Analysis Factors Influencing Community Behaviour in Food Waste Reduction

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Abstract

Food waste is a significant global issue with environmental, economic, and social implications. So that it should be analyze more to get solution. This study aims to analyze the factors influencing community behavior in food waste reduction, focusing on the knowledge, attitudes, and actions of individuals. Using a quantitative research methodology, data was collected from 69 respondents via a Google Form survey. Structural Equation Modeling (SEM) was used to test the hypotheses, revealing significant relationships among the variables. The findings indicate that individual characteristics positively affect knowledge about food waste, which in turn influences attitudes and behaviors towards reducing food waste. The study contributes to increasing the understanding of how personal and psychological factors can be driven to food waste reduction behaviors and support a more extension/campaign programs to reduce food waste at the community level.

Keywords: Attitudes; community behavior; knowledge; food waste; extension program.

1. Introduction

Food waste has emerged as a critical global issue, with significant environmental, economic, and social consequences. According to the Food and Agriculture Organization (FAO), approximately one-third of the food produced for human consumption is lost or wasted globally, amounting to about 1.3 billion tonnes per year. The environmental impact includes the wastage of resources such as water, energy, and land, as well as the emission of greenhouse gases from decomposing food waste in landfills [1]. Economically, food waste translates to a substantial loss of financial resources for individuals and businesses, exacerbating food insecurity issues, particularly in developing regions. For this reason, food waste behavior must be prevented and minimized.

Understanding and addressing food waste requires a multi-faceted approach, involving changes at the individual, household, and community levels. Recent studies have emphasized the importance of personal knowledge, attitudes, and behaviors in influencing food waste reduction efforts. The authors in [2] highlighted those variables such as age, efforts to reduce food waste, guilt, and anxiety about wasting food are significantly related to lower levels of food waste. Furthermore, the authors in [3] identified consumer income and temporal decision sequences as critical factors influencing food waste behaviors. These insights underscore the need for targeted educational and behavioral interventions to mitigate food waste effectively.

Despite the growing body of research on food waste, there remains a gap in understanding how various individual characteristics and psychological factors collectively influence food waste behaviors. This study addresses this gap by investigating the relationships between respondents' characteristics, knowledge, attitudes, and behaviors towards food waste reduction. By employing a comprehensive analytical framework, this research aims to elucidate the pathways through which knowledge and attitudes translate into concrete actions to reduce food waste.

The general solution proposed in this study involves enhancing community awareness and understanding of food waste issues through targeted educational programs. By improving individuals' knowledge and fostering positive attitudes towards food waste reduction, it is anticipated that more sustainable behaviors will emerge. This approach aligns with the principles of the Theory of Planned Behavior (TPB), which posits that behavior is directly influenced by attitudes, subjective norms, and perceived behavioral control [4].

Building on the existing literature, this study explores several key factors that have been identified as influential in food waste behavior. The authors in [5] found that individual attitudes towards reducing food waste, subjective norms, and perceived behavioral control positively impact food waste reduction behaviors. The authors in [6, 7] highlighted the role of psychological factors, environmental concern, and personal attitudes in shaping food waste behaviors. These studies suggest that interventions aimed at reducing food waste should consider both individual and contextual factors to be effective.

External factors such as vanity and food satisfaction have also been shown to impact food waste behavior [8, 9]. Understanding these nuanced influences can help in designing more comprehensive strategies that address both intrinsic and extrinsic motivations for reducing food waste. Additionally, the role of food portion size,

awareness of food waste issues, and concern about environmental impacts are crucial elements that need to be incorporated into educational campaigns [10].

Furthermore, studies have delved into the role of knowledge, attitudes, and practices in food waste management among different groups. Research has explored the knowledge, attitudes, and practices of housewives in managing household food waste [11] and foodservice operators [12]. These findings underscore the importance of tailored interventions that address the specific needs and circumstances of different demographic groups.

Despite these advancements, there remains a need for more detailed investigations into how knowledge about food waste translates into attitudes and actions. While prior studies have identified key variables influencing food waste behaviors, there is a lack of comprehensive models that integrate these factors into a cohesive framework. Additionally, there is limited research on the role of socio-demographic characteristics in shaping food waste behaviors within specific community contexts.

