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Conceptualizing waste reduction potential by understanding consumers' behavioural intention

(Mengkonsepsikan potensi pengurangan sisa makanan menerusi pemahaman terhadap niat bertingkah laku pengguna)

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Abstract

Food wastage has become a global phenomenon. Statistics imply an estimated one-third of edible food meant for human consumption is thrown away globally. With growing recognition on the serious impact of food loss and waste (FLW), strategies to minimize and overcome the issue have become a core element of FLW policy and research. Recent years have witnessed the commitment by countries around the world, setting targets to achieve the 12.3 Sustainable Development Goal (SDG). Moreover, national governments or private sectors have in varying degrees recognized the need for FLW sustainable management and strategies. Although food waste occurs in each of the supply chain stages, private households were identified to contribute the highest amount of food waste. Yet, our knowledge on the household level's situation and practices remains limited. This conceptual paper intends to explore the potential antecedents that might impact the households' intention to reduce food waste by practicing sustainable food waste management. Besides that, this study also investigates the potential impacts from training interventions. Reviewing the existing literature to date, hypotheses are formulated to understand the relationships between psychosocial or behavioural factors and their associated intentions. The implications for managerial actions and future research avenues are discussed. Empirical support is needed for the proposed conceptual framework and is planned to be tested in urban households where wastage occurs more frequently and in huge amounts compared to their counterpart. This study will benefit the society, considering that the food waste issue directly affects the food security of nations if no action is taken to understand and mitigate them. The greater effectiveness of managing wastes at the source justifies the need to further understand household behaviours pertaining to the issue. Thus, policy makers will be guided on emphasizing relevant efforts or programs to improve the household's intention to practice sustainable food waste management. Furthermore, the present study will contribute to the existing literature by expanding the understanding of consumers' behavioural intention to curb food waste in a new country setting, Malaysia which represents a developing country facing a critical food waste level on a daily basis.

Introduction

Food losses and waste occur in different stages including harvesting, threshing, drying, storage, processing, packaging, marketing, post-consumer and end of life, with each stage producing different waste examples and loss characteristics. FAO (2014) defines food waste as food suitable

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for consumption commonly discarded at retail and consumption stages. Many researchers and published reports provide various definitions (*Table 1*) in their studies regarding food waste. One includes over-nutrition that is the gap between the energy value of consumed food per capita and the energy value of food needed per capita (Smil 2004). Food waste is considered to be part of the municipal solid waste (MSW) which is any substances or scrap materials the holder discards or intends to discard within the area of municipal (Abas and Wee 2014). It refers to the decrease in the quantity or quality of food resulting from decisions and actions made by retailers, food service providers and consumers (FAO 2017); focuses generally on avoidable food waste, including initially edible food that turns bad or rotten, no longer safe or appetizing to eat (Pearson and Amarakoon 2019).

Indeed, food waste occurs at various points within the supply chain, but it is most readily identified at the retail and consumer levels, where agricultural system outputs are edible for human consumption (Parfitt et al. 2010). Slorach et al. (2020) provided a

Table 1. Definitions of food waste in the literature

Publication Year	Author(s)	Definition(s)
1981	FAO	Food waste: '... wholesome edible material intended for human consumption, arriving at any point in the FSC (food supply chain) that is instead discarded, lost, degraded or consumed by pests'.
2004	Smil	Food waste: As defined by FAO (1981) and '... including over nutrition – the gap between the energy value of consumed food per capita and the energy value of food needed per capita'.
2014	Abas and Wee	Food waste is considered to be part of the municipal solid waste (MSW) which are any substances or scrap materials the holder discards or intends to discard within the area of municipal.
2010	Parfitt, Barthel and MacNaughton	Food waste occurs at various points within the supply chain, but it is most readily identified at the retail and consumer levels where agricultural system outputs are edible for human consumption.
2016	Thyberg and Tonjes	Food waste: food which is initially meant to be consumed safely by people but later discarded or is not eaten. It includes food that becomes damaged or rotten prior to disposal and food that is still edible when thrown away.
2017	FAO	Food waste refers to the decrease in the quantity or quality of food resulting from decisions and actions made by retailers, food service providers and consumers.
2019	Pearson and Amarakoon	Food waste: '… focuses generally on avoidable food waste, i.e. initially edible food that turns bad or rotten, no longer safe or appetizing to eat'.
2020	Slorach, Jeswani, Harish and Adisa	Food waste classification was done in three groups: avoidable means food suitable for human consumption; possibly avoidable refers to edible food, depending on consumer preferences like potato skin; and unavoidable which is the inedible parts of food.

graph that showed the amount of household food waste generated in the United Kingdom for 9 years. The classification is done in three groups: avoidable means food suitable for human consumption; possibly avoidable refers to edible food, depending on consumer preferences like potato skin; and unavoidable which is the inedible parts of food. Based on the graph, it appears that avoidable food waste is the highest contributor to the total household food waste. The definition most relevant to the current study is food which is initially meant to be consumed safely by people but later discarded or is not eaten. It includes food that becomes damaged or rotten prior to disposal and food that is still edible when thrown away (Thyberg and Tonjes 2016). Examples include plate scrapings, poor storage or stock management in homes, poor food preparation techniques, or confusion over expiry dates, resulting in edible food being discarded.

