

Household food waste: attitudes, barriers and motivations

Household
food waste

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Abstract

Purpose – Food waste at the household level represents a major component of all food waste. Therefore minimizing food waste at the household level remains an important component of the food chain responsibility. This study explores the problem of food waste in Mauritius through an understanding of households' attitudes toward food waste and their motivations and barriers to food waste recycling.

Design/methodology/approach – The study uses a grounded theory approach to identify thematic categories that represent participants' attitudes toward food waste and the barriers they face to food waste reduction. We used a purposive sampling technique to guide the selection of participants. Interviews were conducted with 14 participants: three experts in food waste and 11 households. The data were analyzed using the tools of grounded theory.

Findings – Participants' expressed views on food waste included (1) guilt toward wasting food; (2) (lack of) environmental awareness; (3) financial considerations and (4) exemption from responsibility. The findings also led to the development of four themes that defined the barriers participants face to recycling food waste: (1) lack of awareness; (2) space limitations on recycling methods; (3) inadequate policy and (4) lack of time/priority.

Practical implications – Addressing the problem of food waste requires a holistic approach that takes into account households' attitudes to food waste, their motivation and barriers to food waste recycling as well as the regulatory and institutional framework governing food waste management in Mauritius. Policymakers should try to improve households' knowledge about food waste through educational campaigns. The authorities can provide different types of bins to households freely to facilitate the sorting out of waste and impose a fee for food waste generated beyond a certain limit or provide subsidies to them for handling food waste properly.

Originality/value – The management of food waste is particularly challenging for small islands developing states because of their unique characteristics of smallness, limited resources and environmental vulnerability. Appropriate interventions to reduce household food waste require place-based and geographically sensitive analyses that take into account the specificities of local food and waste management systems and cultural norms with respect to food. However, there is not only a paucity of research on household food waste, but most studies have been carried out in nonisland economies. The study contributes to the limited research on household food waste in small islands.

Keywords Motivation, Food waste, Households

Paper type Research paper

1. Introduction

Food waste is a topic of interest to many researchers, practitioners and governments. Around one-third of food produced globally, equivalent to 1.3bn tonnes of food and USD 936bn, is wasted every year (Food and Agricultural Organisation, 2020). At the same time, recent statistics from the Food and Agricultural Organisation suggest that more than 820m people



are left without food worldwide. The current world population of 7.2bn is projected to increase by bn over the next 12 years, which is likely to further aggravate the problem of malnutrition and famine. Food that goes wasted could be used effectively to fight hunger and malnutrition (Hasegawa *et al.*, 2019). In addition to its socio-economic implications, food waste also constitutes a significant environmental threat (Barles *et al.*, 2020). The consequences of food waste for the quality of life and well-being of individuals are also well-documented in the literature (Corvo, 2019).

Food waste at the household level comprises a major component of all food waste and results from changing lifestyle, rapid industrialization, increased in the availability of convenience food and a consumerism culture. The socio-economic and demographic background of households, their eating and cooking habits and the type of foods have evolved considerably, with implications for people's emotional connection with food. For many individuals, food has no emotional value and are therefore wasted without hesitation. For others, food is no longer a way to socialize with other people, and the value of preparing meals together or eating as a family has disappeared (Pudel and Westenhofer, 1988). In other instances, some people do not necessarily pay particular attention to food ingredients and do not have enough information about the food origin which may be unacceptable to them and their culture, resulting in food being wasted. With globalization, the value and authenticity of local food has diminished, with implications for food waste (Pudel and Westenhofer, 1988). In comparison to industrial, municipal and institutional wastes, household food wastes consume a lot of space in landfill sites. Therefore, in several countries, household food waste is the main source of wastes that has to be dealt with. Separating food waste from other types of wastes at source using composting systems may reduce their environmental impacts. The composting would recapture nutrients along with energy in anaerobic digestions system, reducing their adverse consequences on the environment. However, composting systems not only require higher investments than landfill sites, but there is also a lack of political will that hinders progress in many countries.

The management of food waste is particularly challenging for small islands developing states (SIDS) because of their unique characteristics of smallness, limited resources and environmental vulnerability. Unlike landlocked countries, due to their small size, small islands have limited land space for waste scrapping and do not have opportunities for interstate waste transport. Lack of state funding and technical and financial resources also pose a challenge for the setting-up of an appropriate and sustainable food waste management system (Kowlesser, 2020). The tourism sector on which many islands depend for economic survival further contributes to food waste problems, posing additional challenges to sustainable development (Sealey and Smith, 2014). Compared to other economies, illegal dumping and burning of waste is also common among households due to their lack of awareness of the adverse health and environmental impacts of waste (Kowlesser, 2020). Therefore, the management and reduction of food waste is a significant component of the food chain responsibility and sustainability initiatives in SIDS.

The largest proportion of total food waste emanates from households. Households also represent the final stage of the supply chain and, therefore, they are an important target for food waste reduction initiatives (Schanes *et al.*, 2018). However, there is not only a paucity of academic research on household food waste (Parizeau *et al.*, 2015), but most studies has been carried out in nonisland economies such as the UK, United States, Finland, Denmark and Romania (e.g. Graham-Rowe *et al.*, 2014; Hall *et al.*, 2009; Stefan *et al.*, 2013; Thyberg and Tonjes, 2016; Williams *et al.*, 2012). Appropriate interventions to reduce household food waste require place-based and geographically sensitive analyses that take into account the specificities of local food and waste management systems and cultural norms with respect to food (Parizeau *et al.*, 2015).

