



Determinants of Household Food Wasting Behavior: Applying the Theory of Planned Behavior

Fajar Wahyu Nugroho, Maswadi*, Novira Kusriani

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ABSTRACT

Every year, up to 1.3 trillion tons of global food produced for human use are lost or wasted. Consumer behavior is a major cause of food waste. In Indonesia, households generate approximately 38% of total food waste. The goal of this study is to evaluate at how attitudes toward behavior, subjective norms, perceived behavioral control, and intention to reduce food waste affect food waste behavior in households. The theory of planned behavior (TPB) was used to conduct the survey, which included 160 independent oil palm farmer homes. The collected data was then examined using Structural Equation Modelling (SEM) with the AMOS 24 program. The findings demonstrate the effectiveness of the TPB model in forecasting household food waste behavior. Attitude, subjective norm, perceived behavioral control, and goal to reduce food waste are the factors that influence household food waste behaviors. The study's findings show that perceived behavioral control is the most important predictor of food waste behavior. Furthermore, the findings demonstrate that attitudes and subjective norms can predict the intention to reduce household food waste. Meanwhile, the desire to eliminate food waste appears to be a strong predictor of one's attitude on the amount of food waste produced.

Keywords: food waste, household behavior, SEM-AMOS, theory of planned behavior

INTRODUCTION

Food waste is a global issue that affects many countries (Khusniyah *et al.* 2022). Every year, almost one-third, or 1.3 trillion tons, of global food supply for human consumption is lost or wasted. Food waste is also prevalent in Indonesia (Afifah 2018; Hidayat *et al.* 2020; Saputro *et al.* 2021). Many factors contribute to food waste, including human behavior and awareness. Consumer behavior is one of the leading causes of food waste (Schanes *et al.* 2018). According to the Ministry of Environment and Forestry's National Waste Management Information System, homes generate up to 38.38% of total waste in Indonesia. Food waste accounts for 40.7% of overall trash production. The high amount of trash generated demonstrates that Indonesian consumers, particularly households, have thrown away food, whether purposefully or unintentionally. This indicates that food waste, a global issue, must be prioritized to reduce economic losses to the community. Food waste has a negative influence on community welfare since it reduces possibilities to meet food demands, increases hunger, and provides unsatisfactory nutrition (Anggraini 2020).

Farmers, as food producers, are not immune to food waste behavior (Saputro *et al.* 2021). This study

focuses on independent oil palm farmer households in ex-transmigrant communities. Originally, the transmigrated communities were deemed impoverished. However, since the arrival of palm oil enterprises near the community, there has been a shift in employment from vegetable farmers to independent palm oil growers. The existence of the enterprise has caused social and economic changes in the community (Apriyanti 2020). Palm oil enterprises have a good social impact on the social structure of community institutions, as well as the creation of public facilities in health and education. It can also serve as an economic driver for the local community. Changing economic situations influence consumer behavior. Higher household earnings lead to more food waste (Stefan *et al.* 2013; Stancu *et al.* (2016).

The Planned Behavior Theory (TPB) model can help forecast consumer and pro-environmental behavior (Ajzen 2015) and can explain certain types of food consumption behavior, including food waste. In the topic of food waste, TPB has been widely employed as a theoretical lens for explaining consumer behavior. The TPB is predicated on the idea that most consumers behave reasonably. They pay attention to all available information and analyze the consequences of their acts, whether implicitly or explicitly (Soorani and Ahmadvand 2019). This model focuses on behavioral intentions, which are influenced by a variety of factors, including attitude toward conduct, subjective norms, and perceived behavioral control (Fishbein and Ajzen 2005). These indicators can predict intention as a

Agribusiness Study Program, Faculty of Agriculture,
Tanjungpura University, Pontianak 78115, Indonesia

* Corresponding Author:

Email: maswadi@faperta.untan.ac.id

function of food waste behavior. Attitudes toward behavior, subjective norms, and perceived behavioral control all influence individuals' intentions to behave towards food waste (Stancu *et al.* 2016; Visschers *et al.* 2016). TPB suggests that attitude toward conduct encompasses the motivational variables that drive behavior (Ajzen 1991). Attitude toward conduct indicates a good or negative assessment of one's own performance in terms of food waste behavior. The second predictor is social variables, also known as subjective norms, which refer to perceived social pressure to do or not do certain behaviors (Ajzen 1991). In other words, subjective norms are a person's view of how other people's thoughts would support or oppose the conduct of minimizing food waste (Soorani and Ahmadvand 2019). The third predictor is perceived behavioral control, which refers to the perceived ease or difficulty of doing a task and should consider both experience and predicted obstacles (Ajzen 1991). Perceived behavioral control can influence behavior indirectly through intension, as well as directly predict behavior (Fishbein and Ajzen, 2005). Generally, the higher the attitude toward activity, subjective standards, and perceived behavioral control toward a behavior, the greater the individual's motivation to undertake that conduct. The study's goal is to examine how attitude toward behavior, subjective standards, perceived behavioral control, and intention to reduce food waste affect food waste behavior in families.