While more than one-third of wastes in high-income countries is recovered through recycling and composting, only 4 percent of waste in low-income countries is recycled or composted (Kaza et al. 2018). Most of the food waste from the household food preparation can actually be recycled by using it as organic fertilizer or for replanting, such as chilli seeds along with many other types of vegetables. If households can replant crops at home, then food waste may be reduced, simultaneously reducing the cost of their food expenditure. Besides that, the United Nations projected that by 2050, 68% of the world population will live in urban areas (UN DESA 2018). The food waste generated by the urban population can be composted as organic fertilizers to be utilized in urban agricultural activities, benefitting the environment and increasing the society's economic conditions.

Statistics by the Solid Waste Management and Public Cleansing Corporation (SWCorp) shows that Malaysians contribute more than 16,000 tonnes of food waste daily, which is enough to feed 12 million people three meals a day, indicating how serious the waste situation is in Malaysia (Sharif n.d.). This is about 25% of food being wasted by household during their food preparation, which is about RM225 from the RM900 average monthly food expenditure (SWCorp 2015). In Malaysia, the urban population has become the major contributor to more than 70 percent of the total waste generated. Different income groups contribute different proportion of food waste in Malaysia, and this might be related to their knowledge and awareness on food waste management. Surprisingly, Badgie et al. (2012) found that Malaysia's low-income group (about 54%) was the higher food waste contributor as compared to the middle-income group (26%) and high-income group (21%). Different income groups appear to have different food waste management practices possibly associated to the groups' lower level of knowledge and awareness. A more recent study revealed that to understand the implications of food waste, they need to be informed or taught (Jarjusey and Norshamliza 2017). A training module or any intervention specifically addressing this issue could bring about the needed change.

Even though the government has taken many initiatives to increase the societal awareness to reduce food waste in urban areas, for instance the MySaveFood campaign, the impact of this campaign on food waste reduction has not been determined. According to Jarjusey and Norshamliza (2017), the awareness from information given out by campaigns to reduce food waste through mass media like television or other platforms has received very little positive responses. Moreover, the study showed that most of the consumers responded as not being aware of any campaigns organized by the government to curb this wastage threat. Around 57.1% of the respondents in Selangor did not know how to manage their food waste. The respondents' limited knowledge could lead to a higher amount of food waste. For

example, 57% of the respondents were confused about the terms 'best before' and 'use by' dates of food products (Jarjusey and Norshamliza 2017). Often times, they discard food that can still be consumed due to the confusion of these dates on the products. In a nutshell, Malaysians still require more efforts to reduce its food waste, especially in urban areas. In fact, the increasing food waste culture among the urban population is a warning to the government as well as society towards food sovereignty, especially during this crucial time when the COVID-19 pandemic is impacting the global food systems, disrupting regional agricultural value chains, and posing risks to household food security. Therefore, it is more important now than ever to increase the household's awareness and knowledge which can be the stepping stone towards sustainable food waste management.

The relationship between the households' intention to reduce food waste by practising sustainable food waste management and these six factors from the literature on their perceived importance; training intervention, knowledge, awareness, attitude, subjective norms and perceived behavioural control, has not yet been clarified. Therefore, the factor that correlates stronger to their behavioural intention is unclear. Against this background, this study attempts to address this gap by proposing a conceptual framework that incorporates all of these factors into one model.

The framework will outline the main objective of this study which is to explore the factors contributing towards the consumer's intention to reduce food waste via sustainable waste management practices, as well as the potential impact of training. It would be beneficial to find out whether the above factors would give the urban households an internal drive to engage in sustainable practices to reduce food waste. Besides that, this study also aims to examine the impact of knowledge gained from the hands-on training related to the ways of managing their daily household waste. The benefits will be in terms of quantity reduction of waste being sent to landfills, eventually contributing towards reducing greenhouse gas emissions.

In line with the research objectives, this paper will specifically seek to answer the following research questions:

i) Is there any difference in the food waste management or practices between households with different income group categories?
ii) Is there any difference in the households' awareness level on food waste management between different income groups?
iii) Is there any difference in the households' knowledge regarding sustainable waste management between different income groups?
iv) Do demographic variables affect households' intention to reduce food waste?
v) Does attitude influence households' intention to reduce food waste?
vi) Do subjective norms influence households' intention to practise sustainable waste management?
vii) Does perceived behavioural control influence households' intention to reduce food waste?
viii) Is there any difference in households' awareness of sustainable waste management practices before and after the intervention training workshop?
ix) Is there any difference in households' knowledge of sustainable waste management practices before and after the intervention training workshop?
x) Is there any difference in households' intention to reduce waste before and after the intervention training workshop?
xi) Does household income moderate the relationship?