This study aims to fill these gaps by employing a Structural Equation Modeling (SEM) approach to test the relationships between individual characteristics, knowledge, attitudes, and behaviors related to food waste. By doing so, it seeks to provide a more nuanced understanding of the pathways through which these variables interact and influence each other.

The primary objective of this study is to analyze the knowledge, attitudes, and actions/behavior of the community regarding efforts to reduce food waste. Additionally, the study aims to identify and evaluate the factors that influence people's behavior concerning food waste reduction efforts. The hypotheses guiding this research are as follows:

1. Respondents' characteristics have a positive and significant effect on respondents' knowledge about food waste.
2. Respondents' knowledge about food waste has a positive and significant effect on respondents' attitudes towards reducing food waste.
3. Respondents' knowledge about food waste has a positive and significant effect on respondents' actions/behavior towards reducing food waste.
4. Respondents' attitudes about food waste have a positive and significant effect on respondents' actions/behavior towards reducing food waste.

This study is novel in its comprehensive examination of the interconnectedness of individual characteristics, knowledge, attitudes, and behaviors towards food waste. The scope of the research includes analyzing data collected from a sample of community members, employing advanced statistical techniques to validate the proposed hypotheses, and providing actionable insights for policymakers and community organizers.

2. Materials and Methods

The study used a quantitative research methodology to collect and analyze data on community behavior towards food waste reduction. The primary data collection instrument was a structured questionnaire administered via

Google Forms. The questionnaire comprised sections on respondents' demographic characteristics, knowledge about food waste, attitudes towards food waste reduction, and behaviors/actions related to food waste. The number of sample was 69 respondents of Griya Melati 1 housing complex, Bubulak Village, Bogor City, who voluntary responded to a questionnaire distributed via Google Form. The questionnaire was distributed for two months in December 2023 - January 2024 after going through a validity test. The sample size was deemed sufficient for the application of Structural Equation Modeling (SEM) techniques, which require a minimum sample size for reliable results.

The questionnaire was get to capture comprehensive data on the variables which will analized. It included multiple-choice questions, Likert-scale items, and open-ended questions to gather qualitative insights. The data collection process ensured the anonymity and confidentiality of the respondents. The key parameters measured in the study included: 1. Individual characteristics (e.g., age, education level, income). 2. Knowledge about food waste (e.g., awareness of food waste issues, understanding of expiry dates). 3. Attitudes towards food waste reduction (e.g., beliefs about the importance of reducing food waste, perceived behavioral control). 4. Behaviors/actions related to food waste (e.g., frequency of food waste, efforts to reduce food waste). Structural Equation Modeling (SEM) was employed to test the hypotheses and analyze the relationships between the variables. SEM is a robust statistical technique that allows for the simultaneous examination of multiple relationships among observed and latent variables. The analysis was conducted using software such as SmartPLS or AMOS, and the results were interpreted based on standard criteria for model fit and significance of path coefficients.

3. Results and Discussion

3.1. Results

3.1.1. Characteristics of Respondents

Respondents' ages ranged from 30 to around 60 years where most of them (97,1 percent) were a productive age. It is indicating that the respondent were a potential human resources.

Table 1: Respondent's age

Age Category (year)	Frequency	Percent
30 - 39	10	14.5
40 - 49	28	40.6
50 - 59	29	42.0
60+	2	2.9
Total	69	100

From the education aspect, Table 2 shown that a significant proportion of respondents (68.1%) held undergraduate degrees (D3-S1), suggesting a relatively high level of education, which could influence their knowledge and attitudes towards food waste.

Table 2: Responden's education

Level of Education	Frequency	Percent
High school	4	5.8
D3-S1	47	68.1
S2	13	18.8
S3	5	7.2
Total	69	100

Table 3 shown that respondents' income levels per month ranged from less than IDR 5 million to more than IDR 20 million. Nearly half of them earn between IDR 5 million - <IDR 15 million. However, there are quite a few who earn more than IDR 20 million per month (29 percent). This condition shows that the economic level of most respondents is high.

Table 3: Responden's income

Age Category (year)	Frequency	Percent
< IDR 5 million	8	11.6
IDR 5 million - <Rp10 million	15	21.7
IDR 10 million - < IDR 15 million	16	23.2
IDR 15 million - < IDR 20 million	10	14.5
IDR 20 million +	20	29.0
Total	69	100.0

The majority of respondents (43.5%) had 3-4 family members, which could influence household food management practices and waste generation. This condition can be seen from Table 4.