In an attempt to address the literature gaps, this study explores the problems of household food waste in the island of Mauritius. The research relies on in-depth interviews with

households and other stakeholders and uses the tools of grounded theory to understand participants' attitudes to household food waste and the barriers and motivation to recycling strategies. We use a grounded theory because of its ability to generate new theoretical insights by providing distinct guidelines for theory development (Connell and Lowe, 1997). Furthermore, investigating the subject from a subjective perspective provides the natural occurring of information while allowing us to stay close to the specific situation and taking into account the local context of household food waste. The study contributes to the limited research on household food waste in SIDS and provides useful interventions for reducing food waste at the household level.

The paper is structured as follows. The preceding paragraphs discussed the research problem, identified the literature gaps and outlined the theoretical contribution of the study. In Section 2, we review the literature on household food waste, discuss their impacts and the attitudinal and behavioral aspects of food waste. This section concludes by an overview of food waste and its management in SIDS, with particular reference to Mauritius. In Section 3, we explain the research methodology of the study, the data analysis, and coding process. In Section 4, we present the results of the study. Section 5 discusses the results in the light of the existing literature. In the final section of the paper, the theoretical implications and the limitations of the study are presented.

2. Household food waste

Food waste is defined as leftover foods, foods left to spoil along with edible portions and foods that are for various reasons, discarded (Bernstad, 2014; Stenmarck *et al.*, 2011; Hanssen *et al.*, 2016). The terms “avoidable”, “partially avoidable” and “unavoidable” are often used to describe food waste. However, what constitutes food waste varies across countries and cultures. For example, while in some cultures animal offal is considered as food, in others, it is considered as food waste and discarded as a result. Personal habits also result into “partially avoidable” food wastes. For example, bread crusts and apple peels which may not be appealing to some people end up being wasted (Stenmarck *et al.*, 2011). In contrast, waste produced during the preparation of food such as peels, bones and shells are referred to as “unavoidable” food waste (Bernstad and Andersson, 2015). Avoidable food waste comprises a large proportion of household food waste, accounting for between 35% and 60% in advanced economies (Hanssen *et al.*, 2016).

Food waste at the household level has been increasing over the past years due to changing lifestyles, rapid industrialization and socio-economic and demographic changes. Household size and composition influence the amount of food wasted, with larger households wasting less food than smaller ones (WRAP, 2008). Adults have also been found to waste more food compared to children (WRAP, 2009). Level of income also influences food waste. Households with lower income generate more food waste because of their abrupt food purchase behavior and the absence of grocery planning (WRAP, 2010). Lyndhurst (2007) found that post retirement consumers waste less food due to budgetary constraints when purchasing food and their tendency to recycle foods. In comparison, younger consumers pay less attention to food waste because of their lifestyle. Nowadays, household food shopping for the family is not necessarily a planned activity, resulting in overbuying and overstocking of food, much of which goes wasted (Zang *et al.*, 2018).

Food waste also has an important cultural dimension. For example, Mexican households use few basic ingredients which are combined differently in preparation of the dishes and consequently, they waste less food compared to Anglo-American households. In the UK for example, 40% household food waste results from an excess quantity of food prepared (Thyberg and Tonjes, 2016). In developing countries, food waste is comparatively lower because smaller quantities of food are produced. In Chinese culture, the emphasis and importance placed on hospitality and the entertainment of guests means that if there are no leftover foods post meal it

implies that the host did not cater for enough food for their guests. As a result, Chinese families overcater for food, which in several cases result in waste (Wang *et al.*, 2017).

2.1 Impacts of food waste

Food waste results in a number of environmental impacts in addition to its social and monetary implications. Food waste emits greenhouse gases (GHGs) (Papargyropoulou *et al.*, 2014; FAO, 2014; WRAP, 2009) resulting from the breaking down of organic materials, creating hydrocarbon gas (methane) which is believed to be 25 times more powerful than carbon dioxide. In the United States for example, the value chain of agriculture (dairy, vegetable and fruit) alone accounts for 22% of GHGs emissions (Papargyropoulou *et al.*, 2014). Food waste also implies a loss of natural resources because land and fossil fuels are used in the manufacturing and processing of the food (Kummu *et al.*, 2012). Furthermore, literature suggests more than a quarter of total fresh water is used in the preparation of food (Gunders, 2012). In the US, use of oil for food production accounts for around 4% of total oil consumption, while around 2% of energy consumption is wasted annually because of food waste (Cuellar and Webber, 2010). Food waste also adversely influences the ecosystem, impacting on the health of animals and plants. Therefore, a reduction in food waste can mitigate its impacts on the environment. Some studies even suggest that a reduction in global food waste can have a favorable effect on anthropogenic climate change (Priefer *et al.*, 2016; Thyberg and Tonjes, 2016). While food production cannot be stopped, it should be controlled in such a way that it results into lesser food waste such that its adverse consequences on the environment and biodiversity are mitigated (Gjerris and Gaiani, 2013).

