Enhancing Organic Waste Management Behavior: A case of Thailand

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Abstract

The study is survey research. The objectives are to investigate behaviors and points of view of households in Petchaburi Municipality, Petchaburi Province. Households' heads or its representatives in Municipality, Petchaburi Province, were explored with 400 households. Yamane method was employed to randomize the sample which possesses 95% reliability. Questionnaire was served as main research tool for data collection of which the primary data was conducted during June to September 2018. The findings were that per capita daily domestic organic waste generation was 17.62 ton/day using for several purposes from people separation with 5.35 ton/day. In this connection, most of organic waste (73.43%) was piled up for natural fertilizer. The remaining organic waste for final step of municipality disposal was about 12.27 ton/day. The study result found that people in municipality has a high tendency to take part in waste separation with municipality's supports e.g. material, tools or various incentive techniques such as reward or campaign of organic waste purchasing from people. It could be said that an implementation of economic motivation mechanism results high behavior change for waste separation comparable to other motivation mechanisms. The results could be basic data for further study on economic perspective and appropriate technology to determine strategic management and elevate behavior of organic waste separation for substantial utilization in the future.

Keywords: Organic Waste, Thailand, Separation at sources, Behavior

Introduction

At present solid waste has brought into management problems in various areas across Thailand, particularly in Bangkok and major cities such as in city and town municipalities having a large number of people. Considering the physical composition of the waste, organic waste was found at the highest mean value of 63.57% as surveyed from all municipalities across the country (Pollution Control Department [PCD], 2010).

Typically, a burning method is not suitable for disposal of organic waste featuring high humidity. With high proportion of organic waste, it has affected to the cost of storage and carriage, and the use of landfill sites. In addition, the organic waste has not been popularly traded in a recycle market. There has been purchased only in some areas for animal feed and available only in restaurants, hotels and schools. This organic waste still has no value as other recycle waste. Moreover, a currently energy shortage issue has also brought into an exploration of alternative or renewable energies, such as Organic Waste and Energy Production Project, Rayong Province and Total Waste Disposal Center of Chonburi Provincial Administration Organization, Chonburi Province. Hence, both projects have implemented an anaerobic digestion system to disposal of food and organic waste to produce biogas (Department of Alternative Energy Development and Energy Conservation [DEDE], 2014) for using in various activities. However, the implementation of such projects has experienced a variety of waste composition issues in the area. With this system, it is necessary to separate organic waste from total waste as much as possible in order to obtain much more biogas. In which, the most effective way to obtain organic waste is to separate the waste at sources or from household's participation.

The results of a survey of Pollution Control Department found that Petchaburi Municipality generated waste about 45.38 ton/day, accounting for 1.37 kg/day and composed of organic waste at 59.60% or about 27 ton/day. Considering only sources of households' waste, 76.34% was organic waste (PCD, 2010). The amount of organic waste generated each day has no clear guidelines for management in terms of utilization or reduction them at final disposal yet.

As above mentioned, a researcher has presented how to utilize organic waste. In this research, the researcher will focus on behaviors of organic waste management in the households of Phetchaburi Municipality. This is basic information and can be acted as a guideline to elevate behaviors of organic waste separation for substantial utilization in the future.

Objective

To investigate behaviors and points of view on organic waste management of households in Phetchaburi Municipality, Phetchaburi Province

Scope of study

Scope of study on behaviors of organic waste management of households in Phetchaburi Municipality, Phetchaburi Province is identified as follows.

- Research aspects. There are two aspects in this research: (a) behaviors of organic waste management of households, and (b) points of view of organic waste

management of households.

- Study area. The study area covers 17 communities of Phetchaburi Municipality, Muang District, Phetchaburi Province.
- Timeframe. The primary survey period was conducted during June and September 2018.
- Terminology. Organic waste in this research means garbage that is rapidly degraded and often caused of bad smell and being a breeding ground of germs. These wastes include foods, vegetables, fruits and animals.

Methodology

The study is a survey research, focusing on the results and behaviors of organic waste management of households in Phetchaburi Municipality. Phetchaburi Province. The results will be synthesized as a guideline to elevate behaviors of organic waste separation for substantial utilization in the future.