It is necessary to answer the above questions because households all around the world can make a huge difference in changing the

landscape of the waste hierarchy currently being practiced that is not sustainable for the future. Starting by reviewing one of the most cited theory of behavioural intention, followed by understanding current public awareness and knowledge will provide a strong platform. Besides that, income can be a crucial factor distinguishing lifestyle differences and decision making in food management. Furthermore, interventions done right may pose a positive impact. The next section would further discuss the relevant literature pertaining to the study.

Literature review and hypotheses formulation

Consumer food wastage is a complex issue. Previous studies on food waste and waste management have been summarized within reviews and reports (Parfitt et al. 2010; Aschemann-Witzel et al. 2015; Thyberg and Tonjes 2016; Schanes et al. 2018; Reynolds et al. 2019), detailing the food waste examples along the supply chain, measurement and quantification, drivers of food waste, household food waste practices, and food waste reduction interventions. More recent studies have determined the social factors affecting waste separation behaviour (Knickmeyer 2020), providing recommendations and good practices to prevent food waste (Bravi et al. 2020; Knickmeyer 2020), and analysing food consumption patterns namely storage practices (Davenport et al. 2019), reuse of leftovers (Leverenz et al. 2019) planning and checking (Amirudin and Gim 2019). This study complements these studies by looking at how conducted hands-on and educational-based training may provide an impact. Another point of research proposed to be investigated is on the household income category that is expected to differ in their practices of waste reduction. The breakdown of the research questions to be answered offers insights into how the level of household income differently affects the behaviour regarding food waste management. In other words, for an enhanced understanding, the current study includes additional variables of income and training intervention into the model.

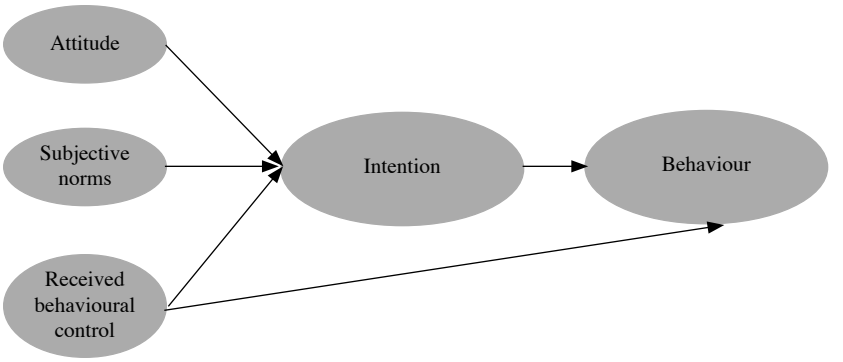
Studies investigating the habits or activities of food preparation and food waste in households offer a more in-depth image of consumer attitudes and perceptions, both in terms of the motivations influencing them and their actions. Consumers do not waste food simply and carelessly, but the socially-determined practices in food and eating, and the contextual factors in which food habits are embedded that impact the consumer's food wastage (Evans 2011). Meah and Watson (2013) found that consumers did not explicitly mention their purpose of protecting the environment, but at the same time, they had an internal drive of ethical motivation to do the right thing for the environment. Consumers often display motivations that offset practices in avoiding food waste. For example, consumers often understand the frustration associated with eliminating food waste and they have the urge to be a good family provider by ensuring that the needs and preferences of all family members are satisfied, possibly at the expense of over-cooking, encouraging pickiness and throwing unwanted leftovers (Graham-Rowe et al. 2014).

Drivers of food waste avoidance include economic constraints, and price orientation traditionally and to a renewed extent, during household financial crisis as faced by the majority today. These drivers might also motivate alternative behaviours, such as the 3R (reduce, reuse, recycle), sharing, gardening or replanting, composting or new developments like "freeganism" (Pentina and Amos 2011) or "dumpster diving" (Nguyen et al. 2014). These alternative behaviours go beyond mere financial considerations, and that the food waste avoidance practices might be part of a lifestyle and a consumer's identity. In other words, consumers might be proud of themselves for being a thrifty household, food manager or a well-organized shopper, attempting to produce new meals from

leftovers or serving the community through participation in programs and networks related to food waste reduction.

Karak et al. (2012) gave a clear composition of municipal solid waste (MSW) in Southeast Asia. The usual physical composition of MSW in Indonesia includes organic matters that may be composted. More than half of MSW composition in Malaysia and Laos includes organic and biodegradable matters. Organic waste accounts for the largest part of Vietnam's MSW composition. Cambodia deals with 66.3% of kitchen waste, garden waste, wood, coconut shells and bones while small countries like Brunei and Singapore also produce 44% of organic waste. Developing countries generate higher organic contents of MSW than European countries where they are mostly composted. Composting is a biological process that converts organic wastes into value-added products that can be used to improve the quality of soil, minimise erosion and promote growth of plants (Adugna 2016). Composting is a waste management practice that allows the transformation of organic waste into a stabilized product. However, while more than one-third of waste in high-income countries is recovered through recycling and composting, only 4 percent of waste in low-income countries is recycled or composted (Kaza et al. 2018). Lim et al. (2019) have emphasized the importance of using home composting as an alternative for waste management in small municipalities. Their case study of a community in Johor Bharu, Malaysia showed a reduction of 27% of GHG when the diversion of food and vegetable waste was made from open dumping to a composting plant. The compost is full of nutrients, and it can be used to fertilize soil, thus completing the recycle process. This makes composting a more environmentally-friendly option than burying food waste in landfills.