The economic impacts of food waste are also well documented. Wasting food equates to wasting disposable income. According to the Food and Agricultural Organisation, the monetary value of global food waste is estimated to be around USD 750bn annually (FAO, 2014; Parizeau *et al.*, 2015). Estimates suggest that a household of four individuals on average wastes between USD 1,350 to USD 2,275 of food annually (NRDC, 2012). In the UK, avoidable food wastes amount to £480 yearly per household, representing around 15% of their total expenses on food (WRAP, 2009), while in the US food waste is equivalent to around \$936 per household (Buzby and Hyman, 2012). In China, food that gets wasted is valued at \$32bn (Lipinski *et al.*, 2013). The monetary value of food waste also represents a missed investment opportunity for every household and impacts on their well-being. A proper food waste management system is likely to prevent monetary loss for households and allow them to make better investment choices (Papargyropoulou *et al.*, 2014).

2.2 Attitudinal and behavioral aspects of food waste

Food waste has an important attitudinal and behavioral dimension (Thyberg and Tonjes, 2016; Evans *et al.*, 2012). Although food waste is mainly influenced by an individual's characteristics, many external factors contribute to it (Graham-Rowe *et al.*, 2014). Some consumers perceive that they do not produce a lot of food waste or that they produce less than others (Qi and Roe, 2016). While wasting food is generally considered an improper behavior (Porpino *et al.*, 2015), most households are concerned about food being wasted, although wasting food is often a conscious act (Evans, 2011a). Environmentalists consider the act of wasting food as "bad" or "wrong" (Melbye *et al.*, 2017; Graham-Rowe *et al.*, 2014). Emotions such as "frustration", "annoyance" (Graham-Rowe *et al.*, 2014), "disgust" (Waite and Phillips, 2016), "anxiety" (Evans, 2011a; Graham-Rowe *et al.*, 2014) and "guilt" (Grandhi and Appaiah Singh, 2016; Pearson and Perera, 2018; Qi and Roe, 2016) are often associated with food waste. For some consumers, food composting and giving leftover foods to pets are ways to reduce their impacts on the environment (Graham-Rowe *et al.*, 2014).

Such emotions and environmental concerns can be used in interventions to reduce the amount of food waste households generate (Stancu *et al.*, 2016). However, although households

display the good intention to limit food waste, in reality, these may not translate into actual waste reduction behaviors (Graham-Rowe *et al.*, 2015; Visschers *et al.*, 2016), a phenomenon explained by the intention–behavior gap (Boulstridge and Carrigan, 2000; Vermeir and Verbeke, 2006). Households may not have the necessary facilities to dispose food waste or may not have full control over food wastage. For example, if not all household members engage in food reduction behaviors, this poses some challenges for reducing food waste (Graham-Rowe *et al.*, 2015). Even if individuals are made aware of the benefits of reducing food waste, they generally perceive that enough is being done and no personal efforts are required (Lyndhurst, 2007). People generally have a laid-back attitude to food waste reduction efforts and for various reasons, they are unwilling to shoulder the responsibility of reducing food waste (Hebrok and Boks, 2017; Lyndhurst, 2007). Furthermore, since quantifying food waste is difficult for many individuals, they cannot attribute a monetary value to discarded food, and consequently, they are reluctant to take remedial actions to reduce food waste. Wasting food is also an unconscious act for many individuals.

The theory of planned behavior (Ajzen, 1991) provides some theoretical insights on households' food waste reduction behaviors. Accordingly, an individual's attitudes toward reducing food waste, subjective norms and perceived behavioral control over waste reduction behaviors have been found to have a positive influence on food waste reduction behaviors (Graham-Rowe *et al.*, 2015). The social practice theory provides additional insights into food waste behaviors (e.g. Lazell, 2016; Leray *et al.*, 2016; Ganglbauer *et al.*, 2013; Watson and Meah, 2012). The theory explains human behavior by offering alternative explanations that goes beyond psychological factors (Reckwitz, 2002; Schatzki *et al.*, 2001, 2002). It is post-humanist in approach, focusing on social practices, rather than individuals and their behaviors (Maller, 2012). Therefore, the theory considers that food waste is not an individualistic problem, but is a social problem, shaped by practice and the social context (Evans, 2011b). Social concerns such as the number of people dying because of hunger and famine make individuals more conscious about food wastage (Pearson and Perera, 2018; Blichfeldt *et al.*, 2015). Households who have control over food waste become more conscious and as a result are more likely to engage in food waste reduction strategies (Stancu *et al.*, 2016; Visschers *et al.*, 2016).

2.3 Food waste in small islands

SIDS, on average, generate around 1.26 kg solid waste per capital daily, although there are some marked differences between them. For example, while the Pacific SIDS generate around 0.92 kg/daily/per capita, SIDS located in the India Ocean, Mediterranean and South China Sea produce 1.27 kg of waste per capita on a daily basis (Kaza *et al.*, 2018). In most islands, dumping and uncontrolled waste are the most common forms of waste management, while the backyard burning of waste is also prevalent in some SIDS (Kowlesser, 2020). Like any other islands, the management of solid waste in Mauritius poses significant challenges for the government due to the smallness, environmental vulnerability and insularity of the island. Limited financial and technical resources perpetuate the problems of food waste management (Kowlesser, 2020). Rapid urbanization and the development of service sectors such as tourism have increased the amount of solid waste.

