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Food Preferences and Food Processing Behavior towards Household Food Waste in Bogor City

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ABSTRACT
Indonesia is recorded to produce 13 million tons of food waste per year, equivalent to 300 kilograms per individual. This makes Indonesia the second highest country with food waste after Saudi Arabia. This cross-sectional study with a sample size of 88 housewife respondents in Bogor City aims to determine the relationship between food preferences and food processing behavior with food waste in households in Bogor City. Data analysis in this study used Spearman rank correlation test because the data was not normally distributed. The results showed that there was a relationship between respondents' food preferences and household food waste (p-value < 0.05) and there was no relationship between food processing behavior and household food waste (p-value > 0.05).

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INTRODUCTION

Food waste is food that is discarded even though it can still be consumed by humans, either stored beyond the expiration date or left to spoil (FAO, 2013). According to the *Food and Agriculture Organization* (FAO), globally, one-third of all food produced for human consumption is lost or wasted. Even in regions such as Africa and South Asia where people still suffer from malnutrition, the amount of waste generated ranges from 400 - 500 calories per person per day (Chalak et al., 2019). In addition, the social costs of food amount to around 415 quadrillion rupiahs globally, which includes 15 quadrillion rupiahs of economic losses in the agricultural food chain, 14 quadrillion rupiahs of losses to human welfare, and 11 quadrillion rupiahs of losses due to the environmental impact of food waste (FAO, 2014). An estimate shows that with the full economic cost of food waste in 2014-2016 around 795 million people-nearly one-ninth of the world's population-suffered from undernutrition (McGuire, 2015).

Indonesia is recorded to produce 13 million tons of food waste per year, equivalent to 300 kilograms per individual (FAO, 2016). This makes Indonesia the second highest country with food waste after Saudi Arabia (The Economist Intelligence Unit (EIU), 2016). This data is also supported by the results of a study from the Ministry of National Development Planning (Bappenas) with several related institutions in 2021 which examined food waste in Indonesia reaching 23-48 million tons per year or the equivalent of 115-184 kilograms per capita per year from 2000 to 2019. This result is also supported by data from the National Waste Management Information System (SIPSN) compiled by the Ministry of Environment and Forestry in 2022 which states that the largest percentage of the national waste composition in Indonesia comes from food waste with 40.52%.

Tracing further, waste problems do not only occur on a national scale, but also occur on a provincial scale, one of which is West Java Province with the largest percentage of food waste also comes from food waste with 41.62%. (KLHK, 2022). Food waste requires special attention from various related institutions, because looking at the percentage of food waste in one of the cities in West Java Province, namely Bogor City, the percentage of food waste continues to increase from 2019-2022 which was only 20% then increased to 40% (KLHK, 2022). Furthermore, food waste in Indonesia is dominated by grains, namely rice, corn, wheat and related products. Meanwhile, the type of food whose process consumes more losses is vegetables with the loss rate reaching 62.8% of the entire domestic supply of vegetables in Indonesia (Bappenas, 2021).

According to FAO (2013), sources of food waste can come from the food supply chain, namely harvesting techniques, post-harvest handling and storage, distribution, food processing behavior, and consumption. This has led to a gap in realizing food security, because increasing food availability only focuses on the upstream part, such as increasing production through agricultural land expansion, which is not matched by efforts to reduce the incidence of food waste in the downstream part, such as food processing and consumption behavior (Kariyasa and Djauhari, 2013 in Fatimah et al., 2022). Based on research conducted by the Food Waste Reduction Alliance (FWRA), food waste generated by residential or households is the largest contributor (47%) (FWRA, 2014 in

Siaputra et al., 2019). In addition, the Ministry of Environment and Forestry of the Republic of Indonesia explained that the largest percentage of waste sources in Indonesia came from households with 38.38% in 2022. On the basis of the data and research above, researchers want to conduct research to find out how the relationship between food preferences and food processing behavior can affect food waste in households.

