

PRELIMINARY SURVEY ON FOOD WASTES DISPOSAL BY RESIDENTS IN GOMBAK AREA

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ABSTRACT: In Malaysia, 8.33 million tons of food waste was generated in 2015, and 70% of the wastes have been sent to landfills daily. Since most food wastes are disposed to landfills, it lead to methane generation resulting in a significant greenhouse emission. Thus, in this study, the food waste survey was conducted focuses on Gombak residents purposely to characterise food waste disposal survey data and study the effect of household size on amount of food waste generated daily using SPSS software (IBM SPSS v26). In this study, quantitative research was adopted by using the online survey tool, Google form to collect sufficient data. The results revealed that most respondents with a household size of 3 to 4 and more than 4 dispose of less than 500g of food waste daily, representing 54.3 percent and 50.0 percent, respectively. About 37.1 percent of respondents from the household size of 3 to 4 responded that they dispose of less than 1kg of food waste daily. In contrast, another 23.7 percent of respondents with more than 4 people dispose of less than 1kg of food waste per day. This result suggests that many people in the family did not necessarily affect the amount of food waste disposed of daily. The SPSS analysis result (size of sample=80) did not support the hypothesis that household size positively impacts the amount of food waste disposed of daily. In this case, limitations such as time constraints leading to low sample size and respondents did not weight their food waste were the main reasons for the failure in rejecting the null hypothesis.

KEY WORDS: Food waste, Composting, Decomposition.

1. INTRODUCTION

Food wastes have been a huge problem worldwide and particularly critical for several developed countries. As proof, in the United States, they estimated that people generated 188 kg per capita of food wastes yearly. Also, food wastes generated in Europe and North America is as high as 280-300 kg per capita per year [1]. In Malaysia, solid waste generated consists of 60% of food waste, and 70% of it is disposed of at landfill sites. Chien Bong reported that Malaysia's households discard around 0.5 to 8 kg of uneaten food daily [2]. This problem is expected to show rapid trends for the following years due to population growth and economic growth.

According to Solid Waste Management and Public Cleansing Corporation (SWCorp), Mohammad Diah Wahari, 16,688 tonnes of food waste were thrown away by Malaysian daily [3]. This data was collected from the SWCorp study conducted 2019. During festive seasons, the number of food wastes generated increases by about 15 to 20 percent. On top of that, 50 percent of solid waste generated was food waste, and about 70 percent of it was dumped at landfills. Note that Malaysia has 170 waste disposal sites as

of 2018, and space is running out. Out of these 170 sites, only 14 had "sanitary landfill" status [4].

Furthermore, food waste problems have gained attention at the academic and social levels recently. As proof, there is a visible increase in the number of studies that relate the consumer's behavior with food waste problem [5]. Such studies revealed that food consumption behavior such as waste reduction, reuse, and recycling are important elements in addressing the food waste problem. As reported by FAO (2011), consumer behavior highly related to food waste, specifically in developed countries. This relationship is unclear in developing countries, mostly due to consumers' mindsets. It is considered morally and economically unacceptable to waste food when poverty and low-income levels still carry the day—a contrast in developed countries where the consumers have the opposite mindset [6-7].

Several factors, including household size and composition, household income, household demographic, and household culture, affect the total quantity of household food waste generated [8]. Based on research by the Waste and Resource Action Program (WRAP), poor planning/food management, lack of skills and personal choices, supermarkets and lifestyles are the four main causes of food waste [8].

Since the disposal of food wastes at the landfill sites resulting to largest source for emission of greenhouse gasses (GHG)[9], diverting the food waste from landfills likely helps to reduce the greenhouse gas emission as well as conserve limited landfill space. Composting is the more prominent and nature-friendly food waste handling methods. This method is a possible option of sustainable food waste management system which can be implemented in Malaysia instead of landfill that contributes to environmental problem.