With a population of around 1.3m inhabitants, Mauritius generates around 1,488 tons of waste daily, resulting in over 500,000 tons of waste in 2018. The total amount of solid waste landfilled at Mare Chicose increased by 8.4% from 444,695 tonnes in 2016 to 482,196 tonnes in 2017. Domestic waste constitutes around 96% of total solid waste (Statistics Mauritius, 2018), out of which 27% represents food waste (Ministry of Environment, 2020). Statistics Mauritius (2018) further estimates that methane increased from 49.94 thousand tonnes in 2014 to 55.34 thousand tons in 2017. Mare Chicose, the only landfill site in Mauritius, has been operational since 1997. Although the site was due to reach saturation by mid-2018, with engineering

works its lifespan has been increased until mid-2020. Recently, the Mauritian government has embarked on a project to expand the capacity of Mare Chicose; however, the lifespan and the carrying capacity of the site are yet to be determined (Kowlessar, 2020). The government has also initiated a number of waste minimization programs that include home composting, regulations and market-based incentives such as deposit-refund mechanism for glass bottles. Nevertheless, a number of challenges remain to be addressed before a comprehensive solid waste management strategy can be developed (Kowlessar, 2020).

3. Research methodology

This study uses a grounded theory approach to identify thematic categories that would help identify and understand participants' attitudes toward food waste as well as the barriers they face to food waste reduction. A "theme" captures important information in the data that helps to elucidate the research question (Braun and Clarke, 2006). Grounded theory provides a holistic view of the research phenomenon and is based on the philosophy of naturalistic inquiry and an inductive approach to data analysis. In so doing, grounded theory sets out to discover new theoretical insights and innovations and avoids traditional logical deductive reasoning (Connell and Lowe, 1997) and is considered to be "emergent explicit" (Martin and Woodside, 2008).

The sampling process in a grounded theory research is not based on samples of specific groups and units of time but on concepts, properties, dimensions and characteristics (Nunkoo and Ramkissoon, 2016). Given that in a grounded theory study samples of events and incidents involving action or interaction relevant to the research purpose are required (Whitehead and Whitehead, 2016), we sought participants who are familiar with food waste at the household level or professionally. Thus, we used a purposive sampling technique to guide the selection of participants, which allowed us to use judgment to select participants who will best answer the research questions of the study (Saunders *et al.*, 2009). Interviews were conducted with 14 participants: three experts in food waste and 11 households. Interviews with the experts allowed the researchers to gain better insights into the current household food waste problems in Mauritius and the challenges and opportunities of food waste management. The interviews with members of the household provided insights on their attitudes to food waste and the barriers and motivations to food recycling.

We followed the established interview protocols for qualitative research (https://sociology.fas.harvard.edu/files/sociology/files/interview_strategies.pdf). All questions were open-ended and were developed considering the broad purpose of the study and the existing literature on the topic. The interview questions focused on participants' general background, their knowledge and understanding of food waste; the feelings and emotions they experience toward food waste; their involvement in food waste recycling strategies and the challenges they face to recycle food waste. Questions were formulated in such a way that it allowed the participants to tell their stories in their own terms and words. As the interview progressed, new questions were added to the interview schedule where necessary (Saunders *et al.*, 2009). Theoretical saturation was reached with the 14th interview. Additional interviews did not provide new ideas on the thematic concepts (Charmaz, 2006; Glaser and Strauss, 2008). Table 1 provides the profile of the interview participants. Interviews were tape recorded with the permission of the participants and were transcribed soon after.

3.1 Data analysis and interpretation

We analyzed the data manually using the data analytical procedures of grounded theory (Strauss and Corbin, 1990, 1998). Manual coding and analysis of interview data are considered to be suitable for small-scale qualitative studies and produce rigorous and reliable

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Code	Stakeholder group	Organization	Age	Gender
P1	Public sector - Academia	University of Mauritius	50	Male
P2	Private sector organization	Business Mauritius	45	Male
P3	Public sector	Waste Treatment Plant	30	Male

Household Participants Interview

Code	Household Size	Age	Gender
P4	Household Couple + 2 kids	39	Female
P5	Household Couple	30	Female
P6	Household Couple	40	Male
P7	Household Couple + 3 kids	70	Female
P8	Household Couple + 2 kids	38	Female
P9	Household Single	35	Male
P10	Household Couple + 2 kids	32	Male
P11	Household Couple + 1 infant	32	Female
P12	Household Single	30	Female
P13	Household Couple + 1 infant	36	Female
P14	Household Couple + 2 kids	47	Female

Table 1. Interview participants

findings (Wolff *et al.*, 2019). First, we read the transcripts several times to have a broad understanding of the data and identified and noted any interesting trends that were evident. Second, we coded the data to isolate significant incidents, events, issues, processes and relationships using the coding process recommended by Strauss and Corbin (1990). We used the open coding process to break down, examine, compare, conceptualize and categorize the data (Strauss and Corbin, 1990). Line-by-line coding, which is a method of conducting open coding, was used to analyze the data. The purpose of line-by-line coding is to develop concepts, categories and properties. The researchers reread the transcripts several times to understand the data and broke them down into manageable forms. This process was important because it helped identify the equivalent meanings our participants attributed to food waste. As new perspectives emerged, the initial codes were continuously refined and altered where necessary. Table 2 illustrates the open coding process in practice. The first