LITERATURE REVIEW

Food Waste

Food waste is a process of food loss that usually occurs at the final stage of the food chain and is related to consumer behavior. Food waste is the designation of food products intended for human consumption, excluding food from inedible parts of the product (FAO, 2011). According to FAO (2011), food waste consists of two main types of commodities, namely vegetable commodities and animal commodities. Among these two commodities, the consumption stage in households is the main contributor to losses and wastage.

The impact of food waste not only affects hunger, but can also impact the environment and the economy. economy. According to a study report on food waste in Indonesia by Bappenas (2021), food waste can cause greenhouse gas emissions. For example, during the production stage, producers rarely take into account the aspect of land use change such as the construction of plantation or agricultural infrastructure, making them vulnerable to landslides and nutrient loss from the soil, transportation of workers that contributes to air pollution, and transportation of workers that contributes to air pollution, the use of water to irrigate plantations, etc.

Food Preference

Food preferences are the degree of liking and disliking a person has for food. Preference for food is an action or measure of a person's likes or dislikes for food (Maghfirah et al., 2020). Food preferences are considered to determine the food that will be consumed by a person. The more often a person interacts with food, the more likely their food preferences will lead to foods that are more familiar to them. This can also symbolize a person's eating choices and eating habits (Febry & Etrawati, 2020). Food preferences are considered to determine the food that will be consumed by a person. The more often a person interacts with food, the more likely his food preferences will lead to foods that are more familiar to him.

H1: Is there a relationship between food preferences and food waste in households?

Food Processing Behavior

Food processing behavior refers to the changes that occur to food during processing (Cabezas-Zabala et al., 2016). Food must be processed properly so that it is beneficial and not harmful to the people who eat it (Gunawan et al., 2022). However, some processing behaviors such as discarding edible parts when preparing food, not checking food stored in refrigerators and storage cabinets, and discarding food based on the expiration date on the label have also been

linked to contributing to the generation of food waste in households (Nonomura, 2018). This makes consumer behavior, especially in food processing, play an important role in generating household food waste. Thus, understanding processing behavior is considered very important for developing strategies to reduce food waste in households (Weng, 2009).

H2: Is there a relationship between food processing behavior and food waste in households?

Conceptual Framework

The conceptual framework in this study is based on a theoretical framework sourced from various research results from several literature reviews. However, not all characteristics contained in the theoretical framework were examined in this study. Only the most important causal factors of food waste were investigated, including food preferences as an indirect causal factor, and food processing behavior which is a direct causal factor. The variables to be studied in this study can be seen in the following conceptual framework.

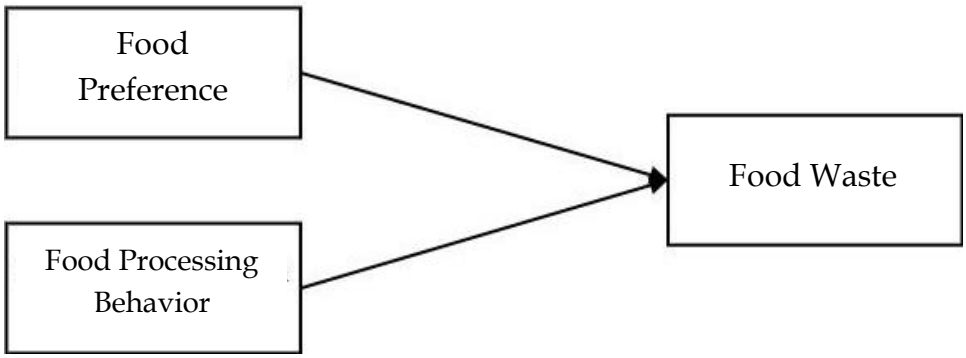

Figure 1. Conceptual Framework

METHODOLOGY

This study used a cross-sectional study design. Primary data was obtained in 2 ways, namely interview sessions using food preference questionnaires and food processing questionnaires which have been validated (0,826 > 0,6) and (0,735 >0,6). The food preference questionnaires and food processing questionnaires use 4 points consisting of Strongly Disagree; Disagree; Agree; and Strongly Agree to represent the respondent's answer. From these 4 points, it will be scored according to the form of the statement. The cut off used as a determinant of food preference is said to be positive if the percentage of food preference scores is ≥60% (Fayasari et al., 2022). Meanwhile, the cut off used as a determinant of food processing behavior is said to be good if the percentage score of food processing behavior is ≥75% (Arikunto, 2014). Furthermore, to measure the food waste of respondents, a food weighing questionnaire was used. The data was obtained by collecting household food waste for 8 consecutive days at 9 am.

