Exploring the psychological determinants of household's intention to reduce food waste: Insight from Yogyakarta Indonesia

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KEYWORDS	ABSTRACT
Emotions Food waste Knowledge Moral beliefs Theory of planned behavior	Food waste's negative effects on the environment and monetary losses have made it a major concern. Food waste at the consuming stage has been directly affected by customer purchasing behaviour. Moreover, the majority of food waste happens within households. This means examining the reasons behind household food waste behaviour is a potential safeguard against food waste issues. This research aimed to analyze household food waste behavior in the Special Region of Yogyakarta after the COVID-19 pandemic. This study was conducted with a questionnaire survey from June to July 2023 to households in the Yogyakarta Special Region. Data was collected purposively using online and offline methods simultaneously. A total of 245 responses were obtained, and 203 were valid for use. Partial Least Square Structural Equation Modeling (PLS-SEM) was used as the analytical method. The research results showed that psychological factors such as attitudes, perceived behavioral control, emotions, moral beliefs, and knowledge about food management influenced households' intentions to reduce food waste. By examining the factors that affect food waste, it is hoped that this research will advance our understanding of trends in food waste behavior at the household consumer level in developing nations.

Introduction

Considering ethical and environmental aspects, food waste has become a major topic of discussion. Worldwide, 783 million people suffered from hunger in 2022. Furthermore, according to FAO (2019), food waste could have been prevented globally, as the 821 million people who suffered from hunger four times could have been replaced. Indonesians represent the fourth largest population in the world, behind Americans, Chinese, and Indians. In 2022, the population of Indonesia will reach 275,361,267 as of June. Based on FAO data, in 1950, Indonesia's population was around 69 million people. This showed an increase of around 205 million Indonesian population over 72 years. On average, Indonesia's population increases by 2.8 million people every year. As the population increased, the issue of food has become one that deserves to be highlighted.

It is essential to study food waste to investigate whether a household has failed to utilize food appropriately. A substantial amount of the 7.2 million tonnes of food waste that UK households produce annually was considered preventable. A study conducted by Fami et al. (2019) states that Iran generated over 25 million tonnes of food waste annually. The existence of food waste was also economically detrimental due to inefficiencies in food management both at the individual and household levels. Apart from that, it also causes nutrition loss, which should be utilized by people who are malnourished.

Using the Theory of Planned Behavior (TPB) method, food waste behavior can be observed. The TPB model has been proven to be able to forecast the behavioural intentions linked to a variety of pro-environmental actions. According to research, the most important component influencing food-throwing behavior was behavioral intention. The

greater a person's intention to engage in a behavior, the more likely they are to achieve it. Attitudes, subjective norms, and perceived behavioral control all affect its objectives.

According to Soorani and Ahmadvand (2019), the primary factors influencing intentions to decrease food waste at the household level in Iran are subjective norms, attitudes, perceived behavioral control, and a sense of guilt. Furthermore, Werf et al. (2019) researched food-wasting behavior, which showed that subjective norms and perceived behavioral control were the two most important factors influencing intentions to reduce household food waste. Aydin and Yildirim (2021) used moral attitude, habits, and knowledge variables in their research on food waste behavior. Marangon et al. (2014) studied the variables influencing food waste behavior. The study's findings indicated that factors such as attitude, age, income, consumption pattern, and purchasing strategy actually affect wasteful behavior. Meanwhile, this study employs the TPB technique but incorporates additional elements, such as feelings, morality, and food management expertise.

