Household Food Wastage in a Developing Country: A Case Study of Mamelodi Township In South Africa

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ABSTRACT

In many developing countries, including those with food shortages a large portion of household waste is estimated to be food. This paper reports on findings of a research study conducted in one of South Africa's largest townships (Mamelodi) within the City of Tshwane Metropolitan Municipality. The research was conducted using structured questionnaires to assess the amount and types of food waste generated in the households and to determine the main causes for food wastage. Only 18% of interviewed households agreed that they waste food, while 82% didn't concede to wasting food. The results indicated that in 58% of households in Mamelodi the largest portion of food waste was porridge, while 26% and 16% of households mainly wasted rice and bread respectively. The main causes for food wastage according to this study were in excess preparation porridge and rice; bread reaching the expiry date before being consumed, and buying in excess.

1. INTRODUCTION

It is estimated that up to 12 million (24.5%) of the South African population go to bed hungry each day (Hosken, 2013) and yet the country has the largest proportion of food wastage in Africa (Allafrica, 2010). In some of the poorest areas as around Cape Town and Msunduzi in KwaZulu Natal, 80% to 87% of the population go hungry daily. Yet, very few poor households in South Africa and specifically in these areas grow their own food (SACN, 2011). Food wastage poses additional problems at landfill sites which result in economic and environmental cost. Preliminary research has found that most food waste in developed countries occurs in households and eating establishments, while in developing countries a greater proportion is lost on farms, during transportation and storage (Allafrica, 2010). It is estimated that in South Africa only about 4.14% of food waste occurs at post-consumer stages, while the majority of food waste 8.67 million tonnes per annum is generated during agricultural production (26%), post-harvest handling and storage (26%), processing and packaging (27%) and distribution 17% (Oelofse and Nahman, 2013).

Although household food waste is likely to be only a small component of the overall food waste problem in South Africa, the total costs to society of household food waste are estimated at approximately R21.7 billion per annum, or 0,82% of the annual South African GDP (Nahman *et al*. 2012). According to Oelofse and Nahman (2013) food waste has a triple negative impact. This includes: environmental impacts of food waste disposed at landfill and consequent pollution; socio-economic impacts associated with food insecurity and atmospheric emissions derived during food production; processing and distribution to consumers contributing to climate change. The accumulated effect of these food wastages from different sources threatens food insecurity of the country. Environmental impacts associated with food waste are caused by the decomposition of food waste that emits the greenhouse gas methane and carbon dioxide; and also causes leachate with the potential to pollute water resources. Methane is a greenhouse gas which is 25 times more powerful than carbon dioxide (Kevin, 2009) and contributes towards global warming and climate change.

Food waste can be defined as all food produced for human consumption or purchased that is unused by humans (Griffin *et al*. 2009). This definition may refer to any food waste raw, cooked, edible and associated inedible material (e.g. bones, egg shells, and fruit and vegetables peelings) generated during the preparation or consumption of meals. The assessment of household food wastage in Mamelodi, a large township in the City of Tshwane Metropolitan Municipality (CTMM) of South Africa was motivated by the need to understand why in a country where about 12 million people go hungry there is still a problem of food wastage at household level. To achieve a better understanding of the complexity of food wastage, a study was carried out to quantify the volumes of food wastage in a small sample of households in Mamelodi. The goal of this paper is further to provide data on the types and causes of food waste in a South African township and suggest possible remedies for such wastage.

1.1 Household Food waste challenges in South Africa

South Africa is a middle income country that counts among Africa's fast growing and strongest economies (DEAT, 1999). There is not much that has been done in South Africa concerning household food waste. This lack of reported data on food waste could be explained by the fact that waste separation at source only became a legal requirement in South Africa in 2009 (Oelofse and Nahman, 2013), while reporting to the SAWIS was voluntary and not required at this level of detail. Reporting to the SAWIS is now mandatory in terms of SAWIS regulations that came into effect on 1 January 2013 (DEA, 2013). But there are attempts that were conducted to quantify food waste (including food losses) generated in South Africa and these estimates are based on food supply data available in South Africa. The preliminary estimate of the magnitude of food loss and food waste generation in South Africa is in the order of 9.04 million tonnes per annum. On a per capita basis, overall food loss in South Africa in 2007 is estimated at 177 kg/capita and consumption waste at 7 kg/capita. However, these preliminary figures should be used with caution and are subject to verification through on-going research (Oelofse and Nahman, 2013).