2. METHODS

There are three main components in this quantitative research including crafting the questions for the survey, execution of the survey and data collection (Figure 1). The work started with the structuring of a series of both close-ended and open-ended questions, which is done via Google Form. The second part involves the spread of the survey in the form of link towards social media applications such as WhatsApp, Twitter, Telegram and Facebook. Respondents are also able to share the same survey to their peers. Then, data obtained from 80 respondents in Gombak area was analyzed using statistical analysis software, SPSS software (IBM SPSS v26).

2.1 Questionnaires

A survey was carried out and shared among Gombak residents to collect data related to food waste disposal in this area. A questionnaire that has been used in this study is a combination of several questionnaires that are usually found in the survey related to household wastes and food wastes. The majority of the questionnaires were about food wastes as the focus of this study is food wastes. The questions for the survey can be found as below in Table 1.

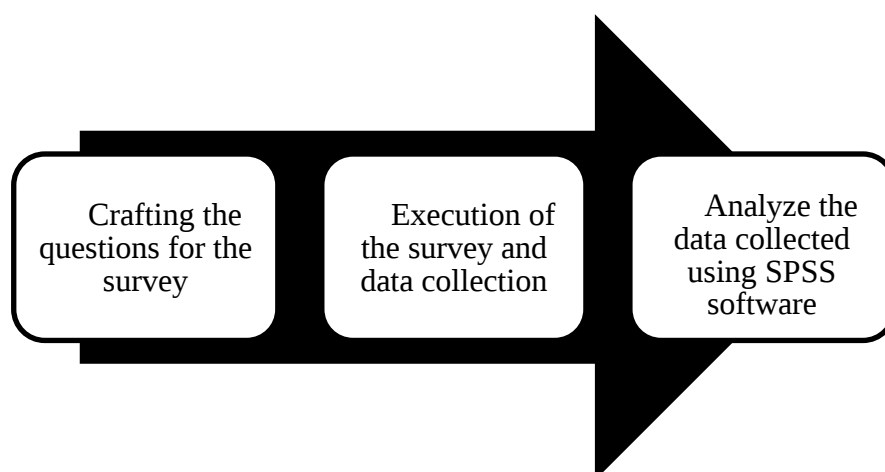


Figure 1. Main components in the quantitative research

Table 1. List of questionnaires in this study

Brief about the respondent:
Area of Gombak/States
Household Size
Type of house
Food wastes related questionnaires:
Recycled items
Amount of food waste disposed of daily
Main type of food wastes that disposed by residents
Main contributor of household food wastes
Respondents may waste less food if
Necessary information to reduce food waste
Agreement on using composter to treat food waste into fertilizer
Amount of used cooking oil disposed of weekly
Location used cooking oil disposed of
Location household waste disposed of
Do respondents do other things to manage food waste?

2.2 Survey's data analysis

Data obtained from the conducted survey from 80 respondents (n=80) were analysed via three inferential analyses; Pearson's chi-squared, Pearson's correlation, and regression.

2.2.1 Descriptive Statistical Analysis

Descriptive statistical analysis was used to summarize the survey data. This analysis was used to measure the frequencies and percentages of all variables included in the survey. Moreover, the sample's normality is interpreted from the Skewness and Kurtosis test values obtained from this analysis.

2.2.2 Hypothesis Test

The hypothesis and null hypothesis of this study was as stated:

Hypothesis, H_1 = Household size effect the amount of food waste disposed of daily.

Null Hypothesis, H_0 = Household size does not affect the amount of food waste disposed of daily.

Dependent variable (DV): Amount of food waste disposed of daily.

Independent variable (IV): Household size.

Chi-Square tests, regression analysis and correlation analysis, were done to investigate the hypothesis suggested.

2.2.3 Chi-Square Test

The purpose of the chi-square test is to evaluate categorical data that are household size and amount of food waste disposed of daily. We did this test to check whether both variables were independent of each other. The variables are considered independent of each other if the p-value obtained from the test exceeds 0.05.