Besides that, not much research has been done on how food waste is positioned at the ménage following the COVID-19 pandemic in both public and indigenous contexts. Meanwhile, fresh research revealed that COVID-19 has changed daily schedules, eating habits, and home food management techniques (Ananda et al., 2023). A spike in food waste during the COVID-19 epidemic passed due to fear of buying and online food shopping. The COVID-19 epidemic has aggravated food instability in Indonesia. This is also the impact of protectionist programs, which make it decreasingly delicate for depressed homes to pierce food because domestic food prices are increasing. After the COVID-19 epidemic, food prices continue to increase so every ménage is anticipated to be suitable to manage food well. Good food operation is hoped to increase public food security, especially at the ménage position after the COVID-19 epidemic. Studies related to the consequences of the epidemic on food waste geste have been carried out in colorful countries, such as Iran (Allahyari et al., 2022), Italy (Amicarelli et al., 2022), India (Cariappa et al., 2022) and this research seeks to answer this gap. Several studies have reported food waste at the individual level (Hidayat et al., 2020; Aydin and Yildirim, 2021; Saputra and Asih, 2017).

Swamilaksita et al. (2022) studied food waste at the household level in West Jakarta. In contrast to this research, it examines food waste at the household level after the COVID-19 pandemic, especially in the Special Region of Yogyakarta.

Thus, a study is demanded that analyzes food waste behaviour at the ménage position in the Special Region of Yogyakarta after the COVID-19 epidemic to support public food security. This exploration aims to dissect ménage food waste behaviour in the Special Region of Yogyakarta after the COVID-19 epidemic. This exploration is anticipated to contribute to knowledge regarding trends in food waste behaviour at the ménage consumer position in developing countries by exploring the factors that impact food waste.

Research and Methods
Data collection
This research was carried out using a questionnaire survey from June to July 2023 for households in the Special Region of Yogyakarta. Data was collected purposively using online and offline methods as well. Online questionnaires with the Google Forms platform were spread via social networks, including WhatsApp, Facebook, Twitter, and Instagram. They are easily produced and have a worldwide audience. Online surveys can only be completed by literate people with internet access and are sufficiently biassed to be interested in the topic (Andrade, 2020). Respondents who can fill out the survey must meet the requirements in this study, namely individuals who are responsible for managing household food needs. To overcome the possible exclusion of respondents who do not have internet access, an offline survey was added to this study.

Pre-test items were used to validate the questionnaire design process, which also included a literature review. Thirty people who used the internet completed a pretest to ensure the questionnaire was simple to read and comprehend. Uncertain and imprecise questions were changed by pretesting. Each IP address could only participate in one survey at a time to prevent survey fatigue (Cahyasita et al., 2021). Out of the 245 responses that were received, 203 could be used. The questionnaire has two sections: questions regarding sociodemographics and questions about home food waste reduction behaviour. The TPB model, which was created via home food waste investigations, served as the foundation for the research in this study (Figure 1).
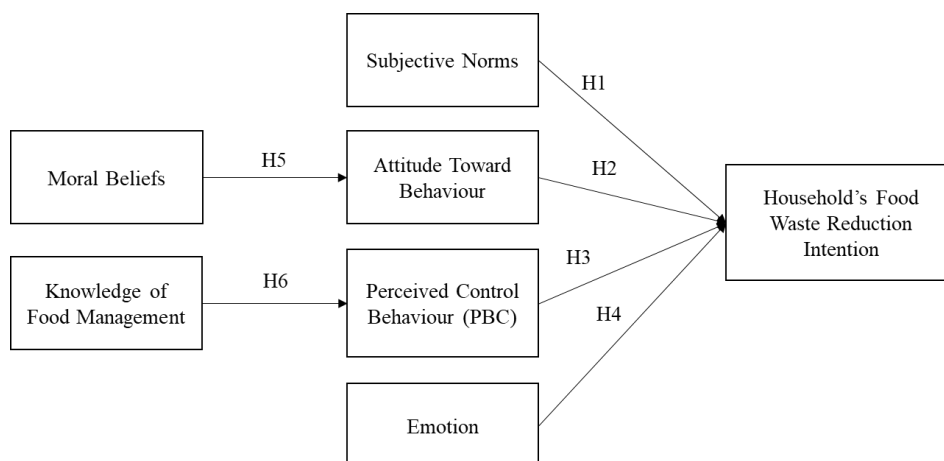
Figure 1. Conceptual model