Secondary data used in the form of a general description of the research location obtained through the 2021 Central Statistics Agency Report on Tanah Sareal District in Figures. The sample in this study were housewives or people who process food in the household, totaling 88 people. Data collection was carried out from December 2023 to February 2024 in Tanah Sareal District, Bogor

City. [masukin scoring questionnaire] The analysis used in this study includes descriptive analysis and hypothesis testing. Descriptive analysis was used to determine household characteristics, total household expenditure, food preferences and household food processing behavior, and household food waste. While for hypothesis testing, the test used was the Spearman's rank correlation test using SPSS 25 to determine the relationship of food preferences to household food waste and the relationship of food processing behavior to household food waste.

RESEARCH RESULT

The research was conducted in Bogor City because Bogor City has an increasing percentage of food waste. The increase occurred by 20% from the previous 20% in 2019, then increased to 40% in 2022. This increase only occurred within a period of three years (MOEF, 2022). According to data collected by the National Waste Management Information System (SIPSN) in 2023 also shows that food waste still has a percentage of 40% in Bogor City. This makes food waste the largest type of waste generated in Bogor City, even higher than the percentage of plastic waste generated (15%). Furthermore, waste generated from the household sector in Bogor City is also still the highest with a percentage of 62.44% in 2023.

Characteristic of Respondents

This study was conducted in 11 posyandu areas in Kedung Badak Urban Village, Tanah Sareal Subdistrict, Bogor City. The posyandu areas used in data collection include Posyandu Nuri 1, Nuri 2, Nuri 3, Rajawali, Pipit, Dadali, Gelatik 1, Gelatik 2, Garuda 1, Garuda 2, and Dara 2. Respondents in this study are housewives or food processors in the household who have the age of 30 - 55 years with the following characteristics:

Table 1. Respondent's Characteristics

Variable	Mean±SD	Median±SE	Min - Max
Age (years)**	38,81±6,70	37,50±0,71	30 - 55
Number of family members (people)**	4,47±1,25	4,00±0,13	2 - 9
Total Expenses (IDR/month)**	2.598.904±1.178.165	2.319.750±1.184.917	642.500 - 6.637.000
Food Expenditure (IDR/month)**	1.983.085±933.944	1.862.000±99.558	448.000 - 5.587.000
Non-Food Expenditure (IDR/month)**	615.818±573.885	495.500,±61.176	46.000 - 3.675.666
Food Preference (score)*	86,61±9,46	86,00±1,00	65 - 108
Food Processing Behavior (score)*	183,57±15,17	185,50±1,61	134 - 214
Household Food Waste (grams/capita/day)**	81,40±60,77	66,80±6,47	9 - 359
Staple Waste (grams/capita/day)**	38,77±41,53	24,78±4,42	0 - 290,16
Vegetables Waste (grams/capita/day)**	14,23±13,27	10,65±1,41	0 - 80,31

Variable	Mean±SD	Median±SE	Min - Max
Other Food Waste (grams/capita/day)**	12,30±18,80	7,04±2,00	0 - 105,44
Animal Protein Waste (grams/capita/day)**	5,98±7,51	3,32±0,80	0 - 43,91
Fruit Waste (gram/capita/day)**	4,92±12,59	0,20±1,34	0 - 89,97
Vegetable Protein Waste (gram/capita/day)**	4,47±5,16	3,01±0,55	0 - 23,91
Packaged Food Waste (grams/capita/day)**	0,26±0,92	0,01±0,09	0 - 5,10

Description:
*normally distributed data (mean)
**normally distributed data (median)

Table 1 shows that the average age of respondents is 37 years old. Furthermore, it is known that respondents who have a high school / equivalent education level are 39 people (44.3%), junior high school / equivalent education levels are 25 people (28.4%), undergraduate and elementary school education levels are 8 people (9.1%), Diploma III education levels are 5 people (5.7%), and there are still respondents who are not in school with a total of 2 people (2.3%). So it can be concluded that the average respondent has a high school / equivalent level of education. In addition, it is known that the average number of family members in Kedung Badak urban village is 4 people/household. This result is the same as the data on the average number of family members in Bogor City households in 2019, which is 4 people/household (BPS, 2019). This shows that the population growth rate in Kedung Badak urban village has not increased when compared to 2019.