METHODS

Research Location

The investigation was conducted in Kubu Raya Regency, West Kalimantan, specifically in Radak Baru Village, Terentang District. The location was determined deliberately or purposefully based on the transmigrants data according to the year of arrival of Kubu Raya Regency published by the Kuburaya Regency Disnakertrans, which shows that Radak Baru Village has the highest number of transmigration people in Kubu Raya Regency, which was 1,744 people (Disnakertrans Kubu Raya 2021). The features of independent oil palm farmer households in Radak Baru Village, which are variable due to their origins, are regarded as representative in the sampling area. The research was implemented from June to July 2023.

Data Collecting

The survey method was used in this study, with a data collection tool in the form of a face-to-face questionnaire distributed to 160 respondents who were independent oil palm farmer households from a population of 437 households. The respondents were spread across four hamlets, namely Maju Sari Hamlet, Maju Jaya Hamlet, Maju Mulya Hamlet, and Maju Makmur Hamlet. Santoso (2014) stated that if a SEM model has five constructs and each construct is

represented by three or more indicators, a sample size of 100–150 data points is deemed appropriate. As a result, a sample size of 160 data points can be recognized as representative for SEM analysis. The purposive sample technique serves as the foundation for selecting respondents. Sugiyono (2014) defined purposive sampling as a technique for selecting samples based on specific criteria. The respondent criteria used were independent oil palm farmer households whose primary source of income was oil palm cultivation, as well as households enrolled in the transmigration program.

Data Analysis

The Structural Equation Model (SEM) in the AMOS 24.0 application was used to examine the importance of the proposed linkages in the study structural model and assess the overall model's fit to the data. Validity, reliability, goodness-of-fit (GOF), and hypothesis testing are all part of data analysis. AMOS 24.0 uses two steps to model structural equations. First, use Confirmatory Factor Analysis (CFA) to determine the measuring scale's validity and reliability. Second, the Structural Model was used to determine the best appropriate model for investigating the casual link between endogenous and exogenous constructs.

RESULTS AND DISCUSSION

Data Filtering and Measurement Models

Confirmatory Factor Analysis (CFA) was used to assess if conceptual models meet the general liner model's assumptions. CFA determined whether an existing manifest variable adequately described a construct. Standardized Regression Weights represent the outcomes of the CFA test when the valid indicator is >0.5 (Santoso 2014). Table 1 shows that after eliminating one item from the Subjective Norms with a low standard loading factor value (<0.5) and reapplying CFA to the conceptual model and retesting, each manifest variable had a loading factor value above the standard (>0.5). The following stage is the Convergence Validity Test. This test examined the relationship between manifest variables and constructs by examining whether each suggested manifest variable could accurately identify the model. A construct is considered valid for use as a gauge if its AVE value is >0.5 .

Table 2 shows that the Average Variance Extract (AVE) values of all constructs in the conceptual model, namely Attitude Toward Behavior, Subjective Norms, PBC, Intention to Reduce Food Waste, and Food Waste Behavior, above the threshold (>0.5). To measure the reliability of data, the Composite Reliability (CR) estimate was used. Malhotra *et al.*

Table 1 Validity test: loading factor

Standardized regression weights: (Group # 1 - Default model)				
Manifest variable				Loading factor
X1.1	<--		Attitude	0.7
X1.2	<---		Attitude	0.9
X1.3	<---		Attitude	0.8
X2.4	<---		Norms	0.6
X2.2	<---		Norms	0.8
X2.1	<---		Norms	0.8
X3.3	<---		PBC	0.7
X3.2	<---		PBC	0.7
X3.1	<---		PBC	0.6
Y3	<---		Intention	0.7
Y2	<---		Intention	0.7
Y1	<---		Intention	0.8
Z1	<---		Behavior	0.7
Z2	<---		Behavior	0.7
Z3	<---		Behavior	0.6

Table 2 AVE and CR calculation results

Manifest variable	Loading factor	Loading faktor ²	Error	AVE	CR
X1.1	0.7	0.5	0.2		
X1.2	0.9	0.9	0	0.9	0.9
X1.3	0.8	0.7	0.1		
X2.4	0.6	0.4	0.2		
X2.2	0.8	0.7	0.1	0.9	0.9
X2.1	0.8	0.7	0		
X3.3	0.7	0.5	0.2		
X3.2	0.7	0.5	0.2	0.7	0.8
X3.1	0.6	0.3	0.2		
Y3	0.7	0.5	0.1		
Y2	0.7	0.6	0	0.9	0.9
Y1	0.8	0.7	0		
Z1	0.7	0.5	0.1		
Z2	0.7	0.5	0.1	0.8	0.9
Z3	0.6	0.4	0.1		

(2014) proposed that the CR estimate for the number of variants defined by the construct should be more than 0.7. The results in Table 2 demonstrate that the construct's dependability with the CR estimate is acceptable.

