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The Influence of Sociodemographic Factors on Food Waste Creation

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Abstract

Food waste has emerged as a global issue of growing international concern, with developing countries striving to identify effective strategies to address the problem of food-related waste. In this study, food waste refers specifically to edible household food residues that are discarded despite being fit for consumption. This research aims to analyze the generation of food waste in Singkawang City and to examine the relationship between sociodemographic factors and the amount of food waste generated. The household sampling technique employed in this study was proportionate stratified random sampling, while the selection of individual family member respondents within each household was conducted using incidental sampling. The analytical methods applied include descriptive analysis, food waste quantification, and multiple linear regression analysis. The findings indicate that the highest level of food waste generation occurred in Singkawang Tengah District, producing the largest volume of waste (28,370 kg/year), while the lowest generation was recorded in Singkawang Utara District (7,140 kg/year). Furthermore, the results of the analysis examining the relationship between sociodemographic factors and food waste generation demonstrate that, simultaneously, sociodemographic variables (age, gender, income, education level, occupation, and number of household members) significantly influence the dependent variable (food waste generation). Partially, however, age, gender, education level, and occupation were found not to have a significant effect on food waste generation.

Introduction

Food waste has emerged as a global issue that has attracted increasing international attention in recent years, with developing countries striving to identify effective approaches to address food waste problems (Ghosh et al., 2016; Morone et al., 2019; Sahoo et al., 2024). Food waste is defined as food that is discarded despite still being fit for consumption, occurring at the final stages of the food supply chain and closely associated with consumer behavior (Parfitt et al., 2010; Block et al., 2016; Aktas et al., 2018). The management of food waste falls within the framework of the Sustainable Development Goals (SDGs), particularly Target 12.3. This target emphasizes the need to ensure sustainable consumption and production patterns, including the commitment to halve per capita global food waste at the retail and consumer levels by 2030.

The issue of waste management is not confined to the national level but also manifests at the municipal level, including in Singkawang City. According to the Food and Agriculture Organization (2011, 2013), the causes of food waste can be identified throughout the food supply chain, from production to consumption stages. In Singkawang City, household waste accounts for 14.76% of total waste generation, while public facility waste constitutes the largest proportion at 61.03%. Although household waste ranks second among waste sources in Singkawang City, there remains a significant possibility of an increase in household waste due to continuous population growth.

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Based on data from SIPSN (2019), the composition of generated waste is dominated by food residues, accounting for 51.61% (Sistem Informasi Pengelolaan Sampah Nasional, 2019). This indicates that the level of food wastage in Singkawang City is relatively high, as reflected in household waste generation, and results in economic losses for households due to the disposal of food that could otherwise have been consumed. Furthermore, the prevalence of food waste issues within the community is evidenced by the high volume of waste generated in Singkawang City, amounting to 113.24 tons per day, of which 58.45 tons consist of food waste (Kementerian Lingkungan Hidup dan Kehutanan, 2020)

To understand the underlying reasons behind food disposal behavior at the household level, it is essential to consider consumer behavior and environmental psychology perspectives (Schanes et al., 2018; Visschers et al., 2016; Viswanathan et al., 2014). This approach seeks to explain the causal relationships associated with behavior, including sociodemographic variables and individual determinants such as attitudes, norms, knowledge, and intentions. A recent review study identified behavioral, product-related, personality, and social factors as key drivers contributing to food waste (Roodhuyzen et al., 2017; Gimenez et al., 2023; do Carmo Stangherlin et al., 2020). Such analysis is crucial, as food waste generated by communities particularly at the household level leads to significant economic, environmental, and social losses, including reduced food availability and deterioration in environmental quality.

Efforts to minimize the level of food waste must begin with identifying the factors that contribute to its generation at the household level (STOICA et al., 2025; Farr-Wharton et al., 2014; Canali et al., 2016). Various strategies can be implemented to reduce food waste in Singkawang City. Based on the considerations outlined above, the objective of this study is to examine the influence of sociodemographic factors on the volume of food waste generated in Singkawang City (Vittuari et al., 2023). The findings are expected to serve as a policy reference for local government authorities in developing measures to reduce household food waste (Diana et al., 2022; van der Werf et al., 2021; In this study, the assessment of food waste focuses on the consumption stage in order to determine the volume of food waste generated and to identify the sociodemographic factors influencing it. Furthermore, information on waste generation particularly food waste can provide valuable insights for waste management authorities responsible for handling household food waste, thereby supporting the development of effective strategies to reduce food waste generation (Aloysius et al., 2023; Diaz-Ruiz et al., 2018; Romani et al., 2018).