Verbatim from transcripts	Initial codes (open-coding)	Label (axial coding)
<p>“Many children across the world and especially in Africa die of hunger and whenever I am wasting food, I remember those hungry children and feel bad about wasting food”; “I have two infants and I am always over preparing food for them to ensure that they eat enough, however, I have a feeling of guilt after every meal as I end up throwing most food and being not able to do much, I end up parking my guilt aside”; “As a child my grandfather used to tell me that wasting food was not good and he used to relate instances of how he went hungry due to lack of food in their household many times. I grew up with this in mind and was just in-built in me not to waste food”</p>	<p>hungry children; throwing away food; grandfather went hungry; feeling bad about wasting food; feeling guilty; over preparation of food; throwing food consciously; parking guilt aside; wasting food not good</p>	<p>Guilt toward food waste</p>

Table 2. The coding process in practice (a sample)

column presents the raw data extracted from the transcripts; the second column shows the initial codes developed from the raw data using a line-by-line coding process.

After this process, axial coding was used, where the researchers made connection between concepts derived from the initial coding process. Axial coding attempts to relate a category and its subcategories (Corbin and Strauss, 1990). This involved comparing the data and grouping similar incidents together into the same conceptual label – process referred to as categorizing (Dey, 1999). These labels were simultaneously organized in order of priority and importance. Following Strauss and Corbin (1998), we used selective coding to show the interlinkages between the core categories. For example, initial codes derived from the line-by-line coding process such as “hungry children”; “throwing away food”; “grandfather went hungry”; “feeling bad about wasting food”; “feeling guilty”; “over preparation of food”; “throwing food consciously”; “parking guilt aside”; and “wasting food not good” were grouped together and given the conceptual label *guilt toward food waste* (third column of Table 2). Table 3 shows the development of themes from the initial codes. A total of 101 initial codes were identified from the data, and these were grouped into 10 conceptual labels. For example, 14 initial codes defined the label *guilt toward food waste* and 17 initial codes defined the label *lack of (environmental awareness)*.

Throughout the data analysis process, we adopted the constant comparison principle (Glaser and Strauss, 2008). Unique and emerging perspectives were compared to existing categories to expand their core meanings. Participants’ expressed views on food waste

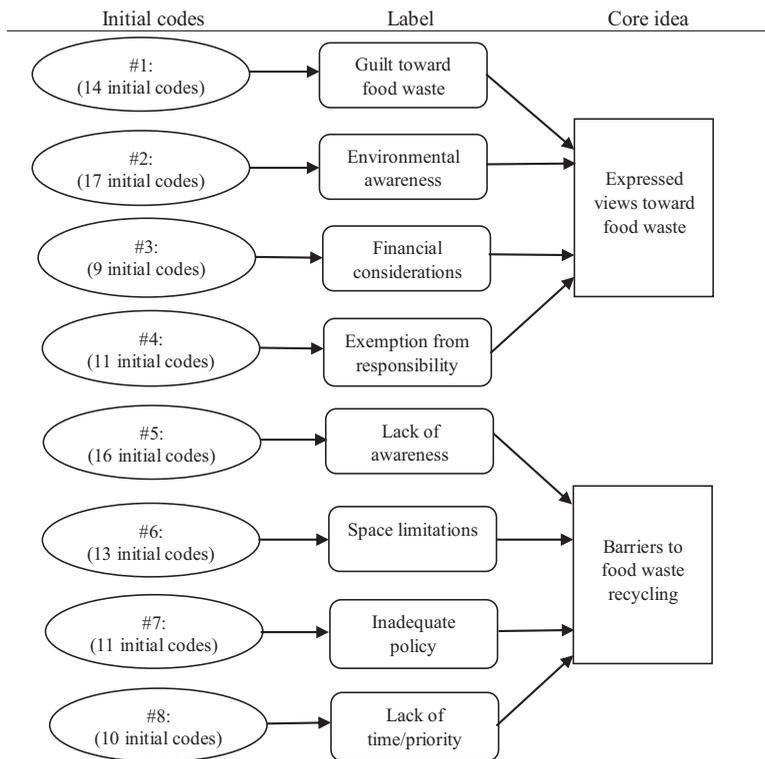


Table 3.
Development of theme

included (1) guilt toward wasting food; (2) (lack of) environmental awareness; (3) financial considerations and (4) exemption from responsibility. The findings also led to the development of four themes that defined the barriers participants face to recycling food waste: (1) lack of awareness; (2) space limitations on recycling methods; (3) inadequate policy and (4) lack of time/priority.

4. Results

4.1 Views on food waste

Guilt toward food waste: Participants expressed a strong feeling of guilt toward wasting food, irrespective of their financial and social conditions. Interpretive codes such as “hungry children,” “throwing away food,” “grandfather went hungry,” “unable to do much” and “religion” were used by participants to describe their guilt toward wasting food. Participant 14 (female; 47 years) explained that:

Many children across the world and especially in Africa die of hunger and whenever I am wasting food, I remember those hungry children and feel bad about wasting food.