Structural Model: Goodness of Fit and Hypothesis Testing

The Goodness of Fit (GOF) test seeks to create a model that meets the study's GOF standard criteria. Evaluating the compatibility of the TPB model with the data reveals that the model was still not fit, with a chi-square of 119.4, Probability 0.0, which was within the restrictions. As a result, to improve the fit model, changes must be made in accordance with the recommendations in the modification indices. Table 3 explains the modification indices utilized to create a fit model in this investigation. The results confirm that the updated model matches the data correctly. The GOF indicator displays how well the suggested final model fits the data (Table 4).

Following the CFA and GOF tests, SEM was performed by examining the values in the regression

weight table. The construct is considered significant if the C.R. is greater than 1.65 and the *P*-value is less than 0.05. One of the five constructs in the test, PBC on the aim to decrease food waste, is minor, as evidenced by a CR of 1.311 and a *P* value of 0.190. The other constructs have a CR of more than 1.65 and a *P*-value less than 0.05. The findings of the SEM analysis following GOF are shown in Figure 1.

Discussion

The findings revealed that all exogenous components in the model had a significant direct and indirect effect on behavior. Perceived behavioral intention and control (PBC) have a direct impact on food waste behavior. PBC has no significant influence on intention, however subjective attitudes and norms do. Only the attitude variable has an indirect effect on food waste behavior via intention.

According to the findings of this study, PBC is the most effective behavioral predictor of food waste behavior. PBC refers to the individual's perceived ability to improve behavior, or the degree to which the individual sees the ease or difficulty of controlling a

Table 3 Modification indices

			M.I.	Par change
e18	<-->	Norms	6	-0.0
e15	<-->	Norms	5.3	-0.0
e9	<-->	Norms	5.8	.0
e8	<-->	e18	5.9	-0.0
e8	<-->	e15	15.6	-0.1
e8	<-->	e9	4.5	.0
e7	<-->	e13	5.1	-0.0
e7	<-->	e11	4.1	.0
e7	<-->	e8	5.5	.0
e5	<-->	PBC	4.3	-0.0
e5	<-->	e8	6.3	-0.0
e4	<-->	e15	9.8	-0.0
e3	<-->	PBC	5.9	-0.0
e3	<-->	e17	4.7	.0
e3	<-->	e13	4.1	.0
e2	<-->	PBC	5.1	.0

Table 4 Results of Goodness of Fit test

Index	Cut off value	Result	Evaluation
Chi – Square	At the least	89.315	Good fit
Probability	≥ 0.05	0.223	Good fit
CMIN/DF	≤ 2.00	1.116	Good fit
RMSEA	≤ 0.08	0.027	Good fit
GFI	≥ 0.90	0.932	Good fit
AFGI	≥ 0.90	0.898	Marginal fit
TLI	≥ 0.95	0.986	Good fit
CFI	≥ 0.95	0.989	Good fit

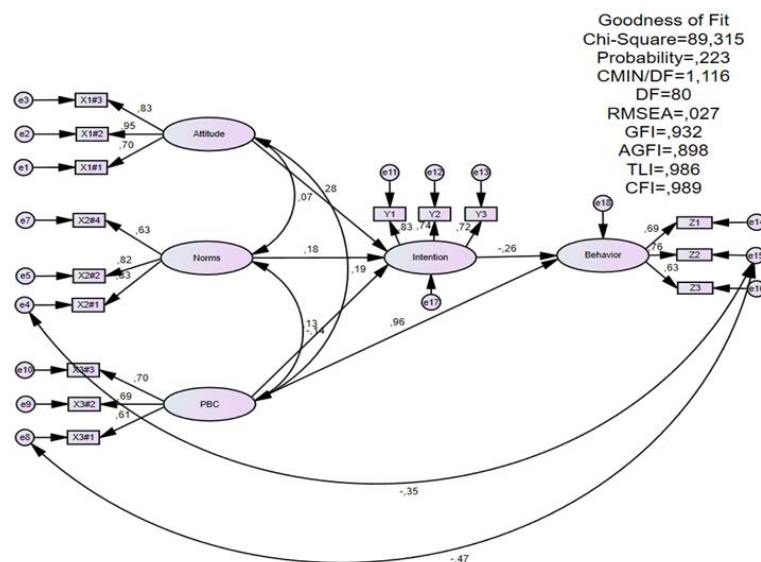


Figure 1 SEM path analysis after GOF.

