

## Assessing Urban Households' Intention to Reduce Food Waste

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### Abstract

The issue of consumers food waste continues to be a challenge in Malaysia. More attention is needed from the public to reduce food waste to protect our environment. Therefore, this study aims to analyze the factors related to urban households' intention towards sustainable food waste management in Malaysia. Using the purposive sampling method, this study collected data from 200 respondents via online survey. On top of that, this study adopted the factor analysis to analyze the relationship between the factors influencing the intention of households to practice sustainable food waste management. The survey's descriptive findings indicated that respondents have a high intent to practice sustainable food waste management. The majority of the respondents claimed that it could reduce environmental harm and reduce their food expenses. Based on the factor analysis, determinants related to the households' intention of practicing sustainable food waste management are attitude, subjective norm, perceived behavioral control, and food waste reduction intention. The Chi-square test showed three important strata groups related to the households' intended to practice sustainable food waste management, i.e. education background, occupation, and income level. Hence, the government should organize more campaigns to influence society to participate in sustainable food waste management activities. Since respondents have a higher perceived behavioral control to practice sustainable food waste management, local authorities should provide more food waste management information and facilities to encourage households to engage in sustainable food waste management campaign.

**Keywords:** food waste, intention, awareness, knowledge, sustainable

## 1.0 Introduction

In Malaysia, the amount of food waste produced shows rapid growth. It is becoming a worrisome problem. Solid Waste Management and Public Cleansing Corporation (SWCorp) is a local authority established in 2008 to complement national policies and ensure that solid waste and public cleansing management services become more efficient. SWCorp is a government agency and in charge of solid-waste composition surveys. According to Nasir et al. (2000) and Moh and Manaf (2014), data and information about Malaysia food waste are not openly accessible to the public. In addition, unsystematic records due to inconsistent periodic analysis and documentation at the national level result in an unreliable database. Therefore, SWCorp's survey data on solid waste composition is the only accurate source for Malaysia's food waste analysis. Table 1 shows the four years of the food waste data from the surveys.

Table 1 : Malaysia's Food Waste Database From The Survey On Solid Waste Composition

Year	Food Waste (tonnes per day)	Percentage of Waste Composition from total Solid Waste (%)
2005	8,550	45.0
2012	14,743	44.5
2015	15,000	40.0
2018	16,688	55.0

Source: Survey on solid waste composition, SWCorp, 2005, 2012, 2015, and 2018, respectively.

Malaysia's food waste production shows a critical increasing trend, recording a twofold increase from 8,550 tonnes per day in 2005 to 16,688 tonnes per day in 2018. In addition, the food waste in 2018 amounted to 55% of the total solid waste, reflecting bad habits in Malaysian food consumption behavior. This alarming rate of food waste could play an impact on issues of food sovereignty, economic development, and environmental sustainability (FAO, 2014). According to SWCorp (2019), the sources of food waste generated by Malaysians are mainly households, night markets, food bazaars, food courts, and other food and beverage sectors. Moreover, festive seasons such as Ramadan will usually contribute to an increase in the amount of food being wasted in Malaysia, resulting in an additional 15% to 20% increase in food waste production.

According to Jereme et al. (2016), households are the main contributor of food waste in Malaysia, amounting up to 38.32% of the total estimated food waste in 2011 (Table 2). However, according to SWCorp Malaysia, the daily food waste generated by the household sector increased to 44.5% from the total 16,667.5 tonnes of food waste generated in Malaysia in 2019 (New Straits Times, 2021). The main reason households generate a high percentage of food waste in Malaysia is due to over-purchasing and confusion about the “best before”, “expiry date” or “use by” information. Besides that, changing consumer food consumption patterns and food preferences over time could be one of the main reasons to explain the high percentage. According to Abdul (2010), improvement in the Malaysian living standards and increase in consumers' purchasing power provided consumer with more food choices. This phenomenon further created the habit of making purchases beyond their need, worsening the household food waste scenario. Brook (2007) and Jereme et al. (2016) also claim that income levels determine the levels of food waste produced by households. The authors find that the amount of food waste in urban areas is higher than its rural counterpart due to their differences in income levels. Malaysia's population growth and urbanization are related to the households' food waste behavior (Zamali et al., 2009). The Star (2016) and New Straits Times (2020) reported the total daily food waste increased from 3,000 to 4,005 tonnes in Malaysia, which include food thrown by the households that is still edible and fit for human consumption.