Participant 8 (female; 38 years) who is also a mother of two children noted that:

I have two infants and I am always overpreparing food for them to ensure that they eat enough, however, I have a feeling of guilt after every meal as I end up throwing most food and being not able to do much, I end up parking my guilt aside.

For participant 13 (female; 36 years), her previous generation has played an important role in shaping her attitudes toward food waste:

As a child my grandfather used to tell me that wasting food was not good and he used to relate instances of how he went hungry due to lack of food in their household many times. I grew up with this in mind and was just in-built in me not to waste food.

For participant 5 (female; 30 years), religion was the main reason for not wasting food as she argued:

My religion forbids me to waste food, hence I am always trying ways and means to convert food or even food wastes so that they do not end up in the dustbin.

(Lack of) environmental awareness: Some participants showed a lack of awareness about the environmental consequences of food waste, believing that food waste does not damage the ecosystem but only fill up space in the landfill. They used interpretive codes such as “naturally rots,” “decomposes,” “heat waves,” “no ill effects” and “compost in back yard” to express their feelings toward the impacts of food waste on the environment. The ignorance of the environmental consequences of food waste is illustrated by participant 13 (female; 36 years):

... but food waste is degradable, therefore it will simply rot in our landfill.

Those participants who expressed concerns about the environmental impacts of food waste displayed a good awareness of climate change and related environmental issues. For example, participant 14 (female; 47 years), noted that:

We can feel the climate change in Mauritius and we hear in many countries such as India where people are dying due to heat waves. . . , I try to contribute to the environment my composting my food wastes and my entire family have got used to this and way of disposing their food when needed.

There was a unanimous agreement among the expert participants about the damaging environmental consequences of food waste. Participant 2 (male; 45 years), a representative of

Business Mauritius which is an independent association that represents local businesses, noted that

Food waste contributes to our greenhouse gas emission and this truth is not known to many.

Participant 3 (male; 30 years), from the Waste Management Authority, described the environmental benefits of recycling food and the lack of awareness among households:

We have noticed that people are so used to wasting food that they do not realize the quantity they waste daily. Worst of all they are unaware of the environmental benefits it may offer by reusing or recycling food waste apart from increasing the landfills capacity.

Financial considerations: The desire to save money was a motivator for many households to reduce food waste. Codes such as “save on plastic bags,” “do not have to buy compost,” “compost bin is expensive,” “money going down the drain” and “careful about food habits due to unemployment” were used to describe the financial motivations to reduce food waste. For many participants, “throwing food” is equivalent to “throwing money” as participant 6 (male; 40 years) described:

... when I throw food, I see my money going down the drain.

The act of wasting food was associated with strong emotions for some participants:

You know life is getting harder, everything is getting more expensive and wasting food really annoys me, especially when I see my kid throwing food away which was hard earned (Participant 12; female; 30 years).

While some participants considered that food waste represents a monetary loss, other associated food recycling with financial gains. As participant 11 (female; 32 years) noted:

I save on plastic bags for waste when I compost my food and then the compost is used in my house garden. That way I do not even have to buy compost for my plants. This is a good reason for me not to waste food in the house.

Participant 4 (female; 39 years), a mother with two kids and whose husband recently left his job because of health issues, had to change her shopping and cooking habits because of lower disposal income:

My husband recently had to leave his job due to his ill health, this has made us be more careful about our food shopping and eating habits in general and we also waste less food as we know we do not have much options.

Exemption from responsibility: Household interviews provided several reasons to exempt themselves from the responsibility of generating and managing food waste. Interpretive codes such as “sale of goods in supermarket close to expiry,” “buying products in bigger packaging” “promotions” and “spoilt products sold in supermarkets” were used to explain that supermarkets produce a considerable amount of waste. For example, participant 10 (male; 32 years) explained that:

There was sale on biscuits the other day and we bought our quota for 2 months. Next when I opened them, they were all stale and it went directly into the dustbin...you know it only costed me Rupees 108.

Participant 14 (female; 47 years):

I love drinking this “pomegranate” packet juice and unfortunately I am the only one who drinks this in the house. How much will I also drink so I just throw the rest away.

Participant 12 (female; 30 years):

I must admit that promotions make me buy a lot of foodstuffs in quantities I do not require. I bought extra packets of pasta as they were on sale and I must admit I had to throw them last week as they were infested.

4.2 Barriers to food waste recycling

Space constraints: Our findings suggest space constraints as a major barrier to the adoption of food waste recycling by our participants, especially for those living in apartments. Interpretive codes such as “no space,” “live in apartment,” “small area” and “syndicate [management] not agreeable” were used by the participants to describe the barriers they face to home composting. For example, participant 8 (female; 38 years) noted:

I am currently living in an apartment and there is not much space for waste recycling, however, I am planning to have a compost bin in my new house.

For participant 11 (female; 32 years):

Space limitation is an issue with the apartment I am staying, it is already small for my family ... but the syndicate as well refused due to fear of rodents and smell among others.

Participant 12 (female; 30 years):

Living in an apartment makes it difficult to have a food waste recycling system, however, if the municipality could organize for source separation pickups and the government works on strategies to recycle food waste it would have been beneficial to us all.