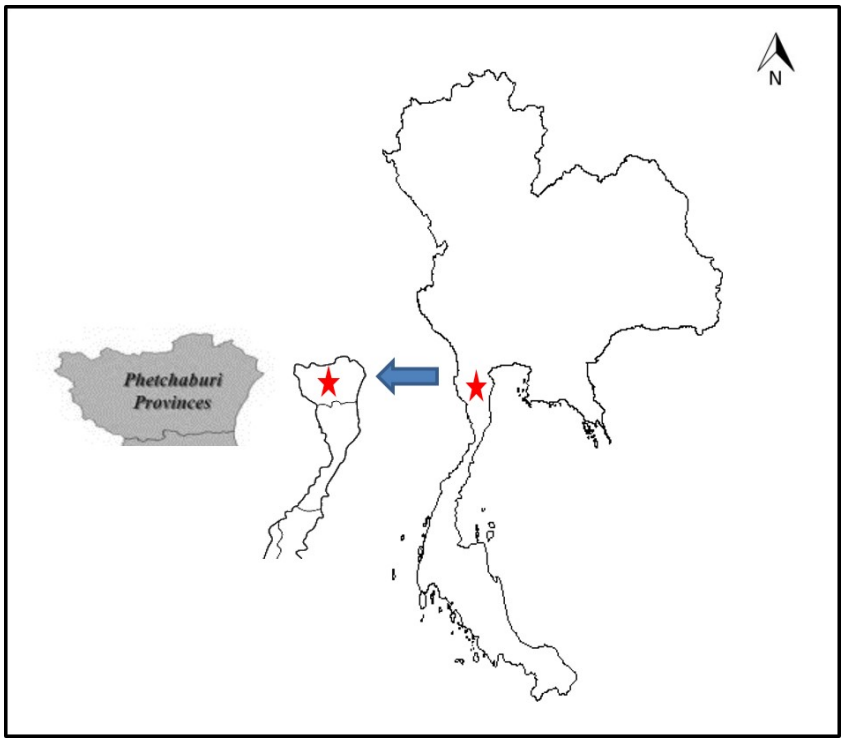

Figure 1. Target of Study Area

The samples used in this study were random sampling. The respondents were from households' heads or its representatives, totaling to 5,666 households and 23,724 people. The data was based on a survey on 16 February 2017, in Phetchaburi Municipality, Muang District, Phetchaburi Province (Phetchaburi Municipality, 2017). Yamane method (Yamane, 1967) was employed to randomize the sample at a tolerance

of (e) ± 5%, obtaining of 374 households. Stratified random sampling was conducted and based on the proportion of households enrolled in all 17 communities in the authority of Phetchaburi Municipality.

The instruments in this study were a questionnaire and a survey. 1) The questionnaires were consisted of closed-end and open-end questionnaires. They used for investigating behaviors of organic waste management in the households. In this connection, the respondents cannot provide any data or some data is unusual from the reality, such as amount of waste or amount of organic waste separation. The surveyor will measure and collect empirical data on a case-by-case basis. 2) The survey was conducted to explore people's needs and improve their behaviors. The surveyed ratio was ranked at 5 levels. The data was analyzed and processed by descriptive statistics, including frequency, mean, percentage and mean. The points of view were ranked in the following scores: less than 1.8 is a lowest level, 1.81 - 2.60 is a low level, 2.61 - 3.40 is a moderate level, 3.41 - 4.20 is a high level, and 4.21 - 5.00 is a highest level.