Table 2 : Estimated Food Waste Thrown by Various Sources in Malaysia, 2011

<b>Sources of Food Waste</b>	<b>Generation Rate</b>		
	<b>'000 tonnes per day</b>	<b>'000 tonnes per annum</b>	<b>Waste Composition Rate (%)</b>
Households	8.745	3,912.404	38.32
Wet and night market	5.592	2,041.929	24.50
Food courts/restaurants	5.319	1,941.608	23.35
Hotels	1.568	572.284	6.87
Food and beverages Industry	0.854	311.564	3.41
Shopping Malls	0.298	108.678	1.30
Hypermarkets	0.291	106.288	1.28
Institutions	0.055	26.962	0.32

<b>Sources of Food Waste</b>	<b>Generation Rate</b>		
	<b>'000 tonnes per day</b>	<b>'000 tonnes per annum</b>	<b>Waste Composition Rate (%)</b>
Schools	0.045	21.808	0.30
Fast food / Chain Shop	2.521	0.808	0.26
Total	22.793	8,331.589	100

Source: Jereme, et. al. (2016)

Besides, the second- and third-biggest contributors of food waste in Malaysia are the wet and night market and food courts or restaurants, respectively. These two sources produced about 47.85% of the total food waste. Compared to other developed countries, Malaysia has the highest percentage of food waste (Parfit et al., 2010; Sharp et al., 2010). Making changes to consumers' waste prevention habits may not be an easy task since human attitudes and behavior have the most influence on their habits (Cox et al., 2010). Consumer food consumption behavior is considered one of the aspects leading to food waste (Radzyminska et al., 2016), and irresponsible food-related behavior among the public has become more prominent. Thus, consumers play a crucial role in reducing food waste through changing their food consumption behavior (FAO, 2011).

In 2018, the estimated amount of food waste in Malaysia was at 16.688 thousand tonnes per day, where this amount of food waste could be enough to feed about 12 million people three times per day (SWCorp, 2019). In addition, SWCorp (2019) also estimated that Malaysians generate a higher amount of avoidable food waste within 18 days, and it is equivalent to the Petronas twin towers filled to the brim. This practice displays the destructive power of population and damage to the environment, society, and economy. In Malaysia, the urban population has become the major contributor of more than 70 percent of the total waste. According to Jarjusey and Chamhuri (2017), 57.1% of their survey respondents in Selangor claimed to not know how to manage their food waste. Additionally, the respondents agreed that they had limited knowledge of their daily food waste management and experienced confusion about the terms "best before" and "use by" dates on food products.

According to SWCorp (2019), the monthly food waste thrown by an average Malaysian household of five people was estimated to be worth RM 225 or about 25% of their total monthly food expenditure. This amount is equivalent to about seven 10kg bags of rice or 130 liters

of petrol. Besides, the Malaysian urban population throws out 3 thousand tonnes of avoidable food waste per day, enough to feed about 2.2 million people. This issue reflected the need to focus on waste reduction and more effort towards curbing daily food waste generation. Society should show more appreciation towards food production and maximize food utilization. Perhaps, increasing the household's intention towards food waste management can be the first step for the urban society to reduce their food waste volume. Hence, this study aims to analyze the factors relating to the intention of urban households to practice sustainable food waste management.

### 1.1 Issues of Households' Intention Towards Sustainable Food Waste Management in Malaysia

The effect on food waste prevention towards the increasing rate of food waste generated is boundless (Cox et al., 2010). Innovative strategies for proper management of food waste in Malaysia are limited and still under-developed compared to other Asian countries (Nadzri, 2013). The government has taken several initiatives to increase public awareness to reduce food waste in urban areas (e.g. the MySaveFood campaign). Moreover, the government also implemented various plans and strategies to cope with the rising amount of food waste disposed of typically at the household level. Examples of efforts to reduce food waste implemented in Malaysia include National Recycling Program (2000 – 2005), Waste Minimization Master Plan (2005), and National Solid Waste Management (2002 – 2020) (MHLG, 2006). However, the impact of this campaign on the reduction in food waste has yet to be determined. According to Jarjusey and Chamhuri (2017), many respondents were not aware of food waste-related campaigns on social media or any other platforms. In addition, Jarjusey and Chamhuri (2017) find that most consumers were not aware of any campaigns organized by the government to curb this excessiveness.

The main contributor to the higher amounts of edible and non-edible food waste in Malaysia is the households' food preparation activities. Indeed, food waste could be composted and turned into organic fertilizer or certain items such as chilies, onions, grains, coffee grounds, eggshells, and others replanted. Replanting crops will help households reduce their food expenditure and food waste. Besides, food waste generated by the urban population that is composted into organic fertilizer and used in urban agricultural activities will benefit the environment and improve the society's economic condition. According

to Brook (2007), many respondents claimed that the cost of dumped food makes them think twice. The household's intention towards recycling food waste for urban agriculture activities needs to be determined to promote urban agriculture and food sovereignty.

The amount of food waste generated by different income groups could be different. Usually, more food waste will be generated by higher income groups stemming from over-purchasing of food. Jarjusey and Chamhuri (2017) claim that respondents could be more active in practicing sustainable food waste management if they receive more updated information and practical training on food waste management organized by the government.

In Malaysia, several issues have caused food waste to increase every year. For example, the government's limited budget allocation for food waste management caused the inefficient manner of reducing food waste (Thi et al., 2015; Alzahrin, 2010). As suggested by Agamuthu et al. (2009), the increase of municipal solid waste had precipitated the government to fund public information campaigns to instill awareness in the general public regarding the impact of the increasing trend of food waste. This scenario reflects the fact that public awareness and participation in sustainable food waste management in Malaysia are still low. Hence, the aim of conducting this study is to emphasize the factors that can increase public awareness and intention to practice sustainable food waste management.