In addition, based on the results of univariate analysis, it is also known that the average money spent by respondents on food is IDR 1.862.000/household/month or equal to 80% of the respondents' monthly income spent on food. Furthermore, the calculation of the proportion of food expenditure in respondent households found that the proportion was 76%. This shows that the percentage of respondents' expenditure on food is above the proportion of respondents' food expenditure. This indicator of the proportion of food expenditure can be used as a reference to see the level of household welfare, which indicates that respondents in this study have low household welfare.

Characteristics of Respondents' Food Preference

From a total of 88 respondents, it is known that the average food preference score is 86.61 points. The following is a frequency distribution table of food preferences from a total of 88 respondents.

Table 2. Frequency Distribution of Respondents' Food Preferences

Variables	n	%
Food Preferences		
≥60% (Positive)	83	94,3%
<60% (Negative)	5	5,7%
Total	88	100%

Based on the table above, it is known that 83 respondents with positive eating preferences (94.3%) and 5 respondents with negative eating preferences (5.7%). Meanwhile, the tendency of respondents' food preferences is at an average score of 86.61 (72.17%). The results of this study have a trend above previous research conducted by Fayasari et al (2022) which states that the score for food preference is 60%.

Furthermore, respondents' food preferences based on the statement with the highest score showed that in determining food preferences, 45 respondents (51%) were more likely to choose foods derived from eggs, milk and dairy products. As many as 40 respondents (45%) choose foods that are easy to process/cook/prepare in order to save processing time. A total of 35 respondents (40%) prefer foods that can provide health benefits to the body. A total of 36 respondents (41%) prefer natural food. And, as many as 32 respondents (36%) prefer food that tastes good. However, respondents' food preferences based on the statement with the lowest score showed that 32 respondents (36%) and 29 respondents (33%) did not avoid foods that were low in calories and fat. As many as 28 respondents (32%) do not care about the food they choose will have an impact on their weight. A total of 27 respondents (31%) stated that they would still eat, even if there were no foods they liked. And, as many as 25 respondents (28%) were reluctant to choose expensive food.

Characteristics of Respondents' Food Processing Behavior

From a total of 88 respondents, it is known that the average score of processing behavior is 183.57 points. The following is the frequency distribution table of food processing behavior of 88 respondents.

Table 3. Frequency Distribution of Respondents' Food Processing Behavior

Variables	n	%
Food Processing Behavior		
≥75% (Good)	36	40,9%
<75% (Bad)	52	59,1%
Total	88	100%

Based on the table above, it is known that respondents with good food processing behavior were 36 people (40.9%) and respondents with poor food processing behavior were 52 people (59.1%). Meanwhile, the tendency of respondents' food processing behavior is at an average score of 183.57 (72.8%). The results of this study have a tendency under previous research conducted by Arikunto (2014)which states that the score for behavior is 75%.

Furthermore, the food processing behavior of respondents based on the statement with the highest score shows that in daily food processing behavior, 70 respondents (80%) have separated dry food ingredients from wet food ingredients to maintain the quality of these food ingredients. A total of 69 respondents (78%) have also paid attention to the food available in the storage cabinet by looking at the *expiration* date of the food ingredients before processing. A total of 65 respondents (74%) checked the quality of food ingredients before use. A total of 62 respondents (70%) processed food according to the number of family members. And, as many as 61 (69%) respondents are accustomed to processing their own food. However, the food processing behavior of respondents based on the statement with the lowest score is known that as many as 49 respondents (56%) still do not make a list of food ingredients to be spent. As many as 47 respondents (53%) more often buy food ingredients for supplies or stock. As many as 39 respondents (44%) have not washed vegetables that will be stored first. As many as 38 respondents (43%) do not store eggs in the refrigerator. Also, 38 respondents (43%) do not consider food portions during weekdays and weekends.