Drawing from Figure 1, the ensuing conjecture is put forth:
- H1: Subjective norms positively impact a household's intention to reduce food waste;
- H2: Attitude positively influences a household's intention to reduce food waste;
- H3: Perceived control behaviour (PBC) positively influences a household's intention to reduce food waste;
- H4: Emotion positively influences a household's intention to reduce food waste;
- H5: Moral beliefs positively influence attitudes towards reducing food waste;
- H6: Knowledge about food management positively influences perceived control behaviour (PBC)

The hypotheses are structured as a basis for testing the relationships and determining the significance of the factors in the newly developed model. Behavior in this study was described by a household's intention to reduce food waste. Each measuring construct's items were taken from earlier research publications, namely the TPB model (i.e., attitude, subjective norm, and perceived behavioral control) following guidelines (Ajzen, 1991), and model development (i.e., moral, knowledge, and emotion) were adopted separately from (Aloysius et al., 2023; Aydin and Yildirim, 2021; Russell et al., 2017). Items as latent construct indicators in this study were measured with a Likert scale of 1 to 5.

Data analysis
Partial Least Squares-Structural Equation Modelling (PLS-SEM) was used to test the relationship in the model proposed in this study via Smart-PLS 3 software (Henseler et al., 2016). Two phases of the analysis were conducted: first, the measurement model was validated, and then, the structural model was assessed. Indicators for latent variables are compiled using reflective models. First, the validity and reliability of the measurement model were assessed. Evaluating the measurement model by executing the PLS algorithm 300 times is recommended. Recommendations pertaining to item reliability, internal consistency, convergent validity, and discriminant validity were consulted to assess the measurement model's applicability.

Figure 2 displays the specific model for this line of inquiry. Second, to evaluate the efficacy of the structural model, the explanatory power and significance level of the path coefficients were evaluated. This study's indirect impacts are examined. The model has a total of 7 latent variables, with each item reflecting the variable.

Results and Discussion
Descriptive analysis
It is evident from Table 1 that the respondents consisted of men and women with 93% of the respondents being women, of whom 71.92% were wives/housewives. This shows that in the household, especially in food management, the housewife manages it. Housewives are responsible for managing household food needs as one of their roles in maintaining food security at the household level (Sari et al., 2022). This is to the understanding that the mother is an important figure in the family. In this research, it was not only the mother/wife who managed household food management. In this research, it was found that several households also involved fathers/husbands and children in managing food management in their households, although it was still dominated by mothers/wives. As many as 34.98% of food managers in households work as housewives. Status as a housewife who does not work can influence the production of food waste in households (Lestari and Halimatussadiah, 2022).
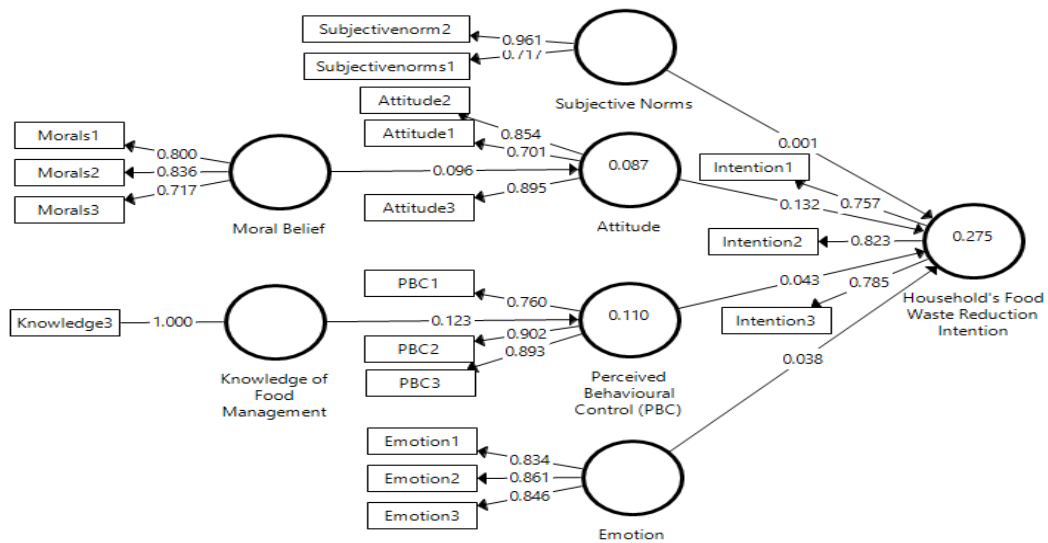
Figure 2. Specific model path