Lack of awareness about food waste recycling: Interviewees displayed a lack of awareness on food waste recycling/composting, not knowing how best to dispose food waste. “Not aware how to dispose food waste,” “food waste rot,” “do not get good compost,” “not aware of additional ways to compost” and “never thought about it” were interpretive codes used by the participants to describe their lack of awareness of food waste recycling.

Participants 14 (female; 47 years) noted that the recycling method she adopted was ineffective, suggesting a lack of awareness on the best ways to dispose food waste:

I tried to compost food waste in my yard, however, we were having issues with rodents, hence we stopped.

Participant 6 (male; 40 years):

There was a composting program launched by the municipalities, I had registered my name, but I was unable to get good compost and did not have adequate information about how composting is done, so the compost bin is simply lying in my backyard

Participant 7 (female; 70 years):

Left-over food and food peels are usually fed to our dogs or given to birds; the rest is thrown as I am not too sure what to do with them

Inadequate regulations and policy: The group of experts were unanimous in their opinion that there is inadequate regulatory framework and policies for managing food waste in Mauritius. Interpretive codes such as “no waste management policy,” “no strategies for sustainable island,” “government need to come up with a plan,” “sorting at source” and “composting plant closed down” were used to indicate their views. For example, participant 3 (male; 30 years), the representative of the waste management unit noted that:

I am still waiting for the waste management policy! We have no strategies in place about how to walk towards a sustainable island. Look at the composting plant at La Chaumière. It had to be closed down due to lack of strategic management planning. Everything was just dumped into the composting plant and no sorting was carried out. This kind of planning is bound to have a catastrophic ending.

Participant 2 (male; 45 years) from Business Mauritius expressed his concerns about the “sustainable island project” (Maurice Ile Durable) that was set up under the previous government. For him,

Maurice Ile Durable concept, I am not even too sure what happened to that. With the new government in place this project almost died a natural death. There is so much money still lying with the government on the food waste composting project. Nothing is being taken forward.

Participant 1 (male; 50 years) also noted:

Projects such as incinerator is being spoken about, but there is no concrete strategic plan about this whole project. At least I am not aware of those. A proper planning and a lot of work with creating awareness has to be actively carried out in the country to really attain a sustainable living.

Lack of time / priority: The interview findings revealed that reducing food waste at home was not a priority for many households. For some, they do not produce much food waste, and because of their daily activities, they do not pay attention to food waste. Others showed a clear lack of engagement with food waste management at the household level. Interpretive codes such as “no inclination,” “do not manage to make time,” “night shifts and household work,” “more important matters to attend to,” “have not made time,” “no ill effect” and “food waste natural” were used to identify reasons for lack of priority and time for composting food waste. Participant 8 (female; 38 years), a mother of two children noted that:

I have to wake up early to get my kids ready for kindergarten and between them and getting my husband’s lunch back and my own I do not really have much time when I am back from work. Thinking about it now, my life revolves around the kitchen whilst I am at home but I have really not bothered about the waste generated from my cooking of left over from the plate.

Some participants felt that generating food waste from their kitchen is a normal practice, and there is nothing alarming with that:

Everyone wastes food like me, at least the people I mingle with have not thought about food waste as an issue, I guess we are all too busy in our lives and have other more important matters to attend to! (Participant 12; female; 30 years)

Participant 13 (female; 36 years):

I do put my plastic waste in specific bins for recycling and even dispose of my batteries and light bulbs accordingly, but I have not heard of specific waste disposal for food. . . , I did not even think about it.

5. Discussion

Compared to other countries, the management of food waste in SIDS is constrained by space limitations (Owens *et al.*, 2011). Indeed, our participants highlighted that lack of space was barrier to food recycling, particularly for those living in apartment buildings. Lack of support for food waste recycling from the management of apartment buildings was also reported as a barrier to food waste recycling. Our participants reported a sense of guilt toward wasting food. Guilt demonstrates a feeling “annoyance” (Graham-Rowe *et al.*, 2014) and is a common emotion people display toward food waste (Russell *et al.*, 2017). The sense of guilt participants felt toward food waste was associated with famine and hunger prevailing in other countries, a finding also emphasized by Pearson and Perera (2018). Several studies show that emotions such as guilt and shame are linked to consumers’ intention to reduce food waste (Lyndhurst, 2007; Jagau and Vyrastekova, 2017; Mondéjar-Jiménez *et al.*, 2016; Qi and Roe, 2016; Principato *et al.*, 2015; Soorani and Ahmadvand, 2019). For example, in this study, we find

that participants' sense of guilt toward food waste was a motivation for them to provide the right quantity of food to their family. The feeling of guilt therefore can be used effectively in food waste reduction interventions (Qi and Roe, 2016).

Participants were ignorant about the environmental consequences of food waste, an attitude reported in other studies (Graham-Rowe *et al.*, 2014; Lyndhurst, 2007; Quested *et al.*, 2011). The general belief was that food waste decomposes naturally, and as a result, it does not harm the environment or causes pollution. Empirical evidence suggests that lack of knowledge on food waste influences behavior toward food waste (Farr-Wharton *et al.*, 2014). In reality, food waste is known to have several impacts on the environment and biodiversity (Chapagain and James, 2011). The Food and Agricultural Organisation (2012), for example, suggests that food waste consumes considerable land and forest resources. In addition, food waste releases gasses such as methane and carbon dioxide that have implications for climate change (Intergovernmental Panel on Climate Change, 2014). The Food and Agricultural Organisation quantifies the food wastage footprint on natural resources, most notably its carbon footprint which is estimated to be around 4.4 GtCO₂ eq. per year. The growing world population would require a further 60% increase in food production by 2025, resulting in more food waste, with implications for greenhouse gasses (FAO, 2014) and threat to food security (Gustavsson *et al.*, 2011).