1.2 Waste characterization studies in South Africa

There is no reliable source of data on household waste generation rates in South Africa. However, the Waste Information Baseline report estimate that, the average waste generation rates (kg/capita/day) by income level as: very low income 0.3, low 0.46, medium 1.03, high 1.68 and very high 1.85 kg/capita/annum (DEA, 2012). There are also few waste characterisation studies available in South Africa. Only a handful of surveys have been undertaken (Silbernagl, 2011).

Two studies were done in Pretoria, estimating the magnitude of food losses and food waste generated in South Africa (Oelofse & Nahman, 2013) and waste stream analysis for CTMM (Snyman, 2007. Jarrod Ball and Associates (2001) conducted a waste characterisation study in the City of Johannesburg and found that the low socio-economic areas and the central business areas had higher portions of putrescible wastes, while the middle and high socio-economic waste stream had large amounts of garden waste but not food waste. Another study was the kerbside waste characterization analysis throughout the greater Rustenburg municipal area where waste from various socio-economic areas including informal areas (very low income), low income, middle income; high income and the commercial/ business sector were sampled. The results of that study suggest that the proportion (by mass) of putrescible waste constituted approximately 27% of the total household waste stream in low income areas, 13% in middle income and 17% in high income areas (Silbernagl, 2011).

Two studies have been performed in the Western Cape (one by Provincial Department of Environmental Affairs & Development Planning; and the second by the City of Cape Town). The State of Environment Report on solid waste in the City of Cape Town defined 14 different categories of waste, of which kitchen waste is one and makes up 8.16% of household waste generated by low income communities, 8.97% of middle income household waste and 4.76% for high income households. It is not clear if these percentages were calculated by mass or volume ((DEAT, 1999). (Gibb Engineering and Science, 2008) found that food waste makes up 12.5% (by mass) of residential waste collected by the municipality in Cape Town.

1.3 Types of household food waste

Most of the food waste that are generated in households are waste such as unused or spoiled cooked food, excess cooked food, vegetable and fruit peelings, beverages that went stale, undesirable raw food, meat scraps, fresh fruit and vegetables and salad (Globalideas, 2013 and FAO, 2011). These food wastes account for around one quarter of all avoidable food wastage and equates to an average of 0.8 portions being thrown away per person per day (Defra, 2010). Most of the studies have identified that it is the most perishable food items that account for the highest proportion of food waste. Fresh, fruit and vegetables (FFVs) are usually among the most-wasted items, followed by other perishables like bakery and dairy products, meat and fish (Parfitt *et al*. 2010).

1.4 Causes of food waste generation in households

One-third (about 1.3 billion tonnes) of all the food produced for human consumption goes to waste or is lost annually because of inappropriate practices. A study on food wasted conducted in the United Kingdom, for instance, shows that consumers throw away 31% of the food that they buy and their reason for food being wasted is that it is left unused or that too much food is prepared (WRAP, 2008) and also by buying more food than what is going to be eaten. Cooking habits of households are the main reason for household food waste. According to the European statistics (Eurostat, 2008), households in Europe spent 12.3% of their household budget on food. People in Romania spent 50% on food (Eurostat, 2008) while South African household

spent 14% on food (StatsSA, 2012). Some of the reasons that cause this food waste are lack of menu planning before meals and also by buying foods that are not on their shopping list. The majority of fresh fruit and vegetables are thrown away because it was not used in time or had gone off or had passed a date label (Eurostat, 2008).