## **2.0 Methodology and Data Collection**

The conceptual framework of the Theory of Planned Behavior (TPB) from Ajzen (1991) is to be adapted and to be modified to analyze the factors related to the urban households' intention to practice sustainable food waste management. TPB is a social-psychological model widely used to explain a person's behavior in specific contexts. Many researchers adapted the TPB model and applied it to determine consumers' food waste management behavior. For example, Soorani and Ahmadvand (2019) include the personal feeling of guilt to extend the TPB theory, and attitude, subjective norm, perceived behavioral control, and the "intention of not wasting food" are found to be the factors that determine consumers' food waste behavior. Similarly, Stefan et al. (2016) analyzed the food waste behavior using the theory of TPB, and moral attitudes and perceived behavioral control variables were significant in explaining their food waste behavior.

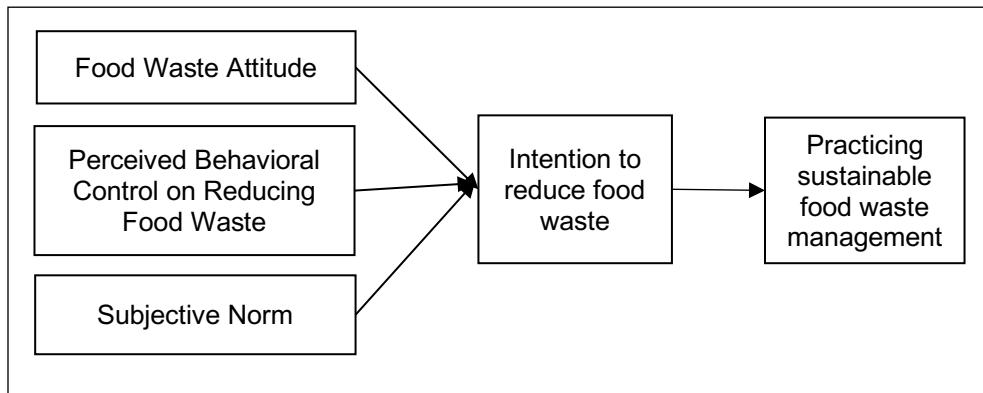


Figure 1 : Conceptual Framework of Factors Influencing Households' Intention of Practicing Sustainable Food Waste Management

Figure 1 shows the factors that determine households' intention to practice sustainable food waste management which had been modified according to the conceptual framework of the TPB and Jereme et al. (2018). The independent variables applied are factors selected from the literature on the intention in terms of social and psychological aspects. Firstly, food waste attitude is related to the knowledge and the household's assessment of food waste management behavior. For example, households are more likely (intention) to practice sustainable food waste management when the households consider wasting food as a negative behavior. According to Soorani and Ahmadvand (2019), attitude toward food waste is a psychological item that measures a person's desire for food waste reduction without considering the environmental concern items in their study. However, Jereme et al. (2018) explain that households' attitude can be determined based on the consumer's environmental awareness and knowledge of food waste. In addition, Barr (2007) and Kilbourne and Picket (2008) confirm that environmental beliefs or concerns will direct and indirectly lead to a positive relationship with behavior. Oskam et al. (1991) claim that the decision-making on practicing sustainable food waste behavior is significantly determined by the environmental knowledge and awareness on food waste issues. The psychological aspects of food waste attitude are motivation-dependent and influenced by normative values that mainly focus on ethical consideration and environmental awareness (Jereme et al., 2018). Hence, the attitude toward food waste constructed in this study

combined the personal psychological assessment and the environmental awareness and knowledge of food waste.

Secondly, subjective norms imply the feelings or thoughts of another household member's or their significant other's support which encourages them to execute the behavior. If the household is impressed by people deemed influential, the household will exhibit a higher intention to perform sustainable food waste management. Thirdly, perceived behavioral control (PBC) in TPB explains the barriers outside of one's self-control or as one's perceived ability to self-manage their self-action (Madden, 1992). PBC or perceived self-efficacy describes a person's confidence on their abilities to engage in a behavior (Fishbein & Cappella, 2006). Recent empirical findings suggest that PBC is significantly related to intention (Yusof et al., 2019; Goh et al., 2019). In this study, PBC is used to assess the convenience of households to manage food waste, such as "It is simple for me to manage food waste in my home". If the household thinks managing food waste is easy, it will have a higher intention to practice food waste management.

Lastly, the variable of intention for food waste reduction is a crucial factor to assess the level of personal care on food waste generated. People will most likely practice sustainable food waste management when they show a higher intention to reduce the food waste in the future (Jereme et. al., 2018). According to Soorani and Ahmadvand, (2019) and Kharat, Murthy, Kamble, and Kharat, (2017), the intention to reduce food waste is related to the future commitment and readiness of a person in food waste reduction behavior.