Characteristics of Respondents' Food Waste

From a total of 88 respondents, it was found that the average amount of food waste per day was 66.80 grams/capita/day. The rest of the food group, which is dominated by used cooking oil that has been repeatedly used by respondents, has an average per day of 7.04 grams/capita/day. The remaining food group of animal protein is known to have an average per day of 3.32 grams/capita/day. The rest of the fruit food group is known to have an average per day of 0.20 grams/capita/day. The remaining food group of vegetable protein is known to have an average per day of 3.01 grams/capita/day and the remaining food group of packaged food which is dominated by the remaining sauce and soy sauce packaging that is still left in the packaging has an average per day of 0.01 grams/capita/day. The following is a frequency distribution table of food processing behavior of a total of 88 respondents.

Table 4. Distribution of Respondents' Food Waste

Variables	n	%
Food Waste		
≥79,5g (High)	33	38,0%
<79,5g (Low)	55	63,0%
Total	88	100%

Based on the table above, it is known that respondents with high food waste amounted to 33 people (38.0%) and respondents with low food waste amounted to 55 people (63.0%). These results are in line with previous research which states that food waste produced by the community reaches 79.5 grams/capita/day and is dominated by staple foods, and vegetables. (Diana et al., 2022).

DISCUSSION

Relationship between Food Preferences and Household Food Waste

Based on the results of the Spearman's rank correlation test, it can be interpreted that there is a relationship between respondents' food preferences and household food waste (p-value < 0.05) (r = 0.220). This indicates that the more positive the respondents' food preferences, the higher the food waste produced. These results can be formed because respondents with positive food preferences tend to be more curious about various types of food. So it is not surprising that respondents with positive food preferences tend to contribute more food waste due to their curiosity.

This is in contrast to respondents who have negative food preferences. Because, respondents tend to only consume 'comfort food' that they believe matches their appetite. This makes respondents limit their choices to explore the types of food they consume. This is because the respondents already feel comfortable with the taste of the food they usually consume. This may also cause respondents with negative food preferences to have lower food waste compared to respondents with positive food preferences.

Furthermore, based on the results of further studies, it can be seen that respondents in this study prefer foods derived from eggs, milk and their preparations because the majority of respondents in this study have toddlers in their households. Thus, respondents still consider these commodities to be important food ingredients that must be consumed. In addition, respondents also still choose foods that are high in calories and fat. The results of these food preferences are also in line with the most wasted food waste, namely in staple food commodities, vegetables and other foods which are dominated by cooking oil. This can illustrate that the implementation of balanced nutrition knowledge is still not well implemented, because respondents in this study consider the value of a food commodity only. This can be reflected in the amount of rice, green vegetables such as spinach, kale, mustard greens and pokcoy that are still wasted.

Furthermore, the high generation of used cooking oil can also mean that respondents are still fond of consuming high-fat foods with the main preferred cooking technique being frying. This could indicate that respondents still need to be educated about the principles of balanced nutrition, so that the selection of foods that are low in fat and consist of a variety of foodstuffs can be used as a balanced nutritious food choice that can improve respondents' preferences for food consumed.

These results are also in line with previous research which suggests that household food preferences are strongly influenced by the nutritional knowledge of food processors (Zahroh, 2023). In addition, food preference itself is a very complex process, because its determination is influenced by science and exposure (Swamilaksita & Novianti, 2023). Therefore, education on Prinsip Gizi Seimbang must be carried out repeatedly, so that respondents are increasingly exposed to the principles of balanced nutrition. Thus, it is hoped that in the future there will be an urge to implement it which can also improve respondents' preferences for food which in turn is expected to reduce the resulting food waste.