1.5 The effects of food waste on the economy

A rise in living standards and growing salaries gradually lifted the income constraint for many households in the 1960s. This imposed a change in food demand and caused a rise (e.g. coffee, cheese, rice) or a fall (e.g. tea, canned meat, potatoes) in average levels of food consumption for some products (Glanz, 2008). Economics and the environment are inextricably linked, as natural resources are the basis of production, manufacturing and waste disposal. At present the economy is growing, but at a slow rate, and unemployment is high, and increasing. This is contributing to unsustainable resource use, polluting activities, and dependency on increasingly degraded natural resources (Blignaut, 2012). The costs of household food waste in South Africa are associated with loss of potentially valuable food source and are valued using a weighted average market price of the wasted food, and also with disposal of organic waste to landfill (Nahman *et al*. 2012).

The total costs of wasted food source (R21,195,308,450 per annum or 0.80%) and landfill disposal (R505,080,938 per annum or 0.02%) to society associated with food-waste related problems are estimated at approximately R21.7 billion per annum or 0.82% of annual South African Gross Domestic Product (GDP) (Nahman *et al*. 2012). South Africa's economy is highly dependent on natural resources for food and energy production, and inputs to manufacturing. The level of impact of changes in macro-economic policy on the environment is uncertain, as data are not readily available in South Africa. However, unless the rate of economic growth increases, there is likely to be even greater dependence on natural resources such as raw materials, and increased use of production methods that create pollution and waste (DEAT, 1999).

2. METHOD

The study was undertaken in Mamelodi, a township located in the CTMM. The study used a quantitative method in which a total number of 50 households were assessed in June and July 2012. The study was designed by using a simple random sampling method of households in Mamelodi. The study was conducted by means of handing a questionnaire to each household selected. The outcomes of the questionnaire gave qualitative information on the type and occurrence of wasted food and reasons for wasting food on the basis of self-reported behaviour of the respondents. Furthermore, information about interrelated conditions and behaviour were gathered (Schneider, 2008; Leedy and Ormrod, 2009; Mouton, 2001). Interviews were carried out after working hours to capture key respondents in the households since the majority of them were employed.

The questionnaire was completed by the person responsible for food preparation in the household. In cases where other household members were not found, children and other family members were invited to take part in the completion of the questionnaire. In such instances group discussions, involving members of the same household, were held to reach consensus on the answers that were captured using questionnaires.

Children between the age of 15 and 24 were considered a reliable source of information for the purposes of this project because they have no reason not to be honest in their responses. Most of the bread winners did not want to disclose information on their salary and did not want to be seen as wasters. The questionnaire was used to gain socio-demographic information about the respondents. According to Lamnek (2005) open interviews are the best method to find new outcomes that can be transformed into hypotheses (Leedy and Ormrod, 2009; Mouton, 2001).

Homeowners often disclosed information about their income, instances when food was thrown away and quantities of food purchased and the type of food that is wasted most often in the household was identified. The study shows that more than 90% of the respondents are literate with 22% of respondents having diplomas. The adult literacy rate in the province (people 15 years and older who can read and write their home language) is 92.9% (Naude and Krugell, 2002). The data collected from the 50 households that participated in the survey was analysed quantitatively using simple exploratory methods such as descriptive and simple statistical analysis (Poate and Daplyn, 1993). The descriptive statistic was used to assess the socio-economic profile of the household such as income, level of education and household demographics.