Table 4: Number of family members

Number of family members	Frequency	Percent
Do not have	1	1.4
1-2 people	20	29
3-4 people	30	43.5
5-6 people	16	23.2
> 6 people	2	2.9
Total	69	100

3.1.2. Level of Knowledge about Food Waste

To determine the level of respondents' knowledge about food waste and food loss, they were asked 10 questions.

These 10 questions cover the meaning of both, what is the position of Indonesian people's food waste behavior at the world level and its impact from environmental, social and political aspects. Apart from that, questions were also asked related to prevention efforts and the value of losses that must be borne due to very high food waste behavior.

From the tracking results, it is known that the level of respondents' knowledge about food waste is still low. Around 40.6 percent of them are still in the don't know category and there are even 13 percent who are in the very don't know category. Meanwhile, those who are in the knowing and very knowledgeable categories reach 46.3 percent. This condition can be seen in Table 5.

Table 5: Level of knowledge about food waste

Knowledge	Frequency	Percent
Don't know	9	13
Do not know	28	40.6
Know	23	33.3
Very know	9	13
Total	69	100

3.1.3. Attitude toward Food Waste

Respondents' attitudes towards food waste behavior are measured by how they respond to a number of food waste behaviors. For example, the behavior of taking excessive portions of food, not finishing the food he has taken, not wanting to finish food in front of other people because of pride, and throwing leftover food in the trash. They were also asked what their attitude was towards efforts to prevent it, for example by teaching it to children from a young age and increasing socialization through social and religious institutions. Table 6 describe the result.

Table 6: Attitude toward Food Waste

Category	Frequency	Percent
Strongly disagree	11	15.9
Disagree	21	30.4
Agree	28	40.6
Strongly agree	9	13.0
Total	69	100

3.1.4. Respondents'Actions to Reduce Food Waste

To find out how respondents behave in food waste, several questions were asked regarding their daily habits in

terms of the frequency of leaving food in a day and the volume of food thrown away in one day. From this it appears that there are still quite a lot of respondents who behave badly, in the sense that they still like to commit acts of food waste. Most of the food prepared is vegetables (raw or cooked), followed by rice, side dishes and snacks.

Table 7: Respondents'Actions to Reduce Food Waste

Category	Frequency	Percent
Never	15	21.7
Seldom	23	33.3
Often	14	20.3
Always	17	24.6
Total	69	100

3.1.5. Factors Influencing Food Waste Behavior

The study utilized Structural Equation Modeling (SEM) with Partial Least Squares (PLS) to test the proposed hypotheses. The SEM PLS model illustrates the relationships between individual characteristics, knowledge, attitudes, and actions/behaviors towards food waste reduction. The path coefficients, T statistics, and P values provided in the figure help in understanding the significance and strength of these relationships.
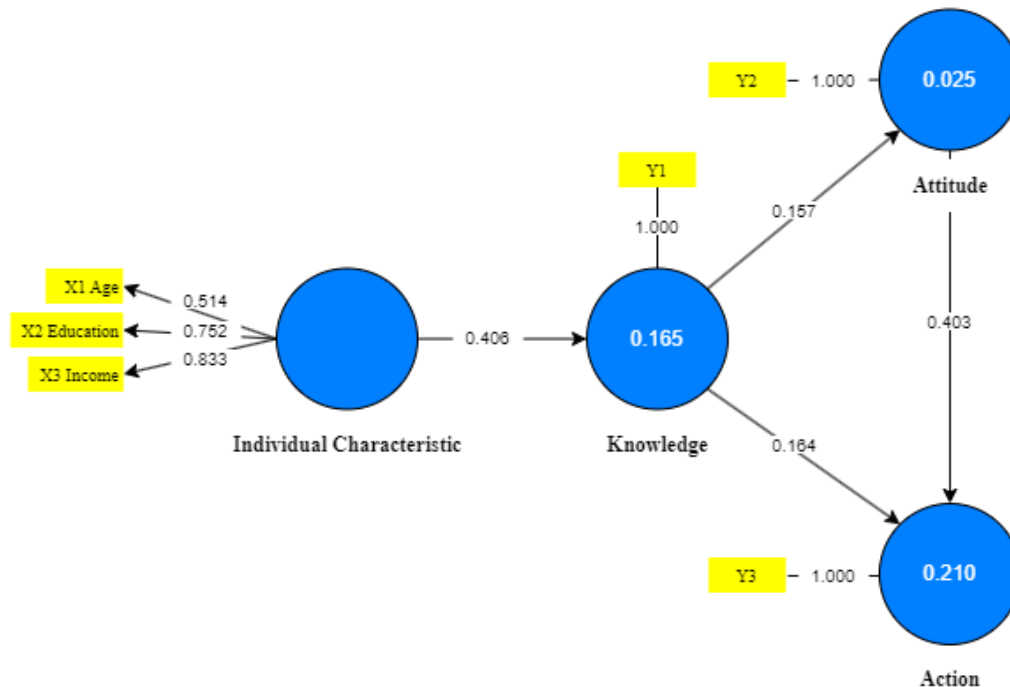