As households contribute the most to the overall food waste, several past researches have aimed to investigate perceptions and behaviours of consumers and households related to food waste (e.g. Abeliotis, Lasaridi and Chroni 2014; Evans 2011; Graham-Rowe et al. 2014; Quested et al. 2013; Stefan et al. 2013). According to Van der Werf et al. (2020), the Theory of Planned Behaviour (TPB) model is a well-known and effective framework at measuring food wasting intention. The TPB explains behaviour using four constructs which will be explained further in the next section. The central factor claimed to determine an individual's behaviour is one's intention to do a particular behaviour, that is their motivation and willingness to behave (Ajzen 1991).



Source: Ajzen (1991)

Figure 1. Theory of Planned Behaviour

Intention to reduce food waste based on the TPB

Graham-Rowe et al. (2015) conducted surveys in households in the United Kingdom, and found that using TPB with additional constructs was able to explain more than half of the variance in intention to reduce food waste, particularly fruit and vegetable waste, with the following predictors: attitude, subjective norms, perceived behavioural control, self-identity and anticipated regret. Evans et al. (2017) highlighted that food waste prevention was initiated by the personal responsibility of individual consumers. A more recent study by Schanes et al. (2018) stated that the understanding of household food wasting behaviours was still inadequate and that the current predominant approaches to better understand these behaviours include social practice theory and psychology-related approaches. Behavioural models, for instance the Theory of Planned Behaviour (TPB) (Ajzen 1991) are proving to be an effective conceptual framework to examine food wastage behaviours (van der Werf et al. 2020).

Attitude

Firstly, the consumers or households' attitudes must be in favour of the behaviour (Fishbein and Ajzen 2005). Assessment of attitude is important in terms of perception, intention, participation, behaviour or action. In the study conducted by Zhang, Fukuda and Liu (2019), positive attitudes do significantly influence people's pro-environmental behaviour. It has been acknowledged that consumers actually feel bad about throwing away food and seem to be against it, showing a negative attitude towards food waste (Qi and Roe 2016; Watson and Meah 2012). Moreover, they were concerned about throwing food especially avoidable ones (Abeliotis et al., 2014; Graham-Rowe et al. 2014). Stefan et al. (2013) conducted a survey among Romanians, and identified moral attitude to have a significant positive impact while a lacking concern attitude had a negative impact on consumer's intention to food waste.

Besides attitude, literature has also identified specific attitudes towards the environment, financial concerns, as well as health concerns (Visschers et al. 2016). One of the financial concerns raised in the literature is due to over-purchasing, which is one of the motivational factors for food waste reduction (Graham-Rowe et al. 2014; Quested et al. 2013). Likewise, price-conscious people tend to waste less food (Williams et al. 2012). Consumers indicate that they feel more worried about the financial consequences of food waste rather than the environmental impact (Parizeau et al. 2015; Principato et al. 2015). Concerns regarding environmental issues arising from food waste seem to have lesser influence and little effect on food waste (Quested et al. 2013; Watson and Meah 2012).

Another element of attitude is related to health concerns which appear to have conflicting consequences. Eating a nutritious diet encourages the households to minimize their food waste. On the contrary, health-conscious consumers have asserted that they purchased a range of perishable food products for their household but later would not be consumed and finally needed to be thrown away (Evans 2011; Graham-Rowe et al. 2014). Furthermore, households placing more conditions on their decision to throw away food and avoid food contamination or other food-related risks were found to generate more wastage, for instance the condition they set on the use-by dates (Parizeau et al. 2015; Van Garde and Woodburn 1987). In fact, the preference towards avoiding health risks can reach a point where some people are even repelled by the idea of consuming such foods (Aschemann-Witzel et al. 2015). Gaiani et al. (2018) claimed to contribute innovatively to the literature by profiling types of attitude: the conscious-fussy type category, the conscious-forgetful type, the frugal consumer, and the exaggerated cook. This

allows the characterisation of consumers by grouping them according to similar behavioural attitudes.

In light of the discussion above, the following hypothesis is developed:

H1a: Attitude influences Malaysian households' intention to reduce food waste.