2.2.4 Correlation Analysis

To further investigate the relationship between the independent and dependent variables, the Pearson's correlation was applied. The value of Pearson's correlation coefficient should be ranging within -1 to +1 to indicate a positive or negative correlation. In testing the relationship between variables, 0.70 is strong, within the range of 0.30 to 0.60 is considered moderate, and less than 0.30 would be weak. Furthermore, a significant test was done to decide whether there was any or no evidence that shows a linear correlation present in the population. The null hypothesis was used against the alternative hypothesis. Both the null hypothesis and alternative hypothesis were express as:

$$H_0 : \rho = 0$$

$$H_1 : \rho \neq 0$$

i.e the null hypothesis of no linear correlation present in population against the alternative that there is linear correlation present. The p-value obtained would indicate whether there is strong evidence to believe the hypothesis of the study. P-value lowers than 0.05 indicate strong evidence that the dependent variable linearly correlated to independent variable.

2.2.5 Regression Analysis

We performed regression analysis purposely to identify the predictor and its contribution toward the criterion. We carried it out to determine the prediction of a single dependent variable from an independent variable. The regression model obtained is considered significant if the p-value obtained from the analysis lower than the standard significance level of 0.05.

3. RESULTS AND DISCUSSION

The first part describes the analysis of data followed by a discussion of the research findings. Furthermore, three inferential analyses were performed, Pearson's chi-squared, Pearson's correlation, and regression.

3.1 Survey data

Table 2. Frequencies of each variable

Variables	Categories	Frequency (N)	Percentage (%)
Area of Gombak/States	Batu 10	1	1.3
	Batu Arang	2	2.5
	Batu Caves	5	6.3
	Gombak	6	7.5
	Greenwood	1	1.3
	Jalan Gombak Batu 11	2	2.5
	Kampung Tengah	1	1.3
	Rawang	24	30.0
	Selayang	1	1.3
	Sri Gombak	3	3.8
	Taman Melawati	1	1.1
	Setapak	24	30.0
	Ulu Kelang	9	11.3
Household Size	1-2 person	7	8.8
	3-4 person	39	48.8
	More than 4 person	34	42.5
Type of house	Bungalow	7	8.8
	Condominium	8	10
	Flat/Apartment	18	22.5
	Semi-D	3	3.8
	Terrace	40	50.0
	Town house	3	3.8
	Village house	1	1.3
Recycled items	Paper	63	31.8
	Glass	41	20.7
	Cooking oil	32	16.2
	Plastic	60	30.3
	None	2	1.0
Amount of food waste disposed of daily	Less than 500g	43	53.8
	Less than 1kg	25	31.3
	More than 1kg	8	10.0
	Not sure	4	4.9
Main type of food wastes that disposed by residents	Carbohydrate	24	30.0
	Protein	19	23.8
	Fat	29	36.3
	Vitamin	8	10.0
Main contributor of household food wastes	Food are expired	50	20.4
	Food does not look good	23	9.4
	Food has mold	39	15.9
		36	14.7

	Food does not have good smell or taste	56	22.9
	Food are left in refrigerator for too long	5	2.0
	There is error in meal planning	36	14.7
	Leftovers		
Respondents may waste less food if	Informed on negative impact of food waste to environment	28	21.9
	Informed on negative impact of food waste on economy	18	14.1
	Labels on food were more clear	12	9.4
	Do meal planning	70	54.7
Necessary information to reduce food waste	Tips on how to conserve food properly	46	33.6
	Information of freshness of food	39	28.5
	Organization and initiatives that deals with food waste	52	38.0
Agreement on using composter to treat food waste into fertilizer	Yes	67	75.3
	No	1	1.1
	Maybe	15	18.75
Amount of used cooking oil disposed of weekly	500ml	55	68.8
	1L	14	17.5
	1.5L	5	6.3
	More than 2L	1	1.3
Location used cooking oil disposed of	Sink	29	36.3
	Normal bin	28	35.0
	Send to collection of cooking oil point	23	28.7
Location household waste disposed of	By the side of the road	4	5.0
	In an empty space near the house	3	3.8
	In the dustbin	44	55.0
	Waste collector from the municipality do the door-to-door waste collection	28	35.0
Do respondents do other things to manage food waste?	I have a compost heap	11	14.1
	I send to community compost	7	9.0
	I gave leftovers food to animals	32	41.0
	Nothings	28	35.9

This survey was set up to observe the amount of food waste disposed of per family, specifically for residents in the Gombak area. According to the response, 30.0 percent of the respondents stayed in Rawang. 30.0 percent of them from the Setapak area and another 11.3 percent from Ulu Kelang. The remaining come from several different areas in Gombak.

