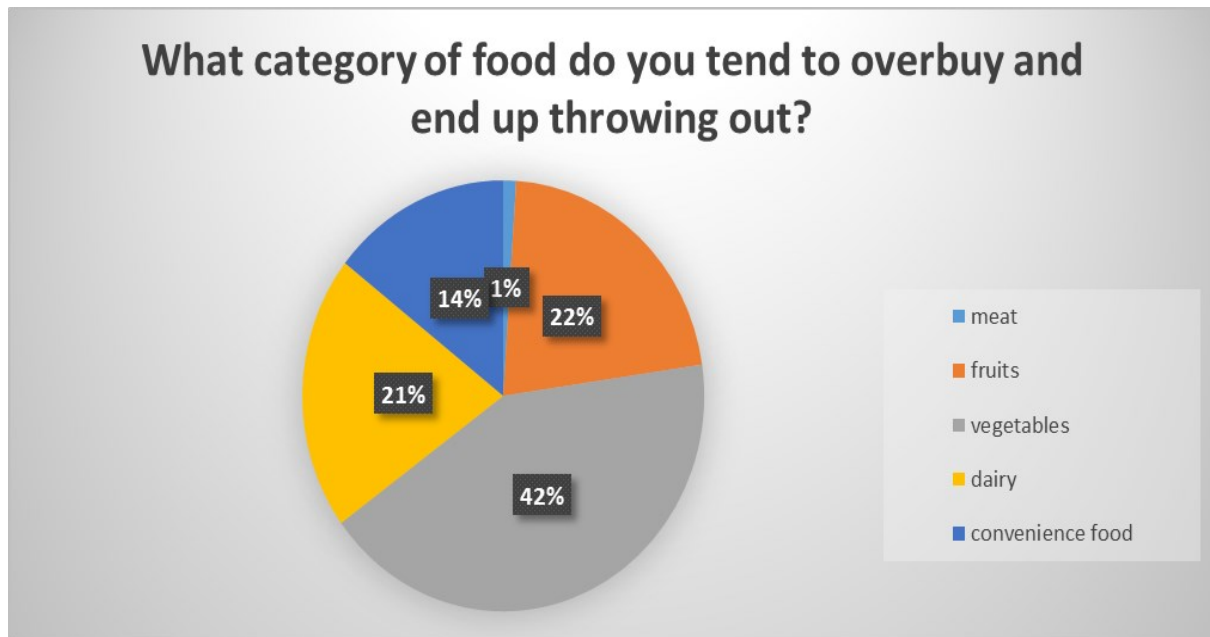


FIGURE 3: CATEGORIES OF FOOD THAT TENDS TO BE OVER-PURCHASED AND DISCARD-ED

leftovers, as the latter need to be stored properly and cannot always be used as it is.

Wrong storage methods, not enough storage space and/or over purchasing of food were possible explanations for the high rates of wastage, specifically for fruits, vegetables and dairy products. Respondents indicated that they most often bought too many vegetable (42%), fruit (22%) and dairy (21%) products (Figure 3). The main reasons for discarding these products was that the products were past their "best before" dates, they smelled off and that mould started to form (on the bread).

CONCLUSION AND RECOMMENDATION

Worth noting was the lack in planning of meals, which was conducive to purchasing in bulk and purchasing the incorrect products. If the consumers in this specific study could be provided with the knowledge and methods to plan their meals, they would be able to save time and money, and it might even lead to less household food waste. There are some researchers who argue that consumers are enticed to purchase in excess of their immediate needs as a result of smart marketing campaigns, and are also encouraged to buy impulsively (Baumeister 2002; Ene 2008; Farr-Wharton et al. 2014).

Although consumers indicated that they did not waste much food, a significant proportion indicated that excess leftover food was discarded. Therefore, alternative practices need to be developed to give consumers ideas about what to do with this food. This study indicated that the majority of respondents were aware of food waste and to some extent, tried to minimise it. Some even indicated that they were willing to change their purchasing and preparation habits to reduce food waste. However, influencing consumers to change their behaviour has varying degrees of success. Although, consumers might have an interest in more sustainable practices, this might not necessarily influence their behaviour. Changing the behaviour of consumers requires a combination of interventions that is culture specific (Farr-Wharton, Foth & Choi 2014).

The exploration and research of possible alternatives for the re-use of leftover food could assist consumers to reduce food waste. Given that food waste depends on the composition of the household, alternative solutions might include culture specific and localised interventions. Consequently, more research needs to be done in other areas of South Africa, with different ethnic compositions of consumers to determine the attitudes and behaviour toward food waste, as well as what food is wasted. This will assist in forming a holistic and

representative of what is happening in households in the country. Furthermore, it is recommended that the behaviour and attitude of the consumers be further explored in more depth than was possible in this quantitative study.

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