## 2.1 Extended TPB Model with Personal Goal

Based on the TPB explained in Figure 1, the practice of sustainable food waste management behavior is completely explained by the intention to reduce food waste. However, the TPB has a lack of focus on personal goal. According to Ajzen and Kruglanski (2019), the TPB should be integrated with a goals-decision theory or goal-system theory proposed by Kruglanski et al. (2002). The TPB is mainly focused on individual social behavior and clarifies that attitudes are influenced by intention. However, Abraham and Sheeran (2003) claim that people often fail to act on their intentions to engage in a behavior because of conflicting goals. People always provide the excuse of forgetting to act or not getting around to it (Sheeran, 2002) because they are pursuing

other goals that are inconsistent with their target behavior (Abraham and Sheeran, 2003).

Besides, people with similar attitudes but with different goals will display different likelihood of behavior. For example, suppose that Adam and Smith have similar overall possibilities for implementing sustainable food waste management because they have the same attitude towards reducing food waste. However, Adam is driven by beliefs related to internal goals (for example saving food costs), while Smith is driven by beliefs related to external goals (for example reducing environmental hazards). According to the theory of self-determination, Adam is more likely than Smith to implement sustainable food waste management because internally motivated people are more likely to achieve their goals than externally motivated people (Deci & Ryan, 2000). Therefore, personal goal is one of the new variables in the TPB model as illustrated in Figure 2.

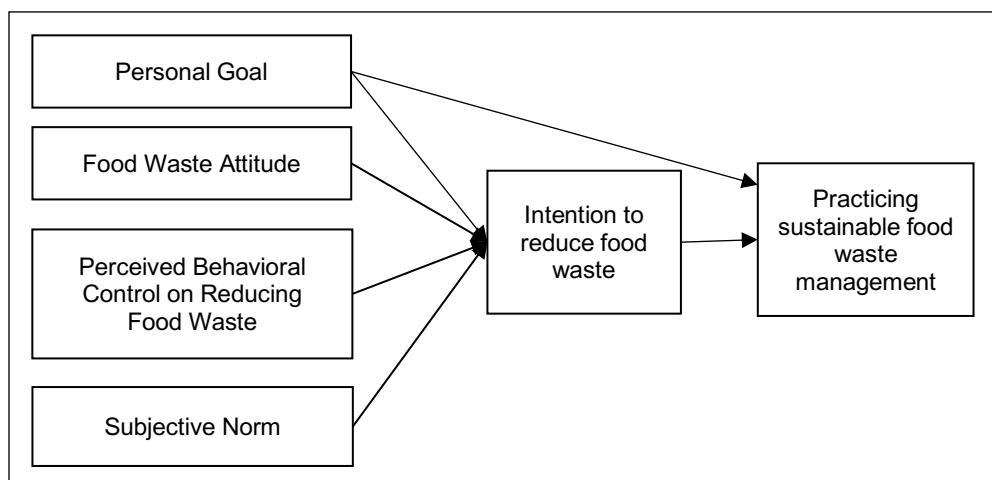


Figure 2 : Extended TPB Framework with Personal Goal

In this study, personal goal is measured by saving the cost of food consumption, feeding hungry people, and reducing environmental harm.

## 2.2 Exploratory Factor Analysis (EFA) and Multiple Regression for Intention to Reduce Food Waste

In this study, exploratory factor analysis was adopted to identify the set of underlying variables respective to each factor (intention to reduce food waste, food waste attitude, subjective norms, and

perceived behavioral control) by gathering data obtained from the market survey. Firstly, the Kaiser-Meyer-Olkin (KMO) and Bartlett's tests are used to examine the data adequacy and suitability for EFA. The criteria to pass these two tests are a statistical value of above 0.5 for the KMO test (Kaiser & Rice, 1974) and the p-value of below 0.05 for Bartlett's test (Tobias & Carlson, 1969). Secondly, the varimax rotation under the principal axis factoring method was chosen to extract the latent variables as pre-mentioned in the conceptual framework. Thirdly, only factors with Kaiser Eigenvalue value greater than one will be considered as appropriate variables. Finally, the Cronbach's Alpha test aims to confirm the reliability of the latent variables proposed in the maximum rotation of variance and the Kaiser Eigenvalue test. When the Cronbach's Alpha coefficient is greater than 0.5, a factor will be considered a potential variable from the aspects of reliability, consistency, and repeatability.

Based on the conceptual framework proposed in this study, the intention to reduce food waste (IRFW) was determined by food waste attitude (FWA), subjective norms (SN), perceived behavioral control (PBC), and personal goal (PG). All variables were transformed into factor scores obtained from the EFA except PG. After confirming the number of factors in EFA, factor scores for each variable are automatically generated based on the regression approach. Furthermore, the data is used to estimate the following regression:

$$\text{IRFW}_i = \beta_0 + \beta_1 \text{FWA}_i + \beta_2 \text{SN}_i + \beta_3 \text{PBC}_i + \beta_4 \text{PG}_i + u_i$$

where  $\beta_0, \beta_1, \beta_2, \beta_3$ , and  $\beta_4$  represent the estimated coefficient for each independent variables and  $u_i$  denotes a stochastic term. Based on the TPB,  $\beta_1, \beta_2$ , and  $\beta_3$  are expected to have a positive causal impact on the intention to reduce food waste. For example, if the respondent's option on food waste is negative then they will intend to reduce food waste. When a person has a strong self-efficacy in controlling wastage, the person will intend to cut their food waste. Similarly, society intends to reduce food waste when the subjective norms are statistically significant. Nevertheless,  $\beta_4$  is also expected to have a positive causal impact on the food waste reduction intention.