Figure 1: SEM PLS Model Test Results for Food Waste Behavior

3.1.6. Interpretation of the SEM PLS Model

The path coefficient of 4.883 indicates a strong and positive relationship between individual characteristics (such as age, education, and income) and knowledge about food waste. The T statistic of 4.883 and a P value of 0.000 confirm that this relationship is statistically significant. This suggests that individual characteristics play a crucial role in enhancing knowledge about food waste.

Tabel 8: Statistical Test Results of Factors Affecting Food Waste Behavior

	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
Individual Characteristic → Knowledge	0.406	4.883	0.000
Knowledge → Attitude	0.157	1.307	0.096
Knowledge → Action	0.164	1.689	0.046
Attitude → Action	0.403	4.565	0.000
* significant at the 95% confidence level			

From Table 8, it can be seen that the path coefficient of 1.307 indicates a positive relationship between knowledge and attitudes towards food waste reduction. However, the T statistic of 1.307 and a P value of 0.096 indicate that this relationship is not statistically significant at the 95% confidence level. This suggests that while knowledge may positively influence attitudes, the effect is not strong enough to be considered significant in this sample. Table 8 also show that the path coefficient of 1.689 indicates a positive relationship between knowledge and actions/behavior towards food waste reduction. The T statistic of 1.689 and a P value of 0.046 indicate that this relationship is statistically significant at the 95% confidence level. This suggests that increased knowledge about food waste leads to more frequent actions/behaviors aimed at reducing food waste. Beside, the path coefficient of 4.565 indicates a strong and positive relationship between attitudes and actions/behavior towards food waste reduction. The T statistic of 4.565 and a P value of 0.000 confirm that this relationship is statistically significant. This suggests that positive attitudes towards food waste reduction strongly influence actions and behaviors aimed at reducing food waste.

3.2. Discussion

This study's findings align with prior research emphasizing the interplay between individual characteristics, knowledge, and attitudes in influencing food waste behaviors. McCarthy and Liu [2] identified age and efforts to reduce food waste as critical factors, while Setti and his colleagues [3] emphasized the role of income and decision-making. Expanding on these insights, this study demonstrates significant pathways through which knowledge and attitudes influence behavior, validated through SEM analysis.

The positive relationship between knowledge and actions underlines the need for targeted educational initiatives. Increasing awareness about the environmental, economic, and social impacts of food waste can foster sustainable behaviors, as supported by Nunkoo and his colleagues [5]. Moreover, the role of attitudes as mediators of behavior change underscores the importance of shaping positive perceptions and beliefs about food waste reduction. Reference [13] also concluded that attitudes have a more substantial influence on behavior compared to knowledge, suggesting that interventions should prioritize activities aimed at cultivating supportive

attitudes. For example, campaigns like DKI Jakarta's SAMTAMA program can serve as models for community engagement.

Interestingly, this study highlights a discrepancy between high awareness and inconsistent actions, reflecting a common intention-behavior gap. Zhang and his colleagues [14] reported similar findings, noting that urban residents exhibit stronger alignment between intention and behavior than rural counterparts. Addressing this gap may involve combining education with practical interventions, such as visual tools for portion size estimation, as demonstrated by Swamilaksita and his colleagues [14], which significantly improved household food management practices.

