Behaviour of Food Waste Home-Composting

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Abstract: The high burden of final waste management causes pollution due to the low contribution of prevention at the source. The composition of Indonesia's food waste reaches 40.62%. Proper food waste management has become a challenge because the habit of segregation at the household level is still low. Home-composting is an option for management from sources with technology that is easy to operate, but its use still needs to be improved. This study looks at the factors influencing people's behaviour in composting-based household food waste management. The objective of this study is to analyze the variables of attitudes, subjective norms, and behavioural control, which affect behaviour in home-composting activities, using the theory of planned behaviour model. A quantitative approach with multiple regression analysis was used in the study. Subjective norms and behavioural control significantly ($p < 0.05$) influence home-composting behaviour, while attitudes ($p > 0.05$) do not influence home-composting.

Keywords: Food waste; Home-composting; Household; Theory of planned behaviour

Introduction

The high population in urban areas has been a long-standing problem that is felt by various countries in the world, including Indonesia. High urban activity without good infrastructure will result in solid waste problems (Mir et al., 2021). Population, lifestyle, and high needs are a few factors in waste generation in urban areas (Damanhuri & Padmi, 2016). Even though the waste problem has received serious attention from the government, it has even been included in the top 5 main national problems (Rahmawati et al., 2021). However, the current implementation of the waste management system has not been able to overcome the waste generated; where out of a total of 28 million tons of waste in 2021, only 48.73% of the waste is handled, and 64.39% of it is managed (KLHK, 2022). It is well known that the waste load is emphasized on final disposal at the landfill or TPA (Landfills), causing various potential environmental and health pollution, as well as the high cost of waste services (Yustikarini et al., 2017).

South Tangerang has a TPA with an open dumping system called TPA Cipeucang (DLH Kota Tangerang Selatan, 2020). Based on existing data, the TPA is no longer able to accommodate the ever-increasing amount of waste; that is, out of a total of 1,057,770 m³/year of waste generation, it can only serve around 438,000 m³/year (DLH Kota Tangerang Selatan, 2019). The land area owned by the Cipeucang TPA must be commensurate with the waste that must be accommodated (Hadomuan & Tuti, 2022). Besides that, applying an open dumping system also contributes to 5% of global Greenhouse Gas (GHG) emissions (Fu et al., 2021). For this reason, there needs to be a change in the concept of waste management by trying to suppress the generation of waste that goes to the TPA and reduce other environmental impacts.

Food waste is one of the largest sources of urban solid waste that requires the highest costs in waste management (Karak et al., 2012). One-third of world food production is wasted as food waste (Kansal et al., 2022). Based on the report of The Economist Intelligence Unit, Indonesia ranks second out of 25 countries as the largest producer of food waste after Saudi Arabia in 2017 (Wulandari & Asih, 2020). The amount of Indonesian food waste is estimated to reach 20,938,252 tonnes/year

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(The Economist Intelligence Unit, 2021). The amount of organic waste in 2016 reached 43.38%, which made it the most significant component of waste in South Tangerang City (Mastuti & Saleh, 2018). As research conducted by Song et al. (2018), if the population of an area and food needs continue to increase, the amount of food waste will also continue to increase. The high organic waste in the TPA will also increase the concentration of harmful leachate from decomposition (Waitt & Rankin, 2022).

As much as 90% of total household waste is waste that can be managed but ends up mixed and becomes waste of poor quality (Hu et al., 2021). For this reason, it is necessary to optimize the sorting and utilization of household waste. Of the various types of food waste management, composting is still the primary choice because it has many advantages, which are more hygienic, lower cost, and have added value (Onwosi et al., 2017). In developed countries, such as Denmark (Andersen et al., 2012), Spain (Vázquez & Soto, 2017), Saudi Arabia (Rashid & Shahzad, 2021), China (Guo et al., 2018), the United States (Platt et al., 2014) and other European countries (EEA, 2020) have implemented household-scale composting which is used as a source-source waste management approach. As in other developing countries, even though the composition of Indonesia's waste is high, household-scale composting is less developed (Thi et al., 2019; KLHK, 2022). In other words, Indonesia must start catching up with waste management from the basics, and what can be done is to carry out activities from the household level as the largest source of waste. As has been done in Denpasar City, the success of waste composting activities over the past ten years has positively impacted reducing GHG emissions (Armadi et al., 2020). That way, composting food waste can be applied to other cities to reduce GHG emissions from the waste sector.