### 2.3 Binary Logistic Model and Practice Sustainable Food Waste Management

Since the dependent variable of sustainable food waste management practice behavior (SFWM) was measured in binary code (1 = practice, and 0 = no), binary logistic regression is an appropriate approach used to analyze the causal impact of personal intention to reduce food waste and personal goal on the SFWM. The specific logistic model of this analysis is shown as follow:

$$\ln \left( \frac{P(SFWM|IRFW, PG)}{1-P(SFWM|IRFW, PG)} \right) = \ln \left( \frac{P}{1-P} \right) = \alpha_1 + \alpha_2 IRFW_i + \alpha_3 PG_i + \varepsilon_i$$

where P = probability of success (practice) and 1 – P = probability of unsuccessful (no).  $\alpha_2$  and  $\alpha_3$  represent the estimated coefficients and need to be converted into the exponential of the estimated coefficient  $e^{\alpha_2}$  and  $e^{\alpha_3}$ , respectively.

### 2.4 Data Collection

This research is conducted via online questionnaire survey through the SurveyMonkey website. A total sample size of 200 respondents was collected from October until December 2019. This study adopted the purposive sampling method due to the larger sampling frame in Malaysia. The questionnaire was dispensed to 200 respondents of different ages, gender, education level, occupation, and income level.

### 2.5 Questionnaire Design

In this study, the questionnaire was designed based on the conceptual framework mentioned in Figure 1. There are two main sections in the questionnaire i.e. sections A and B. Section A includes questions enquiring about the respondents' demographic profile. Section B gathers data on the factors related to the respondents' intention to practice sustainable food waste management as discussed in the conceptual framework and modified from the questionnaire proposed by Zainal and Hassan (2019). In Section B, there are four sub-sections, i.e. attitude toward food waste reduction, perceived behavioral control on practicing food waste management, subjective norms, and the intention to reduce food waste. All questions in section B were designed based on the 5 points Likert scale, where 1 = strongly

disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree.

### **3.0 Findings and Discussion**

#### **3.1 Demographic Profile of the Respondents**

A summary of the overall demographic profile for 200 respondents is shown in Table 3. In this study, 54% of the total respondents are female, and 46% are male. The majority of respondents (59 persons) who participated in this survey were in the age group of 30 to 39 years old. The distribution of the respondents' age group follows the normal distribution, indicating the data is without any outliers and are considered accurate (Figure 2). In terms of education level, most of the respondents hold either a Diploma or a Bachelor's degree and sometimes both (139 persons). Occupationally, 38% of the respondents work in the private sector, 25.5% work in the public sector, and other vocations covered 36.5%, respectively. 81.5% of the respondents' household size is not more than five persons, and only three respondents answered that their family has a size of at least 11 persons. Furthermore, 46.5% of the respondents' households earn below RM 5,000 per month (which falls under the B40 income category in Kuala Lumpur), 36.5% within the range of RM 5,000 to RM 7,000 (M40), and 17% of the respondents' household income is above RM 7,000 per month (T20).

Table 3 : Summary of Respondents' Demographic Profiles

<b>Profiles</b>		<b>Frequency (N)</b>	<b>Percentage (%)</b>
Gender	Male	93	46.5
	Female	107	53.5
Age	20 years and below	20	10.0
	21 – 29 years	49	24.5
	31 – 39 years	59	29.5
	40 – 49 years	38	19.0
	50 – 59 years	28	14.0
	60 years and above	6	3.0
Education Level	Primary school	0	0
	Secondary school	44	22.0
	Diploma / Bachelor	139	69.5
	Master	17	8.5
	Ph.D.	0	0

<b>Profiles</b>		<b>Frequency (N)</b>	<b>Percentage (%)</b>
Occupation	Student	35	17.5
	Public sector	51	25.5
	Private sector	76	38.0
	Self-employed	23	11.5
	Unemployed	8	4.0
	Retired	7	3.5
Household Size	5 and below	163	81.5
	6 – 10	34	17.0
	11 and above	3	1.5
Monthly Income	RM 1000 and below	4	2.0
	RM 1001-RM 3000	27	13.5
	RM 3001-RM 5000	62	31.0
	RM 5001-RM 7000	73	36.5
	>RM7000	34	17.0

In this study, 95% of the respondents claimed that they intended to practice sustainable food waste management (190 persons). However, a minority of respondents (5% or 10 persons) do not intend to practice sustainable food waste management. The main reason given by the respondents is the time-consuming factor where they only have limited time to practice food waste management activities continuous. Besides, the complicated process and simple lack of interest are other reasons given by the respondents.