Secondly, in the established conceptual framework of TPB, the thoughts and opinions of other people are equally important, especially those who are really close and deemed important to the person making the decisions. Those people need to be in favour of the behaviour. These are referred to as subjective norms. Past research has focused on the impact of subjective norms on various behaviours. For example, the opinions of friends highly matter and they are a key behavioural antecedent of using social commerce (Shin 2013). Another study conducted by Sin et al. (2012) in Malaysia to examine factors that encouraged young consumers' online purchase intention also discovered that the actions, participation and experience in online buying using their social network to be one of the influencing factors. Furthermore, the drivers of subjective norms in using agricultural innovations, where the individuals and groups are found to influence farmers' decisions, were recommended to be used as a means to spread information about the innovation (Borges et al. 2014).

Previous analyses have shown that subjective norms are applicable for self-reported pro-environmental behaviour in the area of recycling (Matthies et al. 2012). More recently, Barone et al. (2019) conducted a study in Italy via a mixed method approach, resulting in subjective norms being significant predictors of intention to reduce food waste. However, the results may differ when taking into account the different situation, culture, or economic conditions in Malaysia. Interestingly, it was found that subjective norms affected pro-environmental behaviours among both Malay and Chinese ethnic groups (Ghazali et al. 2019). Thus, the hypothesis below is proposed:

H1b: Subjective norms influence Malaysian households' intention to practice sustainable food waste management.

Thirdly, individuals need to perceive control over the behaviour, recognized as the perceived behavioural control which is another important variable in the TPB. The individual should believe that he or she is capable with sufficient resources to perform the behaviour (Ajzen 1991). Perceived behavioural control also directly affects behaviour. This variable has a large indirect relationship to food waste behaviour through planning and shopping routines (Stefan et al. 2013) and through the intention to reduce food waste (Graham-Rowe et al. 2015). The household and individual food insecurity are also positively and significantly correlated with perceived behavioural control (Mckinney et al. 2015).

In order to adopt innovations in agriculture, perceived behavioural control influences individuals' intentions because it reflects any constraining or encouraging factors that may affect that behaviour (Borges et al. 2014). In contrasts, several past researches were found to not consider the role of perceived behavioural control (Martínez-García et al. 2013; Rehman et al. 2007) because these studies applied an earlier version of the TPB called the Theory of Reasoned Action. Another previous research managed to show some evidence that in the case of food waste behaviour, the perceived behavioural control could determine the behaviour through food-related routines and not intentions (Stefan et al. 2013). Perceived skills for planning meals are incorporated in the study conducted by Romani et al. (2018) whom showed that the skills potentially affected

various behavioural factors related to food waste. Hence, the following hypothesis is formulated:

H1c: Perceived behavioural control influences Malaysian households' intention to reduce food waste via sustainable food waste management.

Income differentiates household behaviour

The total number of households in Malaysia as reported by the Department of Statistics (DOS) Malaysia reaches 8.0 million (2019). The average household size is 4.0 person with an average income recipient of 1.8 people. Five out of 10 households receive RM5,228 per month or less. DOS further categorizes the Malaysian households into three groups based on their income. The top 20% (T20) group comprises 46.2% of income share with a mean monthly household income of RM16,088. The middle 40% (M40) group captures 37.4% income share, with RM6,502 mean household income. Meanwhile, the third category or bottom 40% (B40) carries 16.4% income share and mean monthly household income of RM2,848 (DOSM 2018).

Gaiani et al. (2018) point out that future research should further explore the relationship between income and food waste behaviour, noticing that the area until recently has only been addressed by a relatively small number of authors. Household food waste has been considered as one of the characteristics of high-income nations (Beretta et al. 2013; Gustavsson et al. 2011). Households with less purchasing power are usually expected to be more cautious on their food expenditure compared to households having higher purchasing power (Porpino et al. 2015). Households that have a higher food budget and spend more on food purchases have been identified as bigger food wasters than households with a limited amount of food budget (Parizeau et al. 2015). Affluence also tends to be associated with food wastage (Gustavsson et al. 2011) with affluent consumers being more prone to buying and wasting food due to their affordability. Similarly, in high-income countries, consumers have been identified to contribute the most to food waste (Graham-Rowe et al. 2014). However, in low-income countries, the consumption-stage waste is claimed to be minimal due to the financial constraints and small quantities in buying food (Gustavsson et al. 2011).

While income has been reported to positively correlate with general waste generation (Palatnik et al. 2014), there is a lack of consensus in the limited literature regarding the relationship between income and food waste. While Williams et al. (2012) found no correlation between Swedish household income and food waste in their exploratory study, Gustavsson et al. (2011) stated that poverty and limited household income made it unacceptable to waste food and Porpino et al. (2015) paradoxically found that low-income families tended to waste more food. On the other hand, Stefan et al. (2013) found that higher household income led to more waste, but Porpino et al. (2015) claimed another study conducted in the United Kingdom saw minimal differences in the amount of food waste between socioeconomic classes. Similarly, the income level of respondents in the Croatian household negatively affected the prevention of waste (Ilakovac et al. 2020).

The mixed findings give an impression that it is worthwhile to further test the following hypotheses:

H2a: There is a difference in the food waste management and practices between households with different income group categories.