Methods

This study was conducted in Singkawang City, covering its five districts: Singkawang Barat District, Singkawang Tengah District, Singkawang Timur District, Singkawang Selatan District, and Singkawang Utara District. The research was carried out between November and December 2023. The determination of research samples employed a proportionate random sampling technique by distributing the sample proportionally across the five districts of Singkawang City, namely Singkawang Barat, Singkawang Timur, Singkawang Tengah, Singkawang Selatan, and Singkawang Utara.

The population of this study consists of residents living in the districts of Singkawang City. Given the relatively large population size, the Slovin formula was applied to determine an appropriate sample size. Based on the Slovin calculation, a total of 100 respondents were selected as the study sample (Santoso, 2023). The household sampling technique employed in this study was proportionate stratified random sampling, which is appropriate for populations characterized by non-homogeneous members and distinct strata. Sample selection was conducted by drawing proportional representatives from each population group, with the

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number of selected subjects adjusted according to the size of each subgroup. In this study, the population comprised households located in the districts of Singkawang City. The following section presents the calculation and distribution of the sample based on the proportion of households in each district of Singkawang City.

Number of Respondents=(Population of District A)/(Total Population of Singkawang City) x100%

The study sample also included individual household members. The selection of family member respondents within each household was conducted using an incidental sampling technique (Cochran, 1977). Accordingly, any household member present at the time of data collection in each district was eligible to be selected as a respondent. Multiple linear regression analysis was conducted to address the first research objective, followed by the method for calculating food waste (Araiza-Aguilar et al., 2020). The volume of food waste generated was obtained using the food weighing method. The annual food waste generation was calculated by multiplying the daily food waste generation by the number of days in one year, as presented in the following equation.

$TTs=Ts \times d$

Description:

TTS : Total waste generation (kg/year)

TS : Total household waste generation (kg/day)

d : Number of days in one year

In addition to waste generation, the composition of food waste was also analyzed. According to SNI 19-3964-1994 (Badan Standarisasi Nasional, 1994), waste composition is measured by weighing each separated component of food waste. After obtaining the weight of each component, it is divided by the total weight of all food waste generated. The formula used to calculate the composition of food waste is presented as follows.

$\%composition=Bi/TBi \times 100\%$

Description:

Bi : Weight of household waste component i (kg)

Tbi : Total weight of household waste (kg)

The first objective of this study is to examine whether there is a relationship between sociodemographic factors and the volume of food waste generated, which was analyzed using multiple linear regression. Multiple linear regression analysis is a statistical method used to determine the influence of several independent variables on a dependent variable. In this study, the dependent variable is the volume of food waste generated, while the independent variables consist of the respondents' sociodemographic characteristics, as specified in the following equation:

$$Y = \alpha + \beta 1UMR + \beta 2JK + \beta 3PDTN + \beta 4PDKN + \beta 5KRJ + \beta 6JAK \quad (2)$$

Description:

α = Intercept

Y = Volume of food waste generated

$\beta_1 - \beta_6$ = Regression coefficients

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UMR = Respondent's age

JK = Respondent's gender

PDTN = Monthly income

KRJ = Occupation

PDKN = Respondent's highest level of education

JAK = Number of household members

Results and Discussion

Food Waste Generation

The Food and Agriculture Organization (FAO) and the Indonesian Ministry of Agriculture have acknowledged that food waste represents a tangible and pressing issue occurring at the consumption stage. The Ministry of Agriculture has also highlighted the distinction between food loss and food waste. However, data on food waste generation in West Kalimantan Province, particularly for Singkawang City, remain unavailable. Therefore, the first stage of this study was to identify the level of household food waste generation in Singkawang City.