3. RESULTS AND DISCUSSION

3.1 Types of food wasted

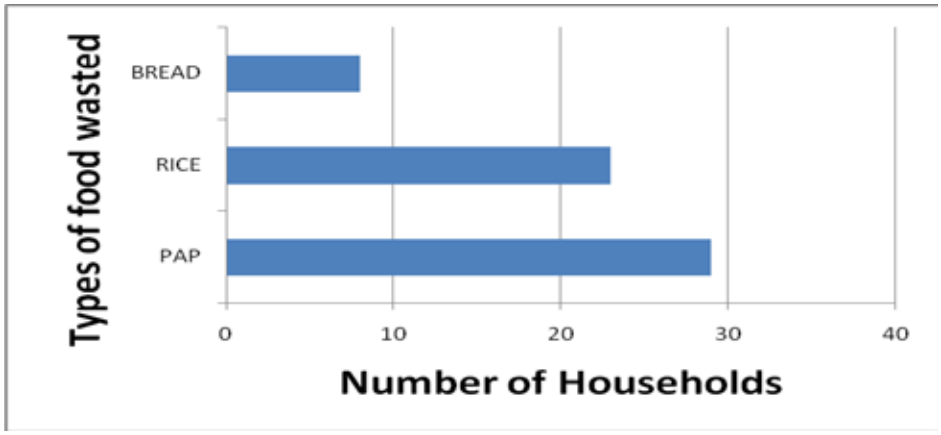

Figure 1. Types of food that is wasted in households (N=50)

Figure 1 represents the results of the types of food that is wasted in the sampled households in Mamelodi. The results showed that 58% of households included in the survey throw away a lot of pap, rice (26% of households) and bread (16% of households). The reasons for food wastage provided (refer to section 3.2) are that households prepared a lot of porridge, and rice; and that they throw away expired or spoiling bread. Promotional specials of retailers also contributed to food wastage at household level. These specials are presumably intended to clear out food items at retailers before reaching the sell-by date. Food wastage depends on the custom of people living in an area. The majority of people living in Mamelodi are black Africans whom prepare porridge as a daily staple meal. This was reflected in the findings that 58% of respondents reported were wasting pap.

3.2 Reasons for wastage

Table 1. Summary of food waste assessment questions (N=50)

Questions	Answers (Y/N)	Percentage of interviewed
Are you attracted by retail special?	NO	74
	YES	26
Total	50	100
Do you eat a lot of fruit and vegetables?	NO	90
	YES	10
Total	50	100
Do you use left-overs?	NO	80
	YES	20
Total	50	100
Do you think you waste food?	NO	18
	YES	82
Total	50	100
Do you use shopping list?	NO	84
	YES	16
Total	50	100
Do you stick to shopping list?	NO	50
	YES	50
Total	50	100

As indicated in Table 1, 26% of respondents disclosed that they are attracted by retail specials when they buy food; 74% responded that they are not attracted by specials. It can therefore be concluded that special offers on food produce in supermarkets are contributing to food waste as they tempt customers into buying bulk to get discounts. Products sold at a discount nearing their expiry date have little prospect of being used in time. Perishable products (e.g. bread or milk) were more likely to spoil if households went food shopping just once a week as compared to more frequent shopping. In one case a lack of shopping coordination caused two household members to buy the same products at the same time.

According to the results of the study most of the respondents do not eat a lot of fruit and vegetables; 90% of respondents reported that they do not eat fresh produce while 10% reported eating fresh produce. Left overs are therefore by far the most important contributing factor to total food waste. Eighty percent (80%) reported that they do not use leftover food, thus throwing it away, whereas 20% reported feeding leftover food to their dogs. The majority of households interviewed (18%) reported that they waste food, whilst 82% did not concede to wasting food. Shopping lists was used by 84% of the respondents, even though about 50% of participants responded that they only purchased enough of what they require.

Table 2. Reasons of household food waste (N=50)

Reasons of wastage	Percentage of respondents (%)
Preparing too much food	76
Special Offers	26
Food Residues	84
Expire Date	52

Table 2 shows that many of the households viewed wasted food as food residues and not mainstream waste as such. Seventy six percent responded that they prepare too much food and that was their reason of wasting food. Food expiry date was one of the factors that contributed to household food wastage with 52% of the responses citing that they buy more than required. Promotional items on special were also cited as a cause of food wastes, with 26% household buying more than what they required.