H2b: There is a difference in the households' awareness level on food waste management between different income groups.

H2c: There is a difference in the households' knowledge regarding sustainable food waste management between different income groups.

H2d: Level of household income moderates the relationship between the constructs and intention.

The impact of training intervention

The term 'intervention' is conceptually defined as a general term referring to any activity or project-like training sessions, workshops, prompts, action learning or campaigns with the aim of creating change. The current study used training intervention to mean communication and activities intended to raise awareness and impart knowledge, to encourage participation, and to promote behavioural change.

Many organizational studies have established the importance of training and development on performance. Khan et al. (2011) for example found significant positive effects on organizational performance. Training also helps employees to gain knowledge on their jobs. People learn from practical experience better compared to books or other reading materials alone, and training provides that experience. In the field of academia and entrepreneurship, the impact of training or courses is measured mostly on the output of satisfaction, business performance, academic achievements, general awareness, and attitudes (Nasr and Boujelbene 2014; Sánchez 2011; Souitaris et al. 2007).

Unawareness and lack of knowledge have the potential to distort households' intention to perform a given behaviour. Edgerton et al. (2009) recommended that it was essential to spread information about the process to promote composting to treat organic waste. To take full advantage of the benefits of home composting, in-depth knowledge regarding the process is important. A hands-on training for example can enable home composting practices to be applied in households. Various studies have shown that consumers' awareness and knowledge impose significant impact on consumer behaviour (Kanchanapibul et al. 2014; Ishak and Zabil 2012; Matthies et al. 2012). A study conducted by Sharp et al. (2010) provided good evidence on the positive impact of intervention campaigns on household behaviour, specifically on household waste prevention. Furthermore, Romani et al. (2018) found that educational intervention reduced the amount of domestic food waste. In other words, their findings confirmed the claims about the positive role of the educational intervention in reducing domestic food waste. Based on the above arguments, it is postulated that:

H3a: There is a difference in the households' awareness of sustainable waste management practices (eg. via composting) before and after intervention training.

H3b: There is a difference in the households' knowledge on sustainable waste management practices before and after intervention training.

Proposed methodology

This paper is conceptual in nature. Thus, it would be subjected to an empirical research test in the near future. *Figure 3* presents the proposed flow for the research design. Therefore, it is proposed to be conducted quantitatively with a Likert scale questionnaire serving as the survey instrument. A questionnaire design will be prepared in two sets. The first set of questionnaires will be answered by respondents before the training workshop. Later, the second questionnaire will be given to the respondents after they have participated in the training workshop. The reason two different sets of questionnaires are prepared is to examine the consumers' intention to reduce food waste and whether they differ in their response before and after the intervention of the training module. Thus, the effectiveness of the training module for the urban households' food waste management may be measured.

Questionnaires using the Likert scale would be suitable in gauging responses from households in Malaysia. The questionnaire will be divided into several sections to