Literature Review

Public participation in recycling schemes is crucial for increasing recycling rates (Perrin & Barton, 2001), and a recycling program is only successful if it can trigger individual participation (Andrews, Gregoire, Rasmussen, & Witowich, 2013). Access to a curbside recycling scheme is a key factor in a successful program when a household recycles its waste (Barr & Gilg, 2005). However, in designing or planning ways for the general public to participate in waste separation, a mixture of several methods that have been proven to work is better than relying on one single method (Martin, Williams, & Clark, 2006; Noehammer & Byer, 1997). In most cases, it was found that mandatory recycling schemes achieve higher participation than voluntary schemes (Noehammer & Byer, 1997). At the same time, the most effective schemes involve active enforcement, i.e., increased education, financial incentives and socio-economic factors conducive to law-abiding behaviors (Everett & Pierce, 1993; Folz & Hazlett, 1991). Harder and Woodard (2007) followed a series of medium-scale trials carried out in the UK on various voucher-based incentive schemes for household recycling and found that these schemes increased participation rates by 10-20% in 3 months. During 2005 and 2006, Timlett and Williams (2008) applied three behavior modification methods in Portsmouth: door-stepping, incentivization and the delivery of personalized feedback. The study found that each method has different efficiencies, with some being higher than others under different operating budgets. The above-mentioned studies are examples of previous work that can be applied to practical situations according to area limitation factors. Campaigning can trigger participation, and other factors can also contribute to changing the behavioral norms for the separation of household wastes.

Many past studies have identified factors that influence the separation of recyclables and non-recyclables. Simmons and Widmar (1990) noted that, among individuals with less environmental concern, it may be more effective to provide rewards to people who recycle. Those concerned about the environment are already motivated to recycle for their own reasons, such as gaining a sense of protecting the environment; thus, external triggers, such as rewards, are not important. Belton, Crowe, Matthews, and Scott (1994) noted that public participation in recycling is essential but that a market for recyclables must also be available, indicating that it is also necessary to build up the public's understanding and attitudes towards buying products made from recycled materials (Perrin & Barton, 2001). Recyclers are generally more mature and affluent homeowners, with higher levels of education. The most influential factor was found to be personal reward, loss and other non-monetary factors such as convenience and ease of use (Miller Associates, 1999). Additionally, from Miller Associates (1999), the typical socio-demographics of a recycler suggest that participation is more likely for well-educated, affluent, older home-owners, allowing local authorities to be more specific when choosing locations for their recycling schemes. Barr, Ford, and Gilg (2003) came up with a framework for recycling behavior based on three groups of factors: environmental values, situational variables and psychological variables. Environmental values relate to an individual's beliefs, which will determine their practices. Situational variables concern the factors that enable and facilitate the activity, such as scheme design, socio-demographics and prior knowledge, and experience with the activity. In contrast, the psychological variables are such factors as motivation, social norms, response efficacy, self-efficacy, personal satisfaction, altruism and citizenship. Robinson and Read (2005) indicated that the barriers to participation in recycling included a perceived lack of incentive to recycle, apathy towards recycling, lack of awareness of recycling provisions and operational problems, with an example of the latter being a lack of sufficient storage area in the household. Household characteristics play a major role in the rate of recycling. For example, larger households seem to be more willing to put out recyclables for collection twice a week, whereas single-family dwellings possess different recycling characteristics. Martin et al. (2006) presented the factors found to be relevant in their research. Although the reasons stated in the questionnaires did not clearly show why the participation of recyclers and non-recyclers differed, it was clear that space was a major factor for recycling. Furthermore, various surveys in Britain have concluded that non-recyclers tend to be younger, less affluent and living in rented accommodations. Chung and Poon (1999) from China and Hernandez, Rawlins, and Schwartz (1999) from Ecuador found that economic incentives to recycle can be a powerful motivator for those with low incomes. Karim Ghani, Rusli, Biak, and Idris (2013) studied the influential factors of participation in

the source separation of food waste in Malaysia and found that the public has positive intentions in participating when opportunities, facilities and knowledge on waste separation at the source are adequately provided by the responsible local authorities. In addition, public involvement and participation can be increased by good moral values and such situational factors as storage convenience and collection times.