Furthermore, behavioral and situational factors significantly influence household food waste practices. Aloysius and his colleagues [15] observed that efficient meal planning, inventory management, and food storage techniques directly impact leftover management. This aligns with our findings, suggesting that equipping households with practical skills could mitigate food waste. During the COVID-19 pandemic, households in Australia reduced food waste by 9%, driven by increased planning and improved storage behaviors, as reported by Ananda and his colleagues [16]. These insights emphasize the potential of leveraging crises to instill long-term positive behaviors.

The influence of individual characteristics on knowledge, as identified in this study, is consistent with the literature. For example, education and income levels were positively associated with food waste awareness [2, 5, 13]. Policymakers should design tailored interventions addressing the specific needs of demographic groups. High-income households, for instance, could be encouraged to act as influencers within their communities, while interventions targeting lower-income groups should prioritize affordability and accessibility.

Lastly, attitudes were shown to significantly mediate the relationship between knowledge and behavior, reaffirming their importance in driving sustainable actions. Educational programs should aim to foster not only awareness but also a sense of personal responsibility and community stewardship. Integrating emotional appeals, as suggested by Aloysius and his colleagues [15], could further enhance the effectiveness of such interventions by addressing the psychological drivers of food waste.

3.2.1. Implications of the theory

1.   Role of individual characteristics in knowledge formation

The significant impact of individual characteristics on knowledge underscores the importance of demographic factors such as age, education, and income in shaping awareness about food waste. This finding aligns with previous research by the authors in [2], which highlighted the influence of these variables on food waste awareness. Policymakers and educators should consider these characteristics when designing educational interventions to ensure they are effectively targeted.

2.   Knowledge as a driver of behavior change

The positive and significant relationship between knowledge and actions/behavior towards food waste reduction indicates that enhancing knowledge is crucial for promoting sustainable behaviors. Educational campaigns should focus on increasing awareness about the environmental, economic, and social impacts of food waste to encourage behavior change. This finding supports the conclusions of the authors in [5], who emphasized the importance of knowledge in driving sustainable behaviors.

3.   Attitudes as mediators of knowledge and behavior

Although the relationship between knowledge and attitudes was not found to be statistically significant, the strong and significant impact of attitudes on actions/behavior highlights the critical role of attitudes in mediating the effect of knowledge on behavior. This suggests that educational interventions should not only focus on imparting knowledge but also on shaping positive attitudes towards food waste reduction. This can be achieved by emphasizing the benefits of reducing food waste and fostering a sense of personal responsibility and environmental stewardship.

3.2.2. Limitations of the Study

This study has several limitations that should be acknowledged. First, the sample size of 69 respondents, although sufficient for Structural Equation Modeling (SEM) analysis, may not fully capture the diversity of behaviors and attitudes within larger or different populations. Future studies with larger and more representative samples could provide more generalizable findings. Second, the data collection was conducted via self-reported questionnaires, which are subject to biases such as social desirability and recall inaccuracies. Employing mixed methods, such as integrating observational or experimental approaches, could enhance the reliability of the data. Third, the study focuses on a specific community in Bubulak Village, Bogor City, which may limit the applicability of the results to other socio-economic or cultural contexts. Comparative studies across diverse regions or demographic groups could provide deeper insights into variations in food waste behaviors. should consider a more holistic framework to explore these external influences comprehensively.

4. Conclusions

This study highlights the significant roles of individual characteristics, knowledge, and attitudes in shaping food waste behaviors. The findings reveal that individual characteristics such as age, education, and income positively influence knowledge about food waste, which in turn impacts attitudes and actions towards reducing food waste. Attitudes were found to strongly mediate the relationship between knowledge and actions, emphasizing the critical role of fostering positive perceptions and beliefs in driving sustainable behaviors. The results underscore the need for targeted educational interventions to enhance awareness of the environmental, economic, and social impacts of food waste. Moreover, bridging the gap between attitudes and consistent actions requires practical solutions such as improving food storage practices, meal planning, and leftover management. Programs like visual portion size tools and emotional engagement campaigns could also prove effective in promoting sustainable behaviors. The study contributes to increasing the understanding of how personal and psychological factors can be driven to food waste reduction behaviors and support a more

extension/campaign programs to reduce food waste at the community level.

5. Author Contributions

DRP: Conceptualization, Methodology, Investigation, Writing - Review & Editing; **AFC**: Writing - Review & Editing; **AFS**: Writing - Review & Editing.

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