Table 1. Demographic characteristics

Variable Description	Amount	Percentage (%)
Gender		
Women	188	92.61
Men	15	7.39
Status in the household		
Mother/Wife	146	71.92
Father/Husband	8	3.94
Child	48	23.65
Other	1	0.49
Profession		
Housewife	71	34,98
ASN/Teacher/Lecturer	47	23,15
Private sector employee	22	10,84
Self-employed	20	9,85
Other	43	21,18
Ages (year)		
<20	4	1.97
20-29	70	34.48
30-29	39	19.21
40-49	47	23.15
50-59	41	20.20
>59	2	0.99
Education		
SD	7	3.45
SMP	7	3.45
SMA	89	43.84
S1	66	32.51
S2/S3	34	16.75
Status of Residence		
Rural	48	49.26
Urban	100	23.65
Suburbs	55	27.09
Family number		
1-4	160	78.82
5-7	41	20.20
7<	2	0.99

The age of most respondents ranged from 20-29 years, with a percentage of 34.48%, which was dominated by online surveys. Numerous studies have shown that age has little bearing on the amount of household food waste (Lestari and Halimatussadiah, 2022). However, (Marangon et al., 2014) show that age influences waste-throwing behavior significantly, and the amount of food wasted decreases with age. As many as 78.82% of respondents had 1-4 family members. The greater the number of household members, the more likely the level of food waste is to increase. From the results of the descriptive analysis (Table 1), most respondents had a high school education level, with a percentage of respondents of 43.84%. The number of household members and education level also influence the level of food waste (Saputro and Santoso, 2021). Respondents in this study were spread across three residence statuses: village, city, and suburban. The majority of respondents live in villages, 49%. Respondents who live in villages usually waste less food. Based on the research results, respondents who live in villages have livestock such as chickens, tilapia, and catfish.

Measurement model validity
A two-stage approach was taken to interpret the PLS-SEM results. First through validating the measurement model and then evaluating the structural model. Item reliability is evaluated by looking at the outer loading value. The results show that all items meet the criteria indicated by an outer loading greater than 0.7 (Table 2)indicating . Some invalid items are excluded from the model. Internal consistency evaluation is carried out by looking at the composite reliability value. The composite reliability values in Table 2 show are all greater than 0.7, so this study model can be said to be reliable (accurate, consistent, and precise). Next, the convergent validity is checked by looking at the average variance extracted (AVE) value.

To be considered to have a high proportion of indicators, the AVE value must be more than 0.5. The model's outcomes satisfy the requirement that the latent variable accounts for more than half of the variation in the indicators. It is necessary to confirm discriminant validity to guarantee that a construct is distinct from others. The Heterotrait-Mono-trait Ratio (HTMT) and the Fornell and Larcker criterion were used for validation. The study's overall score, which is less than 0.85 on the HTMT, satisfies the requirements (Table 3). To prevent bias in the regression results, the multicollinearity issue is also examined using variance inflation factors (VIFs). Since every onion VIF value in this investigation fell between the bounds of 3, there was no evidence of collinearity (Table 2).