From above reviews, factors that influence the behavior of separating waste and participation were analyzed into lists below:

1. Knowledge and perception, including awareness, environmental concern and knowledge of the scheme. Previous studies show that these factors can contribute to a positive change in behavior and an increase in the public's participation.
2. Facilitating factors, such as the existence of infrastructure, the removal of barriers and sufficient storage space. Previous studies have found that this group of factors has a positive impact on the community's waste separation behavior and participation.
3. Economic incentives are factors such as prizes, financial rewards, voucher rewards, charity donation, school reward, market for recyclables and etc. Studies in the past show that this will help to enhance the behavior of the community towards waste separation and increase participation.
4. Media and information materials that are used in communicating with the community such as door-stepping, leaflets, newspapers, radio, television and signs on buses, trains, etc., affect and instruct rather than demonstrate influence on the behavior of the community. Previous studies indicate that this group of factors can influence the efficiency of the scheme and can be used to enhance waste separation behavior and participation at different levels. It also depends on the budget rather than demonstrated effectiveness

Result of Study

Behaviors of Households

The results found that households' organic waste rate was 3.11 kg/household/day, or 0.73 kg/person/day. Plastic bags dominated containers used for collecting organic waste and followed by small tanks, accounting for 90.48% and 9.52%, respectively. Disposal of organic waste was arranged into 2 types. Most of organic waste (61.76%) was disposal in the municipal waste bins placed at various sites. The remaining waste (38.24%) was separated for several purposes. Households have separated organic waste amounting to 2.47 kg/household/day and used for several purposes. In this connection, most of organic waste (73.43%) is piled up for natural fertilizer, followed by making of animal feed (19.58%) and fermentation (6.99%).

Points of View on Organic Waste Management

The survey on points of view on organic waste management of households was classified into 3 aspects and indicated the following results (details in Table 1).

Awareness: People's understanding level towards effects of organic waste non-separation was at a low level, with a mean value of 2.58 and standard deviation of 0.51 (Question A1-A3). On the contrary, people had a positive point of view about recycled waste. Their awareness on recycled waste was very highest, with a mean value of 4.40 and standard deviation of 0.71(Question A5-A6).

Problems and difficulties: People's concern about bad smell of organic waste separation was at a high level, with a mean value of 4.02 and standard deviation of 0.53. They pointed that organic waste separation at sources was not useful if the municipality collects all waste mixed into one garbage truck. Their point under this issue was very high, with a mean value of 3.89 and standard deviation of 0.73.

Motivation and need: The results found that people in Petchaburi municipality had a high tendency to take part in waste separation; they also need the following municipality's supports.

- People accepted at the highest level, with a mean value of 4.34 and standard deviation of 0.45. In case Petchburi municipality has measures or programs to support materials and tools for organic waste separation, such as plastic tanks with a lid.
- People accepted at a high level, with a mean value of 3.98 and standard deviation of 0.55. In case the municipality has various incentive techniques, such as rewards or campaigns of organic waste separation for excellent practice.
- People accepted at a high level, with a mean value of 4.09 and standard deviation of 0.34. In case the municipality has measures or programs to purchase separated organic waste from people.
- People accepted at a moderate level, with a mean value of 3.12 and standard deviation of 0.65. In case the municipality has measures, programs or campaigns to publicize and give knowledge about pros and cons of organic waste separation.
- People accepted at a low level, with a mean value of 2.05 and standard deviation of 0.62. In case the municipality has measures or programs to support about workings and activities from organic waste, such as a fermented bio-extract group, biogas production group and organic fertilizer production group.

Table 1

Result of Household's Attitude

Issue	Question	Mean	S.D.	Level
Awareness of Organic waste	A1.Organic waste separation is good for environmental i.e. global warming, pollution.	3.56	0.47	Moderate
	A2. Organic waste can reduce area of landfill method.	2.14	0.56	Low
	A3. Organic waste separation can reduce cost of community's waste management	2.02	0.58	Low
	Average of Issue	2.58	0.51	Low
Awareness of Recyclable waste	A5.Recyclable waste separation separation is importance than Organic waste practice	4.57	0.65	Highest
	A6. Recyclable waste separation can reduce area of landfill method.	4.37	0.67	Highest
	A7. Recyclable waste separation is good for environmental i.e. global warming, pollution.	4.26	0.57	Highest
	Average of Issue	4.40	0.71	Highest
Awareness of incentive	I1.The separation can increase income to your family in explicitly	4.19	0.67	High
	I2.Price value is significantly influence for your separation practice	4.78	0.34	Highest
	I3. You will perform separation, although unclearly foresee a benefit	2.67	0.46	Moderate
Problems and difficulties	P1. The separation is a wasting time, because collector mixed together in transportation process.	3.89	0.73	High
	P2.Smell of organic waste separation is a barrier of you separation practice	4.02	0.53	High
	P3. Organic waste is no valuable in market , this point is obstacle for separation practice	4.64	0.34	Highest
	P4. Convenience of storage is importance factor to enhance separation practice	4.12	0.54	High
Motivation and need	M1. Organized programs to support materials and tools for organic waste separation, such as plastic tanks with a lid.	4.34	0.45	Highest
	M2.Organized rewards or campaigns of organic waste separation for excellent practice	3.98	0.55	High
	M3. Organized programs to purchase separated organic waste from people	4.09	0.34	High
	M4.Organized programs or campaigns to publicize and give knowledge about pros and cons of organic waste separation.	3.12	0.65	Moderate
	M5. Organized programs to support about workings and activities from organic waste, such as a fermented bio-extract group, biogas production group	2.05	0.62	Low