Home composting is still an attractive alternative in household-scale waste management (Andersen et al., 2010). In implementing sustainable waste management strategies, household-scale compost is a productive choice for processing organic waste from its source to reduce waste generation at the TPA (Thi et al., 2019). In addition, composting food waste can also reduce waste transportation activities, reduce waste processing costs, and restore productivity functions to the soil (Owusu et al., 2013). Activities align with the 13th goal of the Sustainability Development Goals (SDGs) agenda as the primary basis for supporting SDGs. Among them is the utilization and management of natural resources in the waste sector (Shaikh et al., 2021). Household-scale compost also has the potential to increase the circular economy in the community (Sulewski et al., 2021) and utilization in agriculture (Ulm et al., 2019).

Even though composting is a profitable solution, it needs to know its positive reception to develop community behaviour. Various studies have examined the social aspects that affect composting activities. Some of the main factors that support an activity are attitudes, subjective norms, and behavioural control based on the theory of planned behaviour (Loan et al., 2019; Thi et al., 2019; Kopaei et al., 2021a). However, only some studies still explore the psychological side of underlying behaviour in composting (Ng, 2019). It is necessary to start with understanding attitudes, subjective norms, and behavioural control, which in this case is composting, to realize integrated food waste management (Kopaei et al., 2021b). Based on this, this study wants to see how much home-composting behaviour is influenced by attitude, subjective norms, and perceived control behaviour in composting food waste in South Tangerang City, especially in Batan Indah Housing and Lengkong Gudang Village.

Method

For this study, the respondents were taken as many as 16 people each in Batan Indah Housing and Lengkong Gudang Village, South Tangerang City. This amount is adjusted to the number of people who receive composting equipment and have received composting training. Data collection uses online and offline questionnaires distributed directly to the sample. The questionnaire was distributed in September-November 2022. The questionnaire consists of 5 demographic profile questions with single-choice questions. In addition, respondents rated 21 TPB statements related to food waste home-composting with a Likert scale of 1-5 (4 attitude statements, six subjective norm statements, six statements, and five community behaviour statements).
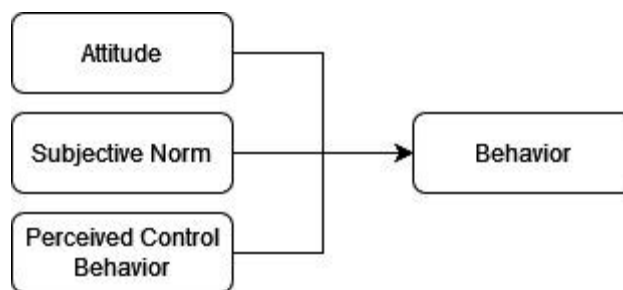

Figure 1. Research analysis framework

Questionnaire questions have previously been tested for reliability with Cronbach's alpha in as many as ten samples; all variables must be above 0.632 (t-table). Validity test with Pearson correlation, all variables must be above 0.632 (t-table) using SPSS software. This study uses a quantitative approach with multiple regression

analysis. Multiple regression statistical analysis was used to assess the correlation between attitude (ATT), subjective norm (SN), and perceived control behaviour (PBC) variables on home-composting behaviour (HB).

Result and Discussion

Demographic profile of the sample

The demographic profile of the respondents based on the questionnaire answers shows in Table 3. Based on the data collected, most of the sex in the Batan Indah Housing Complex is male, while in the Lengkong Gudang Village, it is female. The majority of the sample ages in Batan Indah Housing ranged from 51-60, as much as 44%, and in Lengkong Gudang Village, ranged from 31-40, as many as 31%. Most education is S1 in the Batan Indah Housing Complex, as much as 63%, and Middle School, as much as 44% in the Lengkong Gudang Village. Most of the sample jobs in Batan Indah Housing are employees 56%, while those in the Lengkong Gudang Village are housewives 94%. Most family members in Batan Indah Housing are four people, 19%, while in Lengkong Gudang Village, there are three people, as much as 44%.

Home-composting behaviour analysis

Based on the results of the reliability test using Cronbach's Alpha and the validity test with the Pearson correlation, all variables are above 0.632. It can be shown in Table 1.

Table 1. Reliability and Valaidity Test Result

Variable	Reability test	Validity test
Attitude	0.833	0.799-0.896
Subjective Norm	0.972	0.692-0.974
Percieved Control Behaviour	0.939	0.669-0.945
Behaviour	0.925	0.919-0.969

This shows all the variables are reliable and valid. The ATT, SN, and PBC variables were analyzed using multiple regression; the p-value must be less than 0.05. Based on Table. 4, ATT does not affect HB because the p-value is 0.251 (p > 0.05). SN and PBC have a p-value below 0.05, so they significantly influence HB.