In addition, the survey found that 42.5 percent of the respondents have household size of more than 4 people, followed by 3 to 4 people (48.8%) and 1 to 2 people occupied 8.8 percent. This is consistent with the Malaysia's average household size, whereby the average is 4.09, 4.06, 4.03 and 4 from 2016 to 2019 respectively [10]. The most common type of home for Malaysian was a terrace house [11]. This corresponds with data collected from the survey. Out of 80 respondents, 50.0 percent reside in a terrace house and the least are those who reside in semi-d, town house and village house, representing 3.8 percent, 3.8 percent and 1.3 percent respectively.

Food waste composition varies according to the type of food waste and its constituents. From Table 2, about 36.3 percent of respondents agree that most of their food waste contains abundant of fat like cooking oil. Carbohydrate ranks second, representing 30.0%, followed by protein (23.8%), and vitamin ranked last with 10.0 percent. It was expected as white rice, Santan, condensed milk, condiment, ice cream, and carbonated drink are listed as common unhealthy foods that Malaysians are addicted to, according to an article released by World of Buzz [12]. White rice is high in carbohydrates while coconut milk has high calories and fat used in most Malaysian dishes.

Based on the data from the survey, most of the respondents disposed less than 500g of food waste daily, representing 53.8 percent. A total of 31.3 percent disposed of less than 1kg of food waste per day. Additionally, 10.0 percent response that their house generated more than 1kg of food waste daily, while the remaining 4.9 percent cannot confirm the exact amount of household food waste disposed of their house. Interestingly, the main reason or contributor of food waste is that food is left in the refrigerator for too long, representing 22.9 percent. Also, about 20.4 percent of respondents agree that food expired is also the main contributor to food waste. Leftovers are ranked as third with 14.7 percent, followed by food have molded representing 15.9 percent. Other reasons include food does not look good (9.4%), food does not have good smell or taste (14.7%), and there is an error in meal planning (2.0%).

Furthermore, most of the respondents choose meal planning when asked about ways that may lead them to reduce food wastage, representing 54.7 percent. 21.9 percent of them also choose better informed on the negative impact of food waste on the environment. In comparison, 14.1 percent also choose better informed on the impact of food waste on the economy. Also, 12 out of 80 respondents choose clear labels on food as another way that may result in to decrease in food waste. In terms of the necessary information to reduce food waste, 38.0 percent choose information regarding organizations and initiatives that deal with food waste. About 33.6 percent choose tips to conserve food as necessary information in reducing food waste. The remaining 28.5 percent choose information on the freshness of food. There is an option for others, but no respondents choose this option. Most importantly, 75.3 percent of respondents agree with the idea of using a composter to treat food waste, whereas 23.6 of them not sure with the idea by responding with maybe. The remaining 1.1 percent not agreed with the idea.

In terms of the amount of used cooking oil, from Table 2, 68.8 percent of respondents disposed of about 500ml of used cooking oil weekly, followed by 1 liter (17.5%), 1.5 liter (6.3%), and more than 2 liter (1.3%). On top of that, most of them disposed of this used cooking oil in the sink, representing 36.3 percent. 35.0 percent disposed of it in normal bin while only 28.7 percent send it to the collection of used cooking oil point. Significantly, some of the respondents have a compost heap and used it to manage their food waste (14.1%). Generally, the majority of the respondents gave their leftovers to animals like their own pets representing 41.0 percent. This way is the most common way for Malaysians to treat their leftovers. Also, a minority of them sends their food waste to community compost (9.0%). 35.9 percent of respondents did nothing to treat their food waste. Moreover, most respondents recycled items such as paper, glass, cooking oil, plastic, and cans. The most recycled item was paper (31.8%), followed by plastic (30.3%), glass (20.7%), and cooking oils (16.2%). Out of 80 respondents, two responded that they did not recycle any item (1.0%).