Discussion

The results found that the households in Petchaburi Municipality have currently generated organic waste at 17.62 ton/day, but used for several purposes at separated sources only 5.35 ton/day. Whereas, the remaining organic waste of 69.64% or 12.27 ton/day has not been utilized and got disposal at a final step, resulting to municipal cost of disposal and carriage. Todays, each area has utilized organic waste in various forms, such as Compost Production Project, Biogas Production from Organic Waste Project or Refuse Derived Fuel: RDF. These activities have also delivered positive outcomes to several project managers. However, people participation is very significant for sustainable success to move the projects forwards. Subsequently, a waste separation process at sources has become a tool providing the cheapest cost for collecting raw materials or organic waste for different utilization.

The results also found that most of people in Petchaburi Municipality highly accepted and had a high tendency to separate organic waste from their households. They are willing to carry out such activity under municipality supports on materials, tools or various incentive techniques, such as rewards or organic waste purchasing from people. It could be said that each mechanism brings a management cost. In addition, an implementation of economic motivation mechanism affects to high behavior change for waste separation comparable to other motivation mechanism as aforesaid in the study results.

In conclusion, the study results pointed to an opportunity that the present municipal organic waste will not be useless waste as in the past. The municipality could further study on economic perspective and appropriate technology to determine sustainable strategic management of organic waste. It is possible that the mechanisms initiated from people's needs might inevitably lead to a systematic and sustainable management of organic waste in the future.

Conclusion

The study is survey research which its results can be summarized follows. The results found that households' organic waste rate was 3.11 kg/household/day. With totaling 2,167 households in the municipality, organic waste was generated at 17.62 ton/day. Before the municipality disposal, 38.24% of waste or amounting to 2,167 households was separated at sources for various purposes. This waste amount had a mean value of 2.47 kg/household/day. Therefore, Petchaburi Municipality will separate organic waste for various purposes, totaling to 5.35 ton/day. In conclusion, Petchaburi Municipality had generated households' organic waste at 17.62 ton/day. The waste will be separated and utilized for several purposes at 5.35 ton/day. Then, the remaining waste for final step of municipality disposal was about 12.27 ton/day.

Points of view towards organic waste management of hourseholds in Petchaburi Municipality in the future. Points of view towards organic waste management of households at present and in the future can be summarized as the following results.

1. People's understanding level towards effects of organic waste non-separation was at a low level.
2. People's concern about bad smell of organic waste separation was at a high level.
3. In case Petchburi municipality has measures for behavior supports, people had a high tendency to involve in organic waste separation practice.
4. In case the municipality has measures or programs to support materials and tools for organic waste separation, people had the highest tendency to separate organic waste at sources.
5. In case the municipality has various incentive techniques for organic waste separation at the community level, people had a high tendency to separate organic waste at sources.
6. In case the municipality has measures or programs to purchase of separated organic waste, people had a high tendency to separate organic waste at sources.
7. In case the municipality has measures, programs or campaigns to publicize and give knowledge about organic waste separation, people had a moderate tendency to separate organic waste at sources.
8. In case the municipality has measures or programs to support about workings and activities from organic waste, people had a low tendency to separate organic waste at sources.

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