ATT does not affect HB. The non-significance of ATT can be caused by positive attitude statement answers rather than under community actions. In practice, only five people in the Batan Indah Housing Complex and one in the Lengkong Gudang Sub-District continue the composting process. It differs from the findings of Armitage & Conner (2001) that attitude is often the highest and most consistent variable towards behaviour in TPB research. Zhang et al. (2015) and Kopaei et al. (2021b) which are used as a reference for questionnaire questions, as well as the Loan et al. (2019) which has a similar theme related to household-scale

composting of food waste, it is found that attitudes significant value. Attitude is the first factor that describes the evaluation of how positive or negative an individual's actions are, where shaping a person's attitude comes from the values, emotions, and knowledge he has (Hoyer et al., 2013). Attitude also determines what someone will do (Petty & Krosnick, 1995).

Table 2. Multiple Regression Analyses Result of Home-Composting Behaviour

Variable	Unstandardized Coefficients		t	P-value
	B	Std. Error		
(Constant)	-0.212	0.472	-0.449	0.657
ATT	0.196	0.168	1.172	0.251
SN	0.271	0.104	2.603	0.015
PBC	0.625	0.120	5.220	0.000

Table 3. Demographic Profile of the Sample

Location	Batan Indah Housing		Lengkong Gudang Village	
Profile demographic	n	Percent (%)	n	Percent (%)
Gender				
Men	10	63	0	0
Women	6	38	16	100
Ages				
21 - 30	1	6	3	19
31 - 40	2	13	5	31
41 - 50	3	19	4	25
51 - 60	7	44	3	19
>60	3	19	1	6
Education				
Elementary School	0	0	0	0
Middle School	0	0	7	44
High School	0	0	4	25
Associate degree	0	0	1	6
Undergraduate	10	63	4	25
Master	4	25	0	0
Post-graduate	2	13	0	0
Job				
Housewife	2	13	15	94
Employee	9	56	0	0
Entrepreneur	1	6	1	6
Pensionary	4	25	0	0
Family member				
3	5	16	7	44
4	6	19	6	38
5	2	6	3	19
6	2	6	0	0
7	1	3	0	0

SN affects HB; the findings of this subjective norm are consistent with other TPB studies regarding household-scale composting (Kopaei et al., 2021a). This illustrates that the role of the family, neighbours, community leaders (RT/RW), and so on influences the composting process in the household. This analysis also shows that every increase in subjective norms by 1 unit

will increase people's behaviour by 0.271. However, this value is relatively low; most likely, external factors indirectly influence people's behaviour in composting activities (Azlina et al., 2013).

PBC is related to HB, the effect of the PBC variable on HB in the household scale food waste composting activity is the most significant. PBC shows how much ease or difficulty is felt in composting (Kopaei et al., 2021b). This analysis shows that every increase in behavioural control by 1 unit will increase 0.625 people's behaviour. This represents the response of the community sample that it is easy to implement home composting.

Table 4. Variable of TPB

Attitude	Description
ATT1	Composting activities are needed to manage food waste
ATT2	Composting activities can create a better community environment
ATT3	Composting food waste is essential and useful
ATT4	Composting food waste can be done hygienically
Subjective Norm	
SN1	My family expects me to compost
SN2	My community leader (RT/RW) expects me to do the composting
SN3	Neighbours and the surrounding community expect me to compost
SN4	Many of my relatives and family think that composting is very useful
SN5	Many of my neighbours and community members think that composting is very useful
Percieved Control Behaviour	
PBC1	Composting depends on self-will
PBC2	Composting is easy for me
PBC3	I will continue to compost, even if it is not around me
PBC4	I know what types of food waste can be composted
PBC5	I know how to compost food waste
Home-Composting Behaviour	
HB1	I have enough time to compost food waste
HB2	I have enough space or place to put composter
HB3	Even though composting tools and materials are limited, it doesn't make me lazy
HB4	I intend to continue composting food waste in the future
HB5	I am proud to keep composting
HB6	I am proud to be able to participate in helping run the government program for composting food waste on a household scale

Conclusion

Only 2 out of 3 hypotheses were approved in this study. These findings indicate that subjective norms and perceived control influence home-composting behaviour. The influence of subjective norms on home-composting behaviour shows the support and expectations of the surrounding community to carry out food waste home-composting. The effect of perceived control behaviour on home composting shows the ease of composting. Attitude does not affect home-composting behaviour. Facilitation and socialization efforts are needed regarding the benefits of composting food waste in households to increase the sustainability of composting activities.

Author Contributions
Rohadatul Aisy Afla conceptualized the research idea, designed of methodology, management and coordination responsibility; Sri Wahyono analyzed data, conducted a research and investigation process; Dwi Nowo Martono conducted literature review and provided critical feedback on the manuscript.

Conflicts of Interest
The authors declare no conflict of interest.

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