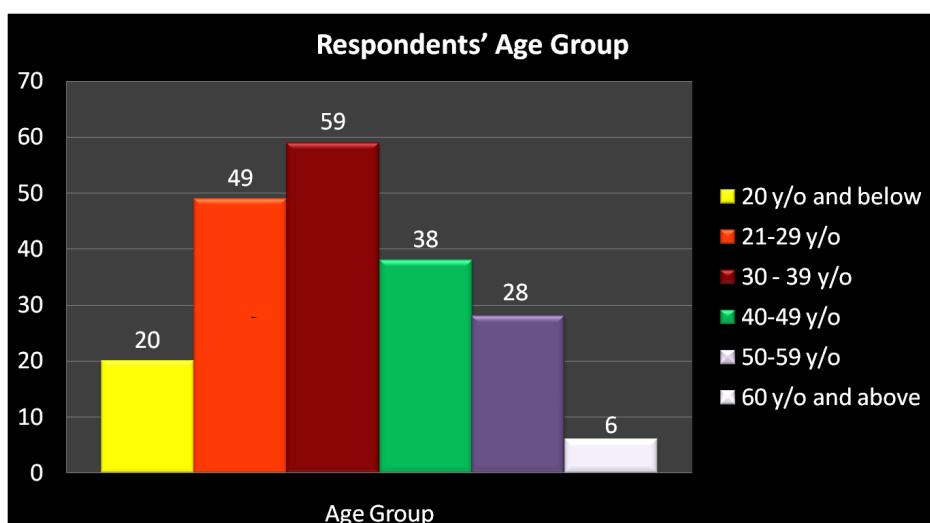


Figure 3 : Respondents' Age Group

In the survey, 79.5% or 159 respondents agreed that sustainable food waste management is capable of curbing environmental harm (Table 4). The second benefit that can be gained from sustainable food waste management is the cost-saving element. 127 respondents agreed that practicing sustainable food waste management can reduce the cost of food expenditure and even possibly generate some extra side income for them.<sup>1</sup> However, 36.5% of the respondents did not agree that practicing sustainable food waste management can bring any monetary benefit to them. Moreover, respondents did not believe that sustainable food waste management could contribute to food availability. Around 68% of the respondents (136 persons) disagreed that practicing sustainable food waste management could feed hungry people and only 32% (64 persons) gave a positive response to this statement.

Table 4 : Summary of the Respondents' Feedback on the Benefit Gained from Sustainable Food Waste Management

<b>Feedback</b>	<b>Types of Benefit or Reward from Sustainable Food Waste Management</b>					
	<b>Save Cost</b>	<b>Feed Hungry People</b>	<b>Reduce Environmental Harm</b>			
Agreed	127	63.5%	64	32.0%	159	79.5%
Disagreed	73	36.5%	136	68.0%	41	20.5%
Total	200	100	200	100	200	100

### 3.2 Factor Analysis

The KMO and Bartlett's tests show that the data set is accurate to be analyzed using factor analysis (Table 5). The KMO test's figure is 0.814 (greater than 0.6) and implies that the sample data is adequate. This was confirmed by Bartlett's test whereby the p-value is lower than the 5% significance level thereby rejecting the null hypothesis.

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<sup>1</sup> Most food waste can be composted to become organic fertilizer. Households could either directly sell their organic fertilizer and/or use it for their home crops such as chili. Hence, practicing sustainable food waste management will enable them to generate extra income for the household or reduce their food expenditure indirectly.

Table 5 : Summary of KMO and Bartlett's Test

<b>Test</b>	<b>Statistic</b>	
KMO	0.814	
Bartlett	Chi-square	827.391
	p-value	(0.000)

In this study, factor analysis was adopted to analyze the factors related to the households' intention of practicing sustainable food waste management and the summary of findings is shown in Table 6. The results show that there are four main factors related to the intention of practicing sustainable food waste management, i.e. the food waste attitude, subjective norms, perceived behavioral control, and the intention to reduce food waste. The accumulated variance for these four factors is explained by about 64.703%, indicating that there remains 35.297% of variance not explained in the model. Each factor contributes different percentages of variance, i.e. attitude (20.646%), intention to reduce food waste (17.691%), subjective norms (13.233%), and perceived behavioral control (13.133%). These findings are supported by Zainal and Hassan (2019), who also find that these four factors significantly affect households' food waste behavior.

Table 6 : Summary of Factor Analysis

<b>Items</b>	<b>Factor Loading</b>			
	<b>F1</b>	<b>F2</b>	<b>F3</b>	<b>F4</b>
1 In my opinion, wasting food is extremely negative.	0.855			
2 In my opinion, loading the environment with my household's food waste is extremely negative.	0.750			
3 In my opinion, wasting food is extremely foolish.	0.657			
4 In my opinion, loading the environment with my household's food waste is extremely harmful.	0.696			
5 I think engaging in food waste behavior is very bad.	0.561			
6 I am very likely to reduce food waste in my home by next week.		0.859		
7 My intention to reduce food waste in my home by next week is very positive.		0.798		

Items	Factor Loading			
	F1	F2	F3	F4
8 I intend to reduce food waste consistently.		0.739		
9 I will follow the important person to me and reuse all leftovers to reduce food waste.			0.860	
10 I will follow the important person to me and recycle the food waste, such as composting.				0.729
11 I will take initiative to reduce food waste in my daily life.				0.810
12 I have strong self-discipline to prevent generating food waste.				0.659
13 I can control myself not to throw food easily.				0.548
Variance (%)	20.646	17.691	13.233	13.133
Accumulate Variance (%)	20.646	38.337	51.570	64.703
Cronbach's Alpha	0.814	0.797	0.793	0.796

Note: F1 = Attitude; F2 = Intention to reduce food waste; F3 = Subjective Norms; and F4 = Perceived Behavioral Control.