Table 2. Construct reliability, validity, and collinearity

Latent Variables	Measurement Items	Outer Loading	Composite Reliability	AVE	VIF
Attitude	Attitude1	0.701	0.860	0.674	1.283
	Attitude2	0.854			1.920
	Attitude3	0.895			2.148
Emotion	Emotion1	0.834	0.884	0.718	1.854
	Emotion2	0.861			2.236
	Emotion3	0.846			1.579
Household's Food Waste Reduction Intention	Intention1	0.757	0.831	0.622	1.281
	Intention2	0.823			1.409
	Intention3	0.785			1.413
Knowledge of Food Management	Knowledge3	1.000	1.000	1.000	1.000
Moral Belief	Morals1	0.800	0.828	0.617	1.486
	Morals2	0.836			1.650
	Morals3	0.717			1.213
Perceived Behavioural Control (PBC)	PBC1	0.760	0.889	0.729	1.549
	PBC2	0.902			2.291
	PBC3	0.893			2.037
Subjective Norms	Subjectivenorm2	0.961	0.834	0.719	1.328
	Subjectivenorms1	0.717			1.328

Table 3. Discriminant validity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fornell-Larcker							
Attitude (1)	0.821						
Emotion (2)	0.365	0.847					
Household's Food Waste Reduction Intention (3)	0.442	0.354	0.789				
Knowledge of Food Management (4)	0.209	0.245	0.278	1.000			
Moral Belief (5)	0.295	0.436	0.365	0.337	0.786		
Perceived Behavioural Control (PBC) (6)	0.181	0.240	0.302	0.332	0.397	0.854	
Subjective Norms (7)	0.193	0.154	0.176	0.208	0.256	0.294	0.848
HTMT							
Attitude (1)							
Emotion (2)	0.453						
Household's Food Waste Reduction Intention (3)	0.602	0.460					
Knowledge of Food Management (4)	0.235	0.267	0.340				
Moral Belief (5)	0.404	0.577	0.529	0.408			
Perceived Behavioural Control (PBC) (6)	0.221	0.275	0.394	0.361	0.537		
Subjective Norms (7)	0.259	0.213	0.227	0.262	0.387	0.454	

Table 4. Values for determining endogenous variables.

Endogen Variables	R^2	Q^2
Attitude	0.087	0.054
Perceived Behavioural Control (PBC)	0.110	0.077
Household's Food Waste Reduction Intention	0.275	0.149

Structural model evaluation (hypothesis testing)
The structural model is assessed subsequent to the measurement model's validation. Table 4 displays the structural model's capacity for prediction in this investigation. The R^2 score in PLS-SEM indicates how much of the variance of the endogenous variable can be accounted for by the exogenous variable. The PLS-Algorithm test was used to determine the R^2. Hair et al. (2019) stated that while R^2 values in consumer behavior studies are generally regarded as strong, they might vary in size across different scientific disciplines. Since the Attitude and PBC variables only include one exogenous variable apiece, their values, 0.087 and 0.110, are both below 0.2. Moreover, the primary framework for the goals of this study, the Household's Food Waste Reduction Intention, has an R^2 value of 0.275. Thus, the R^2 value in this paper can be considered adequate.

Q^2 value was used further to assess the predictive ability of the structural model. The Q^2, which indicates the suitability of the model, is obtained using a blindfolding test with an omission distance set at 8. According to Hair et al. (2019), the Q^2 must be greater than 0, and the results of this study show that all endogenous variables have $Q^2 > 0$ (Table 4). Thus, this proves the accuracy of the predictions in this study.

The proposed connections between the exogenous and endogenous latent constructs in this study are described by the structural model. Using a 500-person subsample and a significance threshold of 0.05, the bootstrapping approach was used to evaluate structural models using SmartPLS 3. The six hypotheses, path coefficients, t-values, and p-values are displayed in Table 5. Except for hypothesis H1, all predicted paths are significant (H2, H3, H4, H5, and H6) at the 5% level (p-value,

0.05), according to the direct structural connection results. Significant coefficient values (p<0.05) for the direct effects of attitudes, emotions, and perceived behavioral control (PBC) on household intention to reduce food waste were 0.336, 0.189, and 0.182, respectively (p<0.05 each). Furthermore, attitudes toward waste reduction are known to be significantly impacted by moral beliefs, with a coefficient value of 0.295 (p<0.05). This study shows that food management expertise significantly (0.332) affects PBC (p<0.05). Subjective norms are found to have little effect on a household's aim to reduce food waste.