behavior (Ajzen 1991). Stefan *et al.* (2013) found that PBC is an effective predictor of food waste behavior. In line with this study, PBC increases food waste behavior, but it is insufficient to drive a person's aim to reduce food waste. Stancu *et al.* (2016) discovered that perceived behavioral control is a more relevant

predictor of reported food waste than the effect of intention. The lack of influence of PBC on intention was related to the respondents' difficulty in making a shopping plan and spending food at home. Respondents' intentions to prevent food waste were lower due to the barriers they faced. So, it can be

concluded that PBC in this study is insufficient to impact a person's intention to reduce food waste. This study results support the findings of Stancu *et al.* (2016) and Soorani & Ahmadvand (2019), which found that perceived behavioral control had no significant effect on the intention not to throw away food. However, our findings contradict Visschers *et al.* (2016), who discovered that perceived behavioral control is a significant direct predictor of desire to reduce food waste.

According to our findings, attitude is the most important predictor of the intention to reduce food waste. The attitude variable has a direct impact on the intention to reduce food waste. Hypothesis testing results suggest that the better a person's attitude, the more likely they are to intend to reduce food waste. According to the research of Stancu *et al.* (2016), attitude positively influences the intention not to throw away food. The sensation of loss while throwing away food has a favorable effect on the aim to prevent food waste, which is equivalent to squandering income money. Furthermore, the sense of guilt and discomfort associated with throwing away food influences respondents' sentiments regarding the intention to reduce food waste. Dewi and Santoso (2020) discovered that a favorable attitude toward the aim to reduce food waste is affected by the onset of discomfort and guilt while throwing away food.

Indirectly, the variable of attitude toward food waste behavior via the purpose to have a negative impact. This suggests that the better a person's attitude, the greater their aim to reduce food waste, and hence the smaller their food waste behavior. This study supports the findings of Soorani and Ahmadvand (2019), who found that attitude influences behavior indirectly.

Subjective norms are the second most important determinant of a person's intention to reduce food waste, following attitudes. Researchers discovered that subjective norms only have a direct impact on a person's intentions. This validates Stancu *et al.*'s (2016) findings that subjective norms influence a person's intention to undertake an activity. Soorani and Ahmadvand (2019) found that subjective norms drive a person's aim to reduce food waste. However, subjective norms have not demonstrated their ability to impact a person's food waste behavior through intention. Although subjective norm indicators influence individuals' intention to reduce food waste, they also believe that family members are sensitive to food waste and try to avoid it, and most Indonesians support food waste reduction programs. However, it is insufficient to influence the behavior of those who generate food waste. This study supports Visschers *et al.* (2016), who discovered that subjective norms are only indirectly associated to food waste. This study contradicts the Soorani and Ahmadvand (2019) findings, that subjective norms indirectly affect behavior.

The final variable is the desire to reduce food waste. This study shows that intention has a negative effect on

behavior. The aim to reduce food waste had no significant effect on reported food waste behavior. The low association between the intention to minimize food waste and the report of food waste can be attributed in part to the fact that the two constructs pertain to opposing acts. Hypothesis testing demonstrates that the greater a person's intention to reduce food waste, the less food waste created. Respondents in this study stated that they will not throw away food since it can affect the environment and others. The same thing was revealed that the respondents in this study intend not to produce food waste; they intend to create a shopping list and pay attention to the portions of food and food to avoid producing food waste. The final element affecting intention is that the respondents in this study expect to consume all the food that has been cooked at home in order not to waste the food that has been purchased. In keeping with the findings of Stefan *et al.* (2013) and Stancu *et al.* (2016), who found that people throw away less food when they had a higher intention not to throw it away.

CONCLUSION

The planned behavior theory model was used in this study to evaluate household food waste behavior. This provides the advantage of identifying the most significant characteristics to focus on in programs designed to reduce household food waste. The outcomes of this study reveal that attitude has a significant direct effect on the intention to reduce food waste; additionally, attitude indirectly influences food waste behavior through intention. Then, subjective norms have a direct impact on the intention to reduce food waste. While perceived behavior control (PBC) has little effect on the intention to prevent food waste, it can have a large impact on food waste behavior. Finally, the aim to reduce food waste has a direct effect on bad food waste behavior. This suggests that the greater a person's desire to reduce food waste, the less food waste created.

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