Financial concerns emerged as an important motivator for reducing food waste among the participants. Previous studies suggest that individuals attribute food waste to monetary loss, and as a result, they are more inclined to curtail food waste (Amirudin and Gim, 2019; do Carmo Stangherlin and de Barcellos, 2018; Schanes *et al.*, 2018; Stancu *et al.*, 2016; Lyndhurst, 2007). However, financial concerns also emerged as a barrier to food waste recycling, with some participants stating that food composting systems are expensive, which prevented them from recycling food waste. It is important that households have easy access to food recycling and composting so as to encourage them to manage food waste sustainably (Barr, 2007). Exemption from responsibility emerged as another barrier to minimizing food waste. It was common among the participants to shift the blame to retail shops, a finding also revealed in previous studies. For example, Graham-Rowe *et al.* (2014) study on UK households found that participants considered that they wasted food because of their poor quality and held supermarkets responsible for the wastage. Bulk sales and near-to-expiry food sold at competitive prices encourage consumers to purchase more than they require, leading to wastage (Porpino *et al.*, 2015).

5.1 Recommendations

Addressing the problem of food waste requires a holistic approach that takes into account the attitudes of households to food waste, their motivation and barriers to food waste recycling as well as the regulatory and institutional framework governing food waste management in Mauritius. The lack of awareness among household members has to be addressed to reduce food waste. Thus, it is important for policymakers to improve households' knowledge about food waste. Active food waste campaigns should be initiated in collaboration with other stakeholders such as secondary schools, universities and work places so that large numbers of people can be targeted. Campaigns targeted at households should have the objective of improving their knowledge about the effects of food waste on the environment and broader socio-economic problems such as famine and hunger. Guilt can also be used as a tool to encourage them to reduce food waste (McCarthy and Liu, 2017; Graham-Rowe *et al.*, 2014). Furthermore, the monetary benefits of reducing food waste should be highlighted to households (Williams *et al.*, 2012).

The authorities can consider providing different types of bins to household freely to facilitate the sorting out of waste. The government can also impose a fee on household for

food waste generated beyond a certain limit and/or provide subsidies to them for handling food waste properly. Such financial instruments have been found effective in reducing food waste (Chalak *et al.*, 2016; Dahlen and Lagerkvist, 2010; Reisch *et al.*, 2013). For example, a “Pay-As-You-Throw (PAYT)” system has been employed by many countries such as Sweden, Canada, United States, Japan, Thailand, Taiwan, Vietnam, Korea and China (UNEP, 2014). The government should also strengthen the legal and institutional framework governing food waste in Mauritius. Strict laws, including waste reduction targets in countries, such as Belgium, Italy, France and Netherlands, and a national waste reduction strategy are required to deal with the long-term challenges of food waste.

6. Conclusion

Roughly, one-third of food produced worldwide are discarded, posing several environmental and socio-economic challenges (Porpino *et al.*, 2015). Identifying households’ views on food waste and their motivations for and barriers to food waste recycling is important for developing appropriate interventions that promote sustainability in the food chain process. This paper investigates the attitudes of households toward food waste and food waste recycling. It relies on in-depth interviews with fourteen household participants and three experts in food waste management. The data were analyzed using a grounded theory approach. The findings suggest that participants have diverse and sometimes conflicting views on food waste and food waste recycling. Participants’ expressed views on food waste included (1) guilt toward wasting food; (2) (lack of) environmental awareness; (3) financial considerations and (4) exemption from responsibility. The findings also led to the development of four themes that defined the barriers participants face to recycling food waste: (1) lack of awareness; (2) space limitations on recycling methods; (3) inadequate policy and (4) lack of time/priority.

The study sheds some light on the problems of household food waste in Mauritius, and in so doing, it contributes to the limited studies on food waste management in SIDS. While some of our findings are not new to the literature, others such as space constraints and lack of regulations provide a unique angle to understanding the problems of household food waste in Mauritius. From this perspective therefore, the study makes a modest theoretical contribution to the literature as it takes into account place-based and geographically sensitive characteristics that can improve our appreciation of the problems of household food waste in SIDS (Parizeau *et al.*, 2015). However, the study is not without limitations.

First, the research findings are specific to Mauritius and possibility to other SIDS. However, given the context-specific nature of food waste, our results may have limited relevance to other countries. To ensure that place-based characteristics are taken into account, future researchers can use subjective research methodologies to investigate household food waste in other countries. Insights revealed from such studies may advance our theoretical understanding of the social and geographical context of household food waste. Second, the subjectivities involved in any qualitative research in comparison to quantitative approaches mean that the results may have been influenced by our personal biases, values and our prior knowledge of the existing literature. It is important, therefore, that other researchers conduct similar studies to validate our themes and findings.

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