3.3 Amount of wastage

Table 3. Total number of food waste bags thrown away by households (N=50)

Household respondent	Number of bags thrown away	Percentage of household respondent
15	0	30
29	1	58
2	2	4
4	3	8

It can be seen from Table 3 which represents all household food waste that 58% responded that they throw away only one bag (24 litres) of food waste every week, while 30% showed that they do not throw away any bag of food waste. The fact that some households claimed not to throw away any bag of food waste may also indicate some degree of denial by some respondents who are conscious of the negative impacts of throwing away food. From the questionnaires results, four percent responded that they throw away 2 bags of food waste every week and 8% throw away 3 bags of food waste every week.

4. CONCLUSION

The results presented in this study show that most of the households interviewed wasted food. These wastes accounted for an average of about one bag per week (24 L). To evaluate the cause why households waste so much food, respondents answered the questions concerning their behaviour when it comes to food and a list of reasons was identified. Reasons such as preparing too much food, expiry date and promotional marketing were prevalent. The types of food that was wasted the most by households were identified as largely the staple food, maize porridge, followed closely by rice and bread. From the responses obtained in this study, it is clear that awareness about food waste and the quantities of food being wasted in Mamelodi is still largely lacking. Young people (21–30 years old) were less likely to think about how much they will use, while those aged 40 years or older were more likely to take this into consideration.

There seems to be a correlation between number of persons living in the household and education categories. Households that have more members they seem to decrease with the category of education. There were four respondents wherein they have 10 members in the family and only one person has matric whilst the rest are unschooled. But households that have members with degrees are also few in the family. The study shows that the income has an impact on the amount of food that is wasted by Mamelodi residents. Households that earned less than R5000.00 per month waste food more compared to high earners. Respondents with lower income have lower food loss rates, but 35 years ago Wenlock *et al.* (1979) found no statistical significance that more income automatically leads to more food waste. According to WRAP (2007a) lower income people waste more food because they are less likely to plan their shopping and have a 'live for today' attitude. Single person households were more likely than other groups to do smaller shopping and to decide what they needed while in store. The household size, age, occupation and income of the respondents therefore have an impact on household food waste.

The findings showed that in order to reduce household food wastage, people must be educated about generating unnecessary waste. Households should also be made aware of the need to recycle food. Further research is needed to determine what kind of measures should be taken to reduce food waste and how these measures can be implemented and monitored. The findings of this study provide some insights that should be expanded on to form the basis for a policy framework development of food waste management in the greater Tshwane metropolitan area. Recommendations to be communicated to the public include: Planning of meals before food shopping and knowing what purchases are necessary as ways of reducing food waste. The buy-one-get-one free special offers encourages customers to purchase food items that eventually end up unused and discarded as waste. It is therefore necessary to raise awareness about the financial impacts of buying specials if the food is wasted, thus not saving any money but perhaps even ending up as wasting money.

RECOMMENDATIONS

Further research is needed to determine what kind of measures should be taken to reduce food waste and how these measures can be implemented or monitored. The findings of this study have led to the following recommendations:

1. Environmental Education should be used as a mechanism of raising household food awareness on how to prepare enough porridge that they will manage to eat and finish, rather than throwing leftovers into waste bin. This recommendation is strongly emphasised by the 58% of the respondents who indicated that they throw away pap/porridge.

2. It is recommended that Environmental Education be used as a mechanism of raising household food awareness on how people with no fridge can keep their food for longer term. As indicated from the study 92% of households they do not own a fridge and they waste food more compared to the households that own fridges.

3. Community awareness workshop is needed in order to educate household especially young consumers, aged 21–30 years. On how to prepare a food budget than just buying everything they come across without a need. They need to consider portion sizes at the point of purchase.

4. Households should also be made aware of the need and benefits to recycle food. Food waste should be stored and collected separately for the purpose of recycling e.g. through composting and anaerobic digestion.

5. Ways must be found in the community to start composting initiatives.

6. The use of Bokashi (which is Japanese term meaning 'fermented organic matter') as a partner strategy to various types of composting. By using the Bokashi process, food waste is fermented without an odour and enhancing the composting process. Turning organic food scraps into compost can reduce greenhouse gas emissions by keeping food scraps from rotting in landfill. It will be of great value to use food waste to produce such an alternative and valuable product.

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