Household food waste generation was calculated based on food that remained edible but was not fully consumed by household members. Based on the analysis of household waste generation in each district, the annual volume of food waste generated is presented in Table 1.

Table 1. Food Waste Generation by District

District	Food Waste	
	Kg/Week	Kg/Year
Singkawang Barat	25,17	9187
Singkawang Tengah	28,37	10355
Singkawang Utara	7,14	2606
Singkawang Timur	11,03	3245
Singkawang Selatan	22,08	7659
Total	93,79	33052

Source: (Processed Primary Data, 2023)

The results of the analysis on food waste generation indicate that Singkawang Tengah District produced the highest annual food waste generation (28,370 kg/year), while the lowest was recorded in Singkawang Utara District (7,140 kg/year). The total food waste generated across the five districts amounted to 93.79 kg/day, equivalent to approximately 33 tons per year. Singkawang Tengah District emerged as the largest contributor to food waste generation, which may be attributed to its status as the most densely populated district in Singkawang City.

According to Raharjo and Geovani (2014), waste composition refers to the constituent components contained within waste, expressed as a percentage by weight, and is used to determine the required equipment, management systems, and planning strategies in waste management. The composition of household food waste in this study consists of five components: rice, vegetables, poultry, beef, and fish. The proportion of each food waste component in the respective districts is presented in Figure 1.

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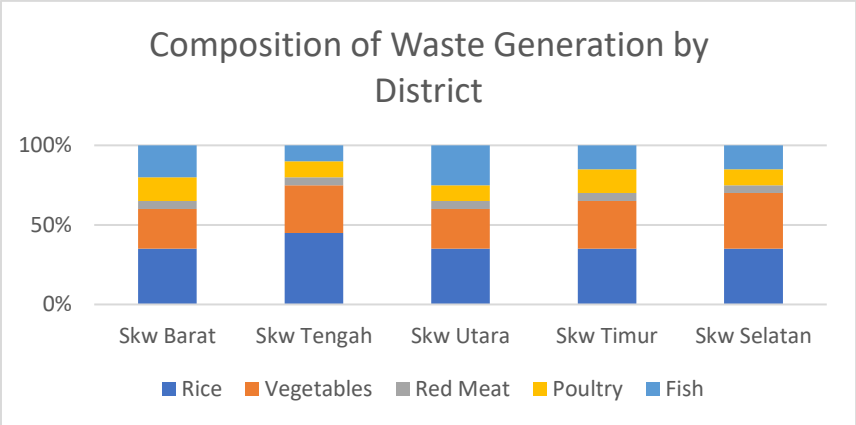

Figure 1. Composition of Waste Generation by District
Source: Processed Primary Data 2023

Based on Figure 1, the largest proportion of food waste generated across the five districts consists of rice and vegetables. Both rice and vegetables show relatively balanced percentages, ranging between 30–40% in each district. Notably, in Singkawang Tengah District identified as the district with the highest food waste generation rice accounts for as much as 44% of the total food waste composition. Rice is a primary carbohydrate source and is widely regarded as the staple food of the Indonesian population. Approximately 98% of Indonesians consume rice as their main staple (Maligan et al., 2019). The high proportion of rice-related food waste is largely attributed to the common practice of cooking rice in excessive quantities at one time. (van Dooren et al., 2020) Additionally, when individuals feel satiated, they often prioritize finishing side dishes or vegetables rather than rice, resulting in leftover rice that remains uneaten. Another common practice among some households is to feed leftover rice to domestic livestock.

Vegetables also constitute one of the largest components of food waste across all districts. The high proportion of vegetable waste can be attributed to the fact that vegetables are a staple food item in most households due to their nutritional benefits as sources of protein, minerals, and vitamins essential for human health (Petrescu-Mag et al., 2024). In addition, vegetables are relatively affordable, resulting in high purchasing power and frequent consumption. Vegetables are often discarded because individuals tend to dispose of them immediately after meals, particularly when prepared using sautéing or stir-frying methods. Moreover, it is uncommon for leftover vegetables to be reheated and consumed later; instead, they are typically discarded (Magalhães et al., 2021).