The factor of attitude shows that food wastage could bring a negative and even harmful impact to the environment. Respondents claimed that they feel very bad when they are involved in food-wasting behavior. This feeling indicates that the negative attitude on the perception of wasting food and engaging in food waste behavior could lead to a lower intention to practice sustainable food waste management. This finding is supported by Pan et al. (2018) who suggest that the attitude is an important factor to determine intention. Jereme et al. (2018) also find that environmental knowledge on food waste has a positive significant impact on the intention to reduce the food waste, in line with the factor analysis finding of this study.

Besides, the factor analysis also shows that the respondents are willing to reduce their food waste by the next week and intend to engage in this behavior periodically. Meanwhile, the respondents could be influenced by other people to reduce food waste. When a person considered important to the respondent suggests reusing their leftovers and/or recycling their food waste (e.g. composting) to reduce their overall household food waste, the respondent is more likely to agree. The variance for this factor shows that the variation of food waste

management behavior of about 17.69% is explained by the intention to reduce food waste.

Yet, the perceived behavioral control factor shows that most of the respondents have self-efficacy when it comes to avoiding generating food waste and they also feel comfortable controlling themselves not to throw food away easily. Stancu et al. (2016), Graham-Rowe et al. (2015), and Sirieix et al. (2017) support the finding that perceived behavioral control is strongly significant in determining the intention of reducing food waste. The 13.13% variation of the intention to reduce food waste is explained by the variation of perceived behavioral control.

### 3.3 Chi-Square Analysis

Table 7 presents the summary result from the Chi-square test. This test was adopted to analyze the hypothesis that different demographic profiles will have different intentions for practicing sustainable food waste management. The test shows that only three profiles are statistically significant to reject the null hypothesis, i.e. education level, occupation, and monthly income. This indicates that respondents of different levels of education will have different intentions to practice sustainable food waste management. Furthermore, different occupations will also produce different intention to practice sustainable food waste management. It is not surprising when the chi-square shows households with different monthly income have different intention to practice sustainable food waste management. The current study's findings are similar to the findings from Brook (2007) and Jereme et al. (2016) where income levels will determine the amount of food waste produced by a household with urban areas generating more food waste than rural areas of Malaysia.

Table 7 : Cross-tabulation between social-demographic profile and household's intention to practice sustainable food waste management

Variables	Chi-square Statistic	P-value
Gender	0.341	0.559
Age	6.934	0.226
Education Level	8.335**	0.015
Occupation	14.269**	0.014
Household's Size	1.082	0.582
Household's Monthly Income	13.379***	0.010

Note: \*\* and \*\*\* denotes a significance level of 5% and 1%, respectively.

### 3.4 Factors Influencing Intention to Reduce Food Waste

Table 8 presents the summary result from the multiple regression analysis. The estimated regression shows that all TPB factors are statistically significant in explaining the intention to reduce food waste. However, personal goals, i.e. saving cost, feeding hungry people, and reducing environmental harm, are found to be not significant in affecting the dependent variable. The  $R^2$  shows that only 22.4% of the dependent variables are explained by the variation of independent variables. The remaining 67.6% are not explained in this model and are considered weak. However, the F-statistic shows a 1% significance and indicates that all variables are jointly significant to explain the model.

Table 8 : Summary of Multiple Regression Analysis

Variable	Coefficient	t-statistic	P-value
Constant	-0.258	-1.279	0.203
Attitude	0.282***	3.832	0.000
Subjective Norms	0.274***	3.620	0.000
Perceived Behavioral Control	0.181**	2.492	0.014
Save Cost	0.170	1.107	0.270
Feed Hungry People	0.044	0.281	0.779
Reduce Environmental Harm	0.166	0.900	0.369
$R^2 = 0.224$			
F-statistic = 7.276***			

Note: \*\* and \*\*\* denotes a significance level of 5% and 1%, respectively.

Even though the personal goal variables are not significant in determining the intention of reducing food waste, the coefficients of saving cost, feeding hungry people, and reducing environmental harm still behave as predicted. Attitude and subjective norm are both found 1% significant in determining the intention of food waste reduction. Similar to Aktas et al. (2018) and Jereme et al. (2018), attitude is found to positively and significantly determine the intention to reduce food waste. In Aktas et al. (2018), the path coefficient for attitude and subjective norms are 0.42 and 0.12, respectively. The coefficient for attitude and subjective norms in this study are 0.282 and 0.274, respectively, which are close to the estimated magnitude in Aktas et al. (2018). In this study, the perceived behavioral control's coefficient is estimated at 0.181 and it is a little lower than the finding of Rusell et al. (2017), which is 0.37.