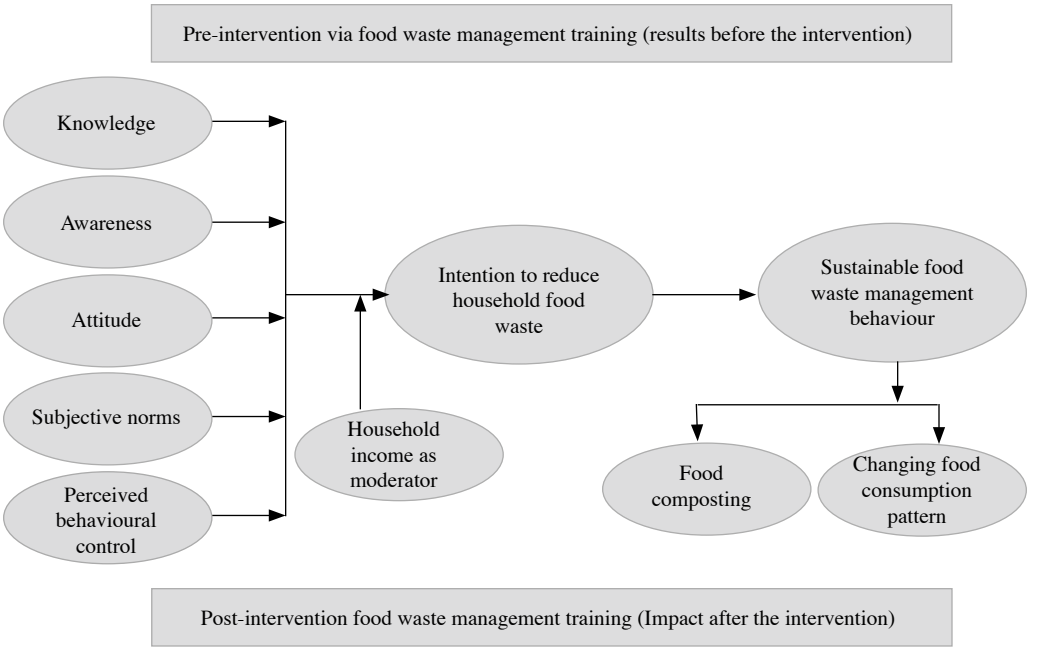


Figure 2. Proposed conceptual framework

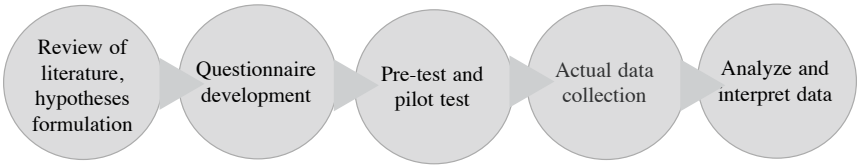


Figure 3. Proposed research design flow

operationalise each of the construct. Where possible, previously established questionnaire items, which reliability and validity have been verified will be adopted and adapted. It is important to note that all constructs and measures developed later for the questionnaire instrument are as perceived by the consumers or households themselves. This is because, dealing with the intention to reduce food waste is highly related to behavioural indices that are best evaluated by the individual themselves.

Prior to running the main analyses, pilot testing the questionnaire items would be useful to establish reliability and validity. Cronbach's alpha value shall be calculated to determine the reliability value to ensure that all constructs fall within the acceptable range. Regarding the statistical analyses, factor analysis will be performed in order to report the factor loadings of each item to determine its content validity. Besides that, it would be beneficial to determine the dimensionality of the study constructs. Spearman product-moment correlation could be the main analyses to test and answer the eight hypotheses, and to establish the relationship between household's intention to reduce food waste by practicing sustainable waste management and its identified factors. Data from the survey shall then be subjected to multiple regression analysis for prediction purposes. Initially, to give a general description of the data collected, descriptive statistics such as frequency distributions, measures of central tendency and variability may be used, all of which may be obtained from the

use of SPSS software. Structural equation modelling (SEM) is also found to be a sophisticated and comprehensive analysis model to be employed.

It is suggested for the empirical research to test the significance of proposed relationships in structural models of the research, as well as to measure the overall fitness of the models to the data. Thus, structural equation modelling may be utilized in two stages. First is to conduct confirmatory factor analysis (CFA) to measure the reliability and validity of the measurement scale. Second is to run a structural equation model to test the best fitting model for investigating the causal relationship between the independent and dependent variables of the conceptual model. In choosing the sampling size for the future empirical study, several criteria should be noted, especially when using the Structural Equation Modelling (SEM). Kline (2015) considered the sample size of less than 100 not feasible if the researchers intended to apply SEM. Similarly, Hoyle (1995) recommended a sample size from 100 to 200 while Kelloway (1995) recommended 200 observations. Therefore, based on this justification, the sample size should be ensured to be more than 200 with the application of Structural Equation Modelling.

Managerial implications

To date, most of the focus in food waste publications is concentrated on municipal solid waste and commercial sectors, be it trend analysis (Samah et al. 2013; Xiao et al. 2007; Yang et al. 2013), treatment and disposal methods (Manaf et al. 2009; Tisserant et al. 2017), energy products (De Gioannis et al. 2017; Kiran et al. 2014; Malinauskaite et al. 2017; Q. Zhang et al. 2017), or operational conditions (Cappai et al. 2014; Li et al. 2018). Thus, the present paper attempts to fill in the gap of research in favour of food waste or kitchen waste management in households which has been reported to be the biggest contributor towards food waste generation. It intends to investigate a model of households' intention to minimize food waste by practising sustainable food waste management. The household unit is chosen with the aim to contribute to a better understanding of food waste-related behaviours and provide theoretical and operational insights on possible strategies to prevent and reduce household food waste.

Knowledge and exposure from the training is expected to increase respondents' awareness and their intention to reduce food waste. The three different income groups are expected to show a different awareness and knowledge on food waste management. The predictor variables are expected to have a relationship with households' intention to reduce food waste. Moreover, income level is expected to moderate the relationship between the predictor variables and the outcome variable.

As Malaysia's population is forecasted to rise further from 28.6 million in 2010 to 41.5 million in 2040, an increase by 12.9 million people in a period of 30 years (DOSM 2016), more burden will be placed on the existing food system to meet the demands. It would be unfortunate if focus is not given to seriously mitigate the continuous food waste occurring every day. Even though the food production on top of the chain is working hard to fulfil demand, there is a giant hole at the end of the chain that swallows and throws away all the efforts.

The significance of this study can be viewed from at least two major perspectives: knowledge (theoretical significance) and practice (practical significance). This study will provide a conceptual understanding on the potential factors predicting intention to reduce food waste, ultimately driving consumer behaviour to practice home composting, a form of sustainable food waste management. In terms of the conceptual model of this study, it intends to provide practical guidance for future empirical work, methodologically,

theoretically, or conceptually by other intellects in the academic arena. Society should be able to benefit from it because the findings may assist policy makers to formulate relevant policies pertaining to sustainable food waste management at the household level.