In contrast, meat represents the smallest proportion in the composition of food waste across the five districts (Karwowska et al., 2021). In each district, meat accounts for less than 10% of total food waste. The relatively low level of meat-related food waste is primarily due to lower consumption rates within the community. Beef has long been categorized as one of the five strategic food commodities targeted for increased production to achieve self-sufficiency; however, this objective has never been fully realized (Trasca et al., 2024). This is largely because beef prices in the market are considerably higher compared to other food commodities, leading to lower purchasing power. The high cost of beef also encourages individuals to avoid leaving leftovers when consuming it. As food prices increase, people tend to minimize waste and consume food more completely. Consumption experience has been found to have a very weak influence, whereas income exerts a much stronger influence on food-related behavior (Jeswani et al., 2021).

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Analysis of Sociodemographic Factors on the Volume of Food Waste: F-Test

Based on the results of the simultaneous test presented in the table, the calculated F-value (F_calculated) is 17.611 with a significance value of 0.00, while the critical F-value (F_table) at a 5% significance level (0.05) is 2.11. These results indicate that F_calculated ≥ F_table (17.611 ≥ 2.11) and the significance value of 0.00 ≤ 0.05. Therefore, it can be concluded that the six independent variables simultaneously have a positive and significant influence on the dependent variable (Y), namely the volume of food waste. In other words, gender, age, education, occupation, income, and the number of household members collectively affect the volume of food waste generated.

Table 2. Analysis test result

Variable	Coeficient	t-Statistic	Sig.
C	2.741	44.514	0.000
X1	0.05	0.307	0.760
X2	-0.001	-0.918	0.361
X3	-0.016	-0,807	0,421
X4	1.971	3,802	0,000
X5	0.041	7.473	0.000
X6	-0.009	-0.565	0.573
X7	0.048	3.134	0.002
Adjusted R2			**0.540**
R^2			**0.573**
F Statistic			**17,611**
F sig			**0.000**

Source: Primary Data Processed, 2023

Based on the results presented in Table 4, the SPSS analysis for the gender variable (X1) on the volume of food waste (Y) yielded a t-value (t_calculated) of 0.307, while the critical t-value (t_table) was 1.986. The significance value obtained was 0.000, which, according to the reported results, is greater than the 0.05 significance level. Since t_calculated < t_table (0.307 < 1.986) and the significance value exceeds 0.05, the hypothesis is rejected. Thus, gender (X1) does not have a positive and significant effect on the volume of food waste (Y). It can therefore be concluded that gender does not influence the volume of food waste generated. Field observations indicate that the majority of respondents in this study were female. As noted by Grasso et al. (2019), their research suggests that males tend to generate more food waste than females.

Furthermore, the SPSS test results for the age variable (X2) on the volume of food waste (Y) yielded a t-value (t_calculated) of −0.918, while the critical t-value (t_table) was 1.986. The significance value obtained was 0.760, which is greater than the 0.05 significance level. Since t_calculated < t_table (−0.918 < 1.986) and the significance value exceeds 0.05 (0.760 > 0.05), the hypothesis is rejected. Therefore, age (X2) does not have a positive and significant effect on the volume of food waste (Y). These findings indicate that age does not significantly influence food waste generation. This result is consistent with the study conducted by Grasso et al. (2019), which reported that age has a negative association with food waste generation, indicating a weak or non-significant effect. Their study also suggested that older individuals (above 65 years) tend to reduce food waste. However, the findings of this study show that age

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is not the most influential factor, as adolescents tend to leave more leftovers, while adults leave less. Most respondents in this study were adults who generally exercise greater control over food consumption and portion sizes, resulting in lower levels of leftover food.

Table 3. Effect of Each Variable

Variable	t-statistic	Sig.
X1	-0,131	0,896
X2	-0,347	0,729
X3	1,848	0,068
X4	-0,611	0,542
X5	**2,108**	**0,038**
X6	**4,900**	**0, 000**

Source: Primary Data Processed, 2023

For the occupation variable (X3) in relation to the volume of food waste (Y), the calculated t-value (t_calculated) was −0.807, while the critical t-value (t_table) was 1.986. The significance value obtained was 0.361, which is greater than the 0.05 significance level. Since t_calculated < t_table (−0.807 < 1.986), the hypothesis is rejected. Thus, occupation (X3) does not have a positive and significant effect on the volume of food waste (Y). It can therefore be concluded that occupation does not influence food waste generation. This finding is consistent with the study conducted by Grasso et al. (2019), which reported that individuals who are unemployed tend to generate less food waste compared to those who are employed.