Through mediation effects, indirect effects can be examined in addition to direct influences that can be determined from the pathways constructed in the structural model. By examining the mediation path model in the path construct in Figure 1, it is possible to examine the indirect impact of moral conviction and food management expertise on a household's aim to reduce food waste. Table 6 presents the study's findings, which indicate that moral conviction, with attitude acting as a mediator, has a significant indirect influence of 0.099 (p <0.05) on a household's desire to reduce food waste. A household's goal to reduce food waste is significantly impacted by knowledge of food management, with a 0.063 (p<0.05) indirect effect, with PBC acting as a mediator.

Discussion and practical implication

Every household in Indonesia was impacted by the COVID-19 pandemic that struck at the start of 2020, particularly in the Special Region of Yogyakarta. According to this study, 33% of households had food intake variations between the pre- and post-COVID-19 periods (Figure 3). Households are more conscientious of food hygiene during COVID-19 than they were previously. Additionally, households would make their own food instead of ordering takeout or utilizing delivery services. Additionally, they focus more on the handling and storage of food. People have been forced, or given the chance, to adopt healthier eating habits as a result of the pandemic (Hanssen et al., 2016) and enhance domestic management and cooking abilities. Additionally, households become more frugal and only purchase food that meets their necessities. Reducing food waste may result from this. After the pandemic was finished, this continued to become a habit.

Household intentions to reduce food waste are significantly positively impacted by attitudes and PBC, according to research results shown in Table 5. These results provide more evidence that the TPB model is appropriate in the context of food waste. This finding aligns with research by Lou et al. (2022) on intentions to sort waste in China. In our research, the extended TPB model's strongest predictor was attitude. This indicates that people are more likely to enhance their desire to reduce household food waste if they feel that doing so is a good idea. Therefore, it is critical to influence household members' attitudes to alter their intention to throw away food. When households have a positive attitude toward reducing food waste, they will be inclined to intend to take the steps.

Table 5. Hypothesis testing

	Hypothesis	Path Coefficient	t-statistic	p-values	Result
H1	Subjective Norms -> Household's Food Waste Reduction Intention	0.027	0.380	0.704	Rejected
H2	Attitude -> Household's Food Waste Reduction Intention	0.336	3.775	0.000	Supported
H3	Perceived Behavioural Control (PBC) -> Household's Food Waste Reduction Intention	0.189	2.550	0.011	Supported
H4	Emotion -> Household's Food Waste Reduction Intention	0.182	2.700	0.007	Supported
H5	Moral Belief -> Attitude	0.295	4.649	0.000	Supported
H6	Knowledge of Food Management -> Perceived Behavioural Control (PBC)	0.332	4.732	0.000	Supported

*p<0.05.

Table 6. Indirect effects

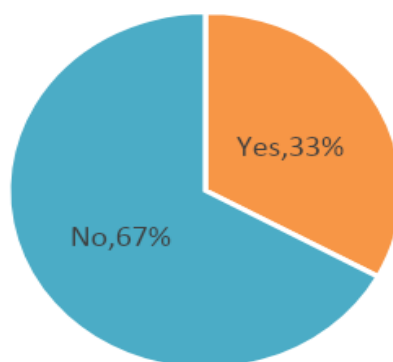| Specific indirect effect	Path Coefficient	t-statistic	p-value	Result
Moral Belief -> Attitude -> Household's Food Waste Reduction Intention	0.099	2.870	0.004	Supported
Knowledge of Food Management -> Perceived Behavioural Control (PBC) -> Household's Food Waste Reduction Intention	0.063	2.098	0.036	Supported