Knowledge of food wastage drivers and behaviours shall be useful to provide insights into the best policy approaches to sustainably manage food waste. Food waste prevention policies may be formulated in context of the waste generating behaviours and attitudes that they address. Policy makers or municipal officers may use this as guidance for developing and implementing multi-faceted food waste prevention programs which address the three aspects of sustainability: economic, environmental, and social factors.

Future research directions

This paper aims to extend the theoretical framework of Theory of Planned Behaviour by adding the important constructs of knowledge, awareness, income and training that have been shown in the literature to be the factors that contribute to the intention of households to reduce food waste. Investigation is proposed to be done within the household environment, considering that the food waste issue has become a global phenomenon and that so much food waste is attributed to households. A literature review has been conducted to explore how the variables are conceptualised and explained. Drawing upon previous results and findings in various settings, the article tries to illustrate how the proposed conceptual framework may be used for future research. Clearly, empirical research is needed to support the conceptual framework presented. A comparison of the results from the Malaysian households could be done with samples from other countries or other areas like the food service industries, including hotels, schools, hospitals, restaurants, airlines, and travel agencies. Based on this study, future research may also seek to employ longitudinal research which would be immensely valuable to the understanding of antecedents and outcomes of food waste management practices.

Other possible antecedents of households' intention to reduce food waste could be considered, such as social media, purchasing style, emotions and others. Furthermore, the impact of training or other intervention programs may be tested not only on household's food waste management, but also on perceived recovery value, ex ante and ex post waste quantification or other possible outcomes of interest.

Conclusion

This paper has reasoned that households of different income groups may have different food management practices and its associated waste management. The construct of training as an intervention is anticipated to have an impact associated with the variables tested using TPB as an underlying theory. It is believed that there will be significant changes in the consumer's level of knowledge, awareness, attitude, subjective norms, and perceived behavioural control before and after the intervention. By examining the antecedents and outcomes, this paper hopes to lay the groundwork for future research on household intention to reduce food waste in particular, as well as the overall household food waste management while offering practical recommendations to carry out empirical research on the topic to contribute further to the existing body of knowledge.

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Abstrak

Pembaziran makanan merupakan satu fenomena global. Statistik menunjukkan bahawa satu pertiga makanan dibuang sedangkan ia masih boleh dimakan dan selamat untuk penggunaan manusia. Kesedaran yang semakin meningkat tentang akibat kehilangan dan pembaziran makanan, mendorong strategi untuk meminimumkan dan mengatasi masalah ini diambil serius dan menjadi elemen penting dalam penyelidikan dan penetapan dasar. Beberapa tahun kebelakangan ini telah menyaksikan komitmen negara-negara di seluruh dunia ke arah mencapai matlamat 12.3 di bawah Matlamat Pembangunan Lestari (SDG). Kerajaan dan sektor swasta dalam pelbagai peringkat menyedari perlunya pengurusan dan strategi pengurusan sisa makanan yang mapan. Walaupun sisa makanan berlaku di setiap tahap rantaian bekalan, isi rumah persendirian dikenal pasti menjadi penyumbang utama kehilangan dan pembaziran makanan. Namun, maklumat atau pengetahuan mengenai situasi dan amalan pengurusan sisa makanan isi rumah masih terhad. Artikel konsep ini bertujuan meneroka faktor-faktor yang mungkin mempunyai hubungan dengan niat isi rumah untuk mengurangkan sisa makanan dengan mempraktikkan pengurusan sisa makanan yang lestari. Di samping itu, model ini juga melihat impak daripada intervensi latihan. Daripada sorotan literatur, beberapa hipotesis dibangunkan untuk memberi pemahaman mengenai hubungan antara faktor psikososial atau tingkah laku dan niat yang berkaitan. Turut dibincangkan adalah implikasi polisi dan pengurusan. Sokongan empirikal jelas diperlukan untuk kerangka konseptual yang dicadangkan dan dirancang untuk diuji di peringkat isi rumah kawasan bandar yang mana penghasilan sisa makanan berlaku lebih kerap dan dalam jumlah yang besar berbanding dengan di kawasan luar bandar. Kajian ini akan memberi manfaat kepada masyarakat dengan mengambil kira bahawa masalah sisa makanan secara langsung mempengaruhi jaminan makanan negara jika tidak ada tindakan yang diambil untuk memahami dan mengurangkannya. Pembuat dasar akan dipandu mengenai usaha atau jenis program yang harus ditekankan untuk meningkatkan niat isi rumah mengamalkan pengurusan sisa makanan yang lestari. Selanjutnya, kajian ini akan menyumbang kepada literatur sedia ada dengan memperluas pemahaman tentang niat tingkah laku pengguna untuk membendung sisa makanan di Malaysia, yang mewakili sebuah negara membangun yang menghadapi peningkatan tahap sisa makanan setiap hari.