Relationship between Food Processing Behavior and Household Food Waste

Based on the results of the study, it can be interpreted that there is no relationship between food processing behavior and household food waste (p-Value > 0.05) (r = -0.004). These results can be formed because respondents in this study still have a bad habit of not making a shopping list, so that when there is a discount when the respondent is shopping, the respondent is still interested in it because they think that the food ingredients will save more money spent on food if they buy it at that time. In fact, this can cause respondents' spending on food to become uncontrolled so that respondents' spending is only focused on meeting food needs. Meanwhile, other household needs go unnoticed. Thus, it will lead to a lack of household welfare because other household needs cannot be met properly.

In addition, the amount of food purchased at discounts will also be related to the storage of food ingredients that are not optimal, so that food ingredients that are stored for too long will experience a decrease in quality which will then slowly deteriorate and rot and finally be wasted because of the quality standards of food ingredients owned by each individual for food to be consumed. This result is in line with previous research which suggests that not making a shopping list before buying food is the cause of the difficulty in reducing food waste in households (Mansor et al., 2022). Other studies have also shown that the habit of excessive shopping when there is a discount has also proven to be a contributing factor to the difficulty of reducing food waste (Bravi et al., 2020).

Furthermore, research on a person's behavior is a complex matter. Its existence is strongly influenced by various other factors, including intention with the actions he takes. Previous research also believes that the stronger the intention to do, the more likely the behavior will be carried out or become an action. This is contained in the behavioral approach using the Theory of Planned Behavior (TPB) (Graham-Rowe et al., 2015). However, in practice in everyday life, it is known that intention alone cannot produce the desired behavior and action, because there is a 'value-action gap' in preventing food waste in households (Soma et al., 2021). This is illustrated by respondents' intentions towards discounts that are intended to be more economical, but in fact this actually makes it difficult for respondents to organize storage and makes other household expenses go unnoticed.

In addition, the habit of not making a shopping list is also related to respondents' difficulty in managing family members' meal portions, which causes a lot of food left on the plate. This can certainly be overcome by considering the portion size of each family. Thus, food procurement can be calculated properly to suit the needs of the household which will make food waste can also be reduced. This result is also in line with previous research which reveals that considering the portion of food for each family member affects the incidence of food waste in the household (Liu et al., 2022).

Furthermore, portion control has also been regulated in the 'Tumpeng Gizi Seimbang' and 'Isi Piringku' which serve as guidelines for consumption in Indonesia. This indicates that, indirectly, the Pedoman Gizi Seimbang contribute to the strategy of reducing food waste at the household level. In other words, the

Pedoman Gizi Seimbang can be used as an alternative solution to overcome the difficulty of managing meal portions at the household level. Therefore, it is important to conduct continuous educational activities to increase respondents' exposure to balanced nutrition, so that it is hoped that with increased awareness of respondents, they can improve the portioning of family members' meals so as not to leave food on the plate, which in turn is expected to reduce food waste at the household level.

CONCLUSIONS AND RECOMMENDATIONS

Based on the research, it can be concluded that :

There is a positive relationship between respondents' food preferences and household food waste. This means that the more positive the respondent's food preferences, the higher the food waste generated.

There is no relationship between food processing behavior and household food waste. This means that the worse a person's food processing behavior, the higher the food waste produced.

Based on the results of the research that has been carried out, the main suggestion for future research is to carry out a series of educational activities, including:

1. Conducting training related to making a grocery shopping list to prevent impulsive purchases of food ingredients with the target audience of housewives or food managers in the household.
2. Conduct training related to how to store food ingredients properly and correctly according to the class of food ingredients to prevent the decline or damage of food ingredients caused by incorrect storage with the target of housewives or food managers in the household.
3. Conducting education related to the implementation of the Balanced Nutrition Guidelines on a regular basis to help increase the awareness of housewives or food managers in households about the importance of managing daily food portions.
4. Conduct campaigns related to the importance of reducing food waste, such as the negative impacts that occur if food waste increases and how to turn food waste into something more useful with the target of housewives or food managers in the household.

ADVANCED RESEARCH

Furthermore, based on the results of the research that has been conducted, the main suggestion for future research is to conduct a series of educational activities, including conducting training related to making shopping lists, and good and correct food storage procedures, conducting education related to the application of Pedoman Gizi Seimbang and conducting campaigns on the importance of reducing food waste in households.

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