3.2 Analysis of data

The research continued with chi-square test, correlation analysis and regression analysis to check whether survey data supported the hypothesis suggested.

Hypothesis, H_1 = Household size effect the amount of food waste disposed of daily.

Null Hypothesis, H_0 = Household size does not affect the amount of food waste disposed of daily.

Chi-square test was done to evaluate categorical data which are household size and amount of food waste disposed of daily. This test was applied to check whether both variables are independent of each other. As mentioned before, household size is independent variable while amount of food waste was dependent variable. If both variables were independent, the hypothesis was rejected.

Table 3. Chi-square test

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.229 ^a	6	0.222
Likelihood Ratio	9.600	6	0.143
Linear-by-Linear Association	2.622	1	0.105
No of Valid Cases	80		
a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .35.			

The chi-square statistic's p -value, referring to asymptotic significance in the Table 3, was 0.222, which was more than 0.05. This indicates that the variables were independent of each other, and there is no statistical relationship between these two variables.

To further confirm the hypothesis, Pearson's correlation was applied to investigate the relationship between the independent variable and the dependent variable. Pearson's correlation coefficients (r) range from -1 to +1 for the indication of positive or negative correlation. The findings of the correlations between the dependent variable and independent variable was summarized and presented in Table 4.

Table 4. Correlation analysis

		Amount of food waste
Household size	Pearson correlation	0.182
	Sig. (2-tailed)	0.106
	Frequency (N)	80

The variable was 0.182, which indicates the relatively weak relationship between the independent and dependent variables. This correlation regarded that household size did not relatively affect the amount of food waste disposed of daily.

The hypothesis was further tested with regression analysis. A regression analysis was performed to identify the predictor and its contribution towards the criterion. It aims to determine the prediction of a single dependents variable from an independent variable. Details of the regression analysis findings are shown in Table 5.

Table 5. Regression analysis data

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.977	1	1.977	2.678	0.106 ^a
Residual	57.573	78	0.738		
Total	59.550	79			

a. Predictors: (Constant), Household_size

Importantly, in this sample, the *p*-value was 0.106 which was more than the common significance level of 0.05. This indicates that the regression model as a whole is statistically not significant.

Based on the chi-square test, regression analysis, and correlation analysis, the null hypothesis failed to be rejected, and the hypothesis is not accepted. The survey's data did not establish support for the hypothesis. Failure to reject the null hypothesis does not give a certain strong decision and may need further investigation. This may happen because the sample collected does not provide sufficient evidence to conclude that the effect exists. The effect may actually exist in the population, but the test does not manage to detect it for several reasons. One of the reasons is the size of the sample was too small to detect the effect. It is true as the targeted number of responses for the survey conducted is 200, but only 80 responses were achieved mainly due to time constraints.

Other than that, the result of data collected was not as expected, especially the amount of food waste disposed of daily. According to the Institute of Islamic Understanding Malaysia (IKIM), the average amount of food waste disposed of every day for a family of four people is 1kg [13]. Still, based on data collected from the survey, most respondents with a household size of 3 to 4 people and more than 4 people responded that they dispose of less than 500g of food waste daily. One of the reasons that may lead to this contradiction is respondents did not know the exact amount of food waste generated from

their household. In this case, respondents may not weigh their food waste and only estimate the amount of food waste while answering the survey. The data collected does not support the information reflected in the literature review and failure to reject the null hypothesis.

4. CONCLUSION

This research aims to analyse data collected from the survey specifically in studying the effect of household size on the amount of food waste generated per. Based on the result obtained, many people in the family did not necessarily affect the amount of food waste disposed of daily. The results of Chi-Square test indicated that both variables, which were household size and amount of food waste disposed of daily, were independent of each other, and there was no statistical relationship between them. The hypothesis was further analysed using a correlation test and regression test. Both analyses revealed the *p*-value of the test was more than 0.05, showing no strong evidence to believe that the hypothesis and the regression model were statistically insignificant.

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