Figure 3. Differences in consumption before and after covid-19

These results also show that moral convictions impact household attitudes toward food waste reduction. According to Lau et al. (2021), morality plays a crucial role in anticipating and comprehending how each individual would decide to take environmental action, such as cutting down on food waste. Food waste, in the opinion of Bretter et al. (2023), is a moral issue. People believe that wasting food is immoral and negatively correlates with efforts to minimize food waste. Our research adds to the body of knowledge on the TPB model of food waste behavior. As a result, it is critical to raise public awareness of food waste behavior as a sinful practice. Building awareness with campaigns linked to environmental, social, and hunger issues could be a practical implication of this study.

The availability of sufficient resources and the capacity to manage the challenges an activity faces impact that behavior. Put differently, perceived behavioral control pertains to the degree of ease or difficulty households experience in mitigating food waste. This result supports the theory proposed by Ajzen (1991) that PBC might directly affect behavior intention. The results demonstrate that people are more likely to intend to minimize food waste if they have faith in their ability to reduce household waste. This study also discovered that PBC functions as a mediator in the indirect relationship between knowledge of food management and the goal of decreasing food waste.

Theoretically, the behavioral model for minimizing food waste is strengthened by inclusing the knowledge variable about food management in the TPB model. It is well established that people with a strong understanding of household food management also possess strong behavioral control over food waste reduction practices. As a result, the government must put rules into place for education initiatives, namely for instruction on food waste and food management in general. The government can apply information regarding food waste and food management at the formal education level by using platforms like social media and community activities. However, the type of educational programs should not be limited to any particular community. Apart from that, promotional campaigns through online media (Instagram, YouTube, etc.) regarding cooking recipes that rely on processed leftover food can be an alternative to support knowledge of food management.

Unexpectedly, household intentions to reduce food waste were not significantly impacted by subjective standards in this study. The impact of subjective norms on intentions has been called into doubt in earlier research. In agreement with the findings of Tian et al. (2019) and Zhang et al. (2021), who discovered that subjective norms had no discernible impact on intentions. This might

happen due to the unique environmental circumstances surrounding this research object. Given that social pressure to participate in an activity is correlated with subjective norms, the respondent's social setting plays a crucial role. Nowadays, many locals do not feel that public is pressuring them to reduce food waste. The lack of perceived social sanctions for not reducing food waste is one possible cause of the lack of impact of subjective norms on intentions to reduce food waste.

Lastly, this model adds an emotional variable as a predictor of household intentions to reduce food wastage. The findings show that individuals who have negative feelings about food waste behavior will have more intention to try to reduce food waste. This is in line with the findings of Russell et al. (2017), which state that the aim to reduce food waste is effectively driven by negative feelings.. In other words, these findings provide practical implications that utilizing negative emotions such as guilt and shame effectively increases the intention to reduce food waste.

Conclusions

This study uses an enhanced Theory of Planned Behavior to analyze household intentions to reduce food waste. We discovered that the intention to decrease food waste is positively influenced by attitude and PBC. Subjective norms, however, proved to be insignificant in this investigation. Additionally, feelings indirectly impact moral convictions and food management knowledge, in addition to directly influencing the intention to minimize food waste. The findings of this study have application in terms of policy recommendations for incorporating food waste knowledge into curricula for educational institutions. Furthermore, the government and other parties can use social media and other channels to raise household awareness of food management. Promoting awareness of the detrimental effects of food waste behavior can effectively increase moral convictions and personal emotional investment. Finally, there are several limitations to this study. Initially, the study's findings were derived from the participants' self-reports, which introduces the possibility of social expectation bias. Due to the restricted scope of this study conducted inside a single Yogyakarta Province, variations in culture, society, and demography may arise. Aside from that, the TPB model does not consider any variables related to environmental knowledge and practices concerning food waste behavior. This could be a proposal for further research to explore the psychological underpinnings of individual food waste reduction intentions.

Declarations

Conflict of interests The authors declare no competing interests.

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