For the income variable (X4), the calculated t-value (t_calculated) was 7.473, while the critical t-value (t_table) was 1.986. The significance value obtained was 0.000, which is less than 0.05. Since t_calculated > t_table (7.473 > 1.986) and the significance value is below the 0.05 threshold (0.000 < 0.05), the hypothesis is accepted. This indicates that income (X4) has a positive and statistically significant effect on the volume of food waste (Y). Therefore, income significantly influences food waste generation. Income reflects the purchasing power of consumers, which determines the quantity of products that can be consumed by individuals and their household members. This statement is supported by Canali et al. (2017), who assert that higher income levels are associated with increased food waste. Household purchasing power is determined by the combined income of all family members. In contrast, lower income levels restrict food preferences due to limited purchasing power, leading households to adopt more cautious and economical food purchasing behaviors.

For the fifth variable, namely the number of household members (X5), the calculated t-value (t_calculated) was −0.565, while the critical t-value (t_table) was 1.986. The reported significance value was 0.00, which is less than 0.05. Based on the decision criteria (t_calculated > t_table and significance < 0.05), the hypothesis is accepted, indicating that the number of household members (X5) has a positive and statistically significant effect on the volume of food waste (Y). Thus, it can be concluded that the number of household members influences food waste generation. An increase in the number of individuals within a household contributes to greater food waste generation (European Commission & Report, 2010), as larger households tend to prepare greater quantities of food, thereby increasing the potential for leftovers. The findings of this study further indicate that households with three or fewer members tend to cook according to the exact number of family members, whereas households with more than three members are more likely to prepare excess food, resulting in higher levels of food waste.

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The seventh variable, residential location (X7), yielded a calculated t-value (t_calculated) of 2.154, while the critical t-value (t_table) was 1.986. The significance value obtained was 0.002, which is less than 0.05. Since t_calculated > t_table (2.154 > 1.986) and the significance value is below 0.05 (0.002 < 0.05), the hypothesis is accepted. This indicates that residential location (X7) has a positive and statistically significant effect on food waste (Y). Areas located closer to urban centers tend to contribute to higher levels of food waste (Secondi et al., 2015). This may be attributed to the more consumptive lifestyle of individuals living near city centers, facilitated by easier access to markets and shopping centers. In contrast, districts such as Singkawang Timur, Singkawang Utara, and Singkawang Selatan have relatively limited access to large traditional markets. Additionally, cultural practices particularly in Singkawang Utara and Singkawang Selatan such as sharing food with neighbors, may also contribute to lower levels of food waste in these areas.

Conclusion

Based on the findings of this study, food waste at the consumer level primarily originates from households. The highest level of food waste generation was recorded in Singkawang Tengah District, reaching 28,370 kg per year, while the lowest was observed in Singkawang Utara District at 7,140 kg per year. The main reasons households leave food uneaten are the absence of further consumption and food spoilage. In terms of disposal practices, most households discard leftovers directly, although some repurpose them as animal feed. These findings highlight the significant contribution of household behavior to overall food waste generation and underline the importance of consumption-stage interventions in urban waste management strategies.

The analysis further demonstrates that income and the number of household members are the only sociodemographic variables that exert a statistically significant influence on food waste generation in Singkawang City. Higher income levels increase purchasing power and the likelihood of surplus food, while larger households tend to prepare greater quantities of food, thereby increasing the probability of leftovers. The novelty of this study lies in its provision of empirical data on household food waste generation in Singkawang City where such data were previously unavailable and in its integration of direct food weighing methods with sociodemographic regression analysis at the municipal level. Future research is recommended to expand the scope by incorporating behavioral and psychological variables, longitudinal data, and comparative analyses across different urban and rural contexts to better understand the dynamic drivers of food waste and to design more targeted and sustainable policy interventions.

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