### 3.5 Findings of Binary Logistic Regression

Table 9 shows the estimated outcome of the binary logistic regression. The estimated regression shows that the intention to reduce food waste statistically affects the probability of practicing sustainable food waste management. The exponential value for this coefficient is 3.896, indicating that the person who intends to reduce food waste will have 3.896 times more behavior that practice sustainable food waste management than a respondent who has a lower intention to reduce food waste.

Table 9 : Summary Findings of Binary Logistic Regression Analysis

Variable	Coefficient ( $\alpha_i$ )	Exponential Alpha ( $e^{\alpha_2}$ )	P-value
Constant	0.662	1.939	0.545
Intention to reduce food waste	1.360***	3.896	0.002
Save Cost	2.586**	13.278	0.017
Feed Hungry People	1.717	5.566	0.154
Reduce Environmental Harm	2.378**	10.783	0.040
Cox & Snell R Square = 0.164			
Nagelkerke R Square = 0.462			

Note: \*\* and \*\*\* denotes a significance level of 5% and 1%, respectively.

The personal goal variables, i.e. save cost and reduce environmental harm show positive significance in leading respondent to practice sustainable food waste management. The results show that respondents who have a strong goal to save cost are 13.278 times more likely to practice sustainable food waste management than respondents without this aim. In addition, those respondents with a strong goal of reducing environmental damage will be 10.783 times more likely to implement sustainable food waste management behaviors than those without. However, the aim to feed hungry people were found not significant in affecting respondents' behavior. The self-determination theory supports the findings in this study where, compared with those with extrinsic motivations (such as feeding hungry people), people with intrinsic motivation (saving cost) will be more likely to achieve their goals.

## **4.0 Policy Implications**

Most of the respondents intend to practice sustainable food waste management and believe that food waste management can reduce their food expenses as well as reduce environmental harm. From the factor analysis result, it can be interpreted that respondents are easily influenced by people they perceive to be important such as friends and family. Hence, the government should organize more campaigns to influence society at all levels to participate in sustainable food waste management activities. Since respondents have strong perceived behavioral control to practice sustainable food waste management, local authorities should provide more food waste management information and facilities to encourage households to engage with sustainable food waste management campaigns. Furthermore, different income levels, educational backgrounds, and occupations affect intention towards practicing sustainable food waste management. Hence, policymakers must plan strategies based on these strata groups.

Regression analysis shows that personal goals are important in influencing respondents to implement sustainable food waste management but not their intention to reduce food waste. This result shows that society should set a target before starting to practice sustainable food waste management, specifically to reduce household food consumption. Recently, Malaysia's food price index recorded 136.1 in Feb 2021 (BNM, 2021). This indicates that the food price increased sharply and the higher inflation will cause food consumption burden especially in the low-income group. Hence, practicing sustainable food waste may be one good alternative for the society to reduce the food inflation burden.

## **5.0 Limitation of the Study**

The data collected in this study is 200, which is sufficient and adequate to analyze the EFA. According to Winter et al. (2009), the minimum sample size of 50 is adequate to produce good results using the EFA process. A recent review of psychological research reports that approximately 40% to 60% of applied research has no more than 200 observations (McNeish, 2017). Although the sample size in this study is considered accurate and adequate to analyze the objectives, it may be insufficient to conduct a full latent structural model using another approach such as the PLS-SEM (Hair et al., 2011). It is

suggested for future studies to expand the sample size to compare the findings.

Besides, the variables used in this study are mainly based on the TPB model which focuses on psychological behavior only. Therefore, future studies that take a more nuanced view of emotion will help the field. For this study, we have classified emotions based on valence. This has led to some interesting findings, especially about differences in the relationship between emotion, intention, and behavior. A nuanced perspective may produce more interesting results.

### 5.1 Conclusion

The issue of food waste continues to be a challenge to be managed. However, the respondents from the current survey proclaimed high intention to practice sustainable food waste management. The majority of respondents believe that practicing sustainable food waste management could help reduce environmental harm and provide monetary benefits to them. Based on the factor analysis, the determinants related to households' intention of practicing sustainable food waste management are attitude, subjective norms, perceived behavioral control, and the intention of reducing food waste. Furthermore, the Chi-square test shows that there are three important strata groups related to households' intention of practicing sustainable food waste management, i.e. educational background, occupation, and income level. Local authorities should implement various strategies and campaigns to create public awareness to reduce food waste. The government also can enforce laws such as waste segregation laws, building anaerobic digesters for food courts, composting facilities, the MYSaveFood initiative, and others to ensure that the public practices sustainable food waste management. However, the efforts of local authorities and the efficiency of the strategies to minimize local food waste are still under observation. Perhaps, all communities should improve their cooperation to drive towards a zero-food-waste culture in Malaysia. To instill this culture, further initiatives to involve everyone in the whole food system should be introduced since everyone holds the responsibility to reduce waste or